

# **CADW PROJECT DAT 124 CRICKCHURCH, CAREW PEMBROKESHIRE: GEOPHYSICAL SURVEY 2012**



Prepared by  
Dyfed Archaeological Trust  
For CADW



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# CADW PROJECT DAT 124 CRICKCHURCH, CAREW, PEMBROKESHIRE: GEOPHYSICAL SURVEY 2012

Gan / By

**Philip Poucher**

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# CRICKCHURCH, CAREW, PEMBROKESHIRE: GEOPHYSICAL SURVEY 2012

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## **CRICKCHURCH, CAREW, PEMBROKESHIRE: GEOPHYSICAL SURVEY 2012**

### **SUMMARY**

*The site of Crickchurch or Christ Church lies in a field immediately to the east of Crickchurch Farm in the parish of Carew, Pembrokeshire. In 1921 it was reported that this was the site of a chapel and hamlet which, in church wardens accounts of 1672, possessed the right of burial, and that burials had been disturbed by nearby quarrying activity. Potential deserted medieval church sites are not common in southwest Wales, and the possibility of one with an associated settlement is most unusual, indicating this is potentially a very important site.*

*The location of the possible chapel building is suggested on mid-19<sup>th</sup> century map sources, but nothing remains of the site above ground. In 2011 the owner of Crickchurch Farm reported that in dry weather the foundations of a rectangular stone building with an east – west alignment were clearly visible, as well as the foundations of one other building. He also stated that he may have come across a grave whilst digging a service trench in the vicinity, and that this part of the field was traditionally regarded as a religious site. Since recently changing tenants the field is now regularly ploughed, which is disturbing stonework and bringing pottery fragments to the surface.*

*Cadw commissioned Dyfed Archaeological Trust to undertake the geophysical survey of the site in the hope of identifying and characterising possible buried archaeological remains.*

*The geophysical survey of the site was undertaken in early September 2012, the only known archaeological investigation of the site to date. This revealed a complex range of archaeological activity throughout the surveyed area. The site of the building identified as a parch-mark in dry weather is not clearly identified on the survey, lying as it does on the edge of the surveyed area in a location affected by interference from adjacent wire fencing. A series of enclosures, trackways, pits and possible structural remains are visible on the survey results within the western corner of the field. When taken together these features appear consistent with the site of a small settlement, possibly the hamlet associated with the chapel site. Further intrusive archaeology would be required to confirm this and provide an indication of the date and condition of these archaeological remains. Intrusive archaeology would also be required to prove the existence of a chapel and locate any associated cemetery.*

*It is clear from stonework and pottery fragments visible on the field surface at the time of the survey that ploughing is disturbing buried remains. No bones were visible within the plough soil, but this site would appear to now be undergoing regularly ploughing for arable crops.*

## **INTRODUCTION**

### **Project Commission**

The site of Crickchurch or Christ Church lies immediately to the east of Crickchurch Farm in the parish of Carew, Pembrokeshire (SN 0526 0373). There is now no surface evidence for the church. Documentary evidence indicates that a settlement was also located here, but, apart from the farm, there is no surface evidence for this. In 1921, it was reported that: "the site of a hamlet chapelry which is spelt Christchurch in the church wardens' accounts for 1672....it possessed the right of burial, and human remains have been found in an adjacent quarry". This clearly is potentially a very important site. Deserted medieval church sites are not common in southwest Wales, but to have one with an associated deserted medieval settlement is most unusual, if not unique.

In 2011, the owner of Crickchurch Farm reported that in dry weather foundations of a rectangular stone building with an E-W alignment were clearly visible, as well as the foundations of at least one other building. He reported that until three years ago the field had not been ploughed, but that new tenants had then ploughed the field bringing building stone and pottery to the surface. The owner's family have farmed at Crickchurch since at least the mid-1500s. They had always regarded the field as a religious site, and services were held on it or near the farm.

Crickchurch was identified in the 2010-11 Churches and Chapels Project as worthy of scheduling, but it was noted that it would be desirable to collect more data on the site prior to finalising such a designation. There is also a clear threat to this site from continuing agricultural practice. The ploughing of the site three or four years ago is of great concern. There is, however, no data on this site, and therefore that impact of this ploughing on the buried remains is not certain, but the observations of the owner of Crickchurch Farm indicate that this is likely to be severe.

Cadw commissioned Dyfed Archaeological Trust to undertake the geophysical survey of the site in the hope of identifying and characterising possible buried archaeological remains. The fieldwork was undertaken in September 2012.

### **Scope of the project**

This project aims were to characterise by geophysical (gradiometer) survey the buried medieval archaeology of the church and settlement of Crickchurch. A survey area of slightly larger than 1ha was required.

The information from the survey will be used as the first stage in a larger project to determine the exact character, survival and depth of any identified remains.

This project will help to clarify the history and development of Crickchurch. In the Medieval Section of the *Introducing a Research Framework for the Archaeology of Wales* identifies under Settlement the need for 'Deeper, more intensive studies of secular settlement sites of different status...' is highlighted. Investigations at Crickchurch offer the opportunity for such a study of a medieval settlement site potentially uncontaminated by later development.

The work will also allow the enhancement of the Dyfed Historic Environment Record (HER).

## Report outline

Because of the limited nature of this project, together with the considerable archaeological evidence in the wider area, this report is restricted solely to the results of the geophysical survey and subsequent test-pitting.

## Abbreviations

Sites recorded on the Regional Historic Environment Record (HER) are identified by their Primary Record Number (PRN) and located by their National Grid Reference (NGR). Gradiometer readings are measured in nanoTesla (nT).

## Timeline

The following table illustrates the approximate dates for the archaeological periods discussed in this report:

PERIOD	APPROXIMATE DATE
PALAEOLITHIC	c.120,000 BC – c.10,000 BC
MESOLITHIC	c.10,000 BC – c.4400 BC
NEOLITHIC	c.4400 BC – c.2300 BC
BRONZE AGE	c.2300 BC – c.700 BC
IRON AGE	c.700 BC – c.43 AD
ROMAN	c.43 AD – c.410 AD
EARLY MEDIEVAL	c.410 AD - c.1086
MEDIEVAL	c.1086 - c.1536
POST MEDIEVAL	c.1536 – c.1900
MODERN	c.1900 onwards

**Table 1:** Archaeological and historical timeline

## THE SITE

### Location and Archaeological Potential

The site (SN 0526 0373) is located within a field immediately to the east of Crickchurch Farm, a short distance north of Sageston in south Pembrokeshire. Sageston lies on the banks of the Carew river, which feeds into the Cleddau c.5.5km to the northwest.

The field, which overlooks Crickchurch Farm and Carew beyond, is bounded on its west side by a narrow road (photo 5) that runs past Crickchurch Farm, crosses a ford (photo 6) in the Carew river 120m to the south and then meets the road between the villages of Sageston and Carew. To the north lies a modern bungalow with outbuildings, and a hedgerow field boundary. To the southwest lie the remains of a former limestone quarry with a modern fence line extending to the east, although this appears to run alongside a denuded former field bank (photo 4). To the south of this boundary the land falls away to the Carew river. To the east the field opens out, with farmland beyond.

At the time of the survey the field had recently been ploughed (photo 3), and appears to be regularly used for arable crops. Several areas of disturbed stone were noted within the plough soil, with some areas, particularly close to the northern edge of the site, having the appearance of potential (unworked) building stone. Numerous sherds of pottery was also visible on the surface, clearly recently brought up by the plough. The pottery was in greater concentrations along the north and western side of the area surveyed. This pottery has not been examined by a specialist but would appear on initial examination to be largely post-medieval in date.

The underlying geology consists of limestone of the Pembroke Limestone Group.

In 1921, it was reported (Spurrell 1921) that close to Crickchurch Farm was: "the site of a hamlet chapelry which is spelt Christchurch in the church wardens' accounts for 1672....it possessed the right of burial, and human remains have been found in an adjacent quarry". Charles (1992) in his 'Place-names of Pembrokeshire' records the first mention of Crickchurch (as Crychurche) in 1543. No further study or previous archaeological investigation has been undertaken on the site of the chapel (PRN 46799) or its associated hamlet (PRN 3524). The nearby quarry (PRN 37467) in which the burials were found lies approximately 50m to the south-southwest of the presumed site of the chapel.

The tithe map of c.1839 and the more detailed 1<sup>st</sup> edition 1:2500 Ordnance Survey map of 1865 (Figure 2) shows a building close to the northern boundary of the field, aligned east – west and accessed via a trackway from the road to the west. The tithe map shows the building in the corner of a large field called 'Merchant's Park'. The building appears to have been abandoned by the time it is shown on the 1865 OS map.

In 2011, the owner of Crickchurch Farm reported that in dry weather foundations of a rectangular stone building with an E-W alignment were clearly visible, as well as the foundations of at least one other building. He reported that until three years ago the field had not been ploughed, but that new tenants had then ploughed the field bringing building stone and pottery to the surface. The owner's family have farmed at Crickchurch since at least the mid-1500s. They had always regarded the field as a religious site, and services were held on it or near the farm. During the course of the survey he also stated that whilst digging a shallow trench for a toilet drain/water pipe in SW corner of the field, close to



the quarry, he came across a horizontal stone slab that sounded hollow when struck, he considered it to be a grave covering.

## **METHODOLOGY**

A fluxgate gradiometer was used for the survey, which detects variations in the earth's magnetic field (full specifications are in Appendix 1). Readings were taken at a medium resolution on traverses 0.5m wide and every 0.25m within a 20m x 20m grid across the site. In total an area of 1.3ha was surveyed. A Trimble TST was used to tie the grid into the local Ordnance Survey grid.

## **Limitations**

The survey was undertaken over a total of two days in September 2012. Weather conditions were dry and sunny. The field was bounded by post and wire fencing to the north and south which obscured readings taken in their immediate vicinity. Thick nettles growing against the northern side of the field also prevented complete coverage up to the northern boundary. The field has recently been ploughed resulting in uneven ground however, pacing lines were used throughout the survey and any variations in the data collections are likely to have been small.

The underlying geology and soils did not appear to cause any geological distortions of the geophysical survey results.

## **Processing, presentation and interpretation**

Processing was performed using *ArchaeoSurveyor 2.5*, detailed explanation of the processes involved are described in Appendix 1. The data is presented with a minimum of processing (Figures 3 & 4), but the presence of high values caused by ferrous objects tends to hide fine details and obscure archaeological features, thus the values were 'clipped' to remove the extreme values allowing the finer details to show through. The survey was clipped to a range from 10nT to -10nT. During the survey the presence of small surface iron anomalies, typically deriving from modern material, causes spikes in the data. These have been removed using median values.

The processed data is presented as grey-scale plots overlaid on local topographical features (Figures 3 & 4). The main magnetic anomalies have been identified and plotted onto the local topographical features as a level of interpretation (Figure 5).

The survey results and interpretation diagrams should not be seen as a definitive model of what lies beneath the ground surface, not all buried features will provide a magnetic response that can be identified by the gradiometer. In interpreting those features that are recorded the shape is the principal diagnostic tool, along with comparison with known features from other surveys. The intensity of the magnetic response could provide further information, a strong response for example indicates burning, high ferric content or thermoremnancy in geology. The context may provide further clues but the interpretation of many of these features is still largely subjective.

All measurements given are approximate as accurate measurements are difficult to determine from fluxgate gradiometer surveys. The width and length of identified features can be affected by its relative depth and magnetic strength.

## **RESULTS**

### **Geophysical Interpretation (Figure 5)**

The geophysical survey shows a complex range of archaeological activity throughout the surveyed area, therefore only the major features are discussed. Any interpretation from these geophysical results is by its nature speculative and precise details about the context, function, state of preservation and date of any archaeological features would require further intrusive investigation.

#### **No. 1**

Prior to the survey the location of the proposed chapel was suggested close to the northern end of the field, as depicted on historic map sources (Figure 2). It was in this location that spreads of plough-disturbed stonework, seemingly suitable for building stone, was noted. The geophysical survey results however give no positive indication of a building at this point. This area is however adjacent to a post and wire fence, fronted by thick undergrowth. The readings from the wire fence cast a long shadow, preventing much finer detail being revealed, and the undergrowth prevented a complete survey in this area. The survey results may however pick out a rectilinear enclosure around this possible chapel building. A possible L-shaped ditch line is shown to the SE, the long side orientated NE – SW. The NE side of the enclosure may be formed by the line of a possible bank (see No.2), or by a kink visible in the current field boundary just beyond.

#### **No. 2**

Two wide linear features, which converge close to the eastern side of the surveyed area, form a large triangular area. These linear features are formed largely by parallel lines of magnetically negative readings roughly 5m apart, which may represent buried banks or walls. In between are both generally more magnetically negative areas, and areas and lines of magnetically positive readings. Both linear features appear to represent trackways, the darker areas likely to pick out wheel ruts and sunken sections of the track, the lighter areas possible track surfaces. The southern arm of the triangle is still partly visible as a sunken hollow in the surface of the field. This arm appears to curve to the SW as it runs west, before being truncated by the quarry. The remainder of this line runs parallel to the current field boundary to the south, which, although a modern post and wire fence, runs alongside the remains of an earlier tumbled wall or hedgebank. The NE trackway runs in a SSE – NNW direction, and appears to access the possible chapel enclosure (No.1). Just before this enclosure the line of the trackway is interrupted by an area of mixed magnetic readings, indicating an area of disturbed ground.

#### **No. 3**

In the angle in between the two trackways (No.2) a series of probable ditches divides the area into a series of long narrow enclosures. These enclosures appear to respect the line of the trackways and the possible chapel enclosure (No.1) indicating they are likely to be contemporary features. The ditches do not appear to run as far as the possible chapel enclosure however (see No.4).

#### **No. 4**

Within this area between the possible chapel enclosure (No.1) and the long narrow enclosures (No.3) are several small discrete features and possible linear features. It is not clear what activity this signifies, there is the suggestion that one linear may be L-shaped suggesting possible partial structural remains although it is not aligned with any surrounding features. Areas of strong magnetically positive readings, surrounded by a halo of magnetically negative readings, such as can be seen to the NE, are often indicative of objects with high ferric content, usually found to be relatively modern in origin although that cannot be stated for certain without further intrusive archaeological investigation.

#### **No. 5**

The area to the SE of the ditched enclosures (No.3) and in between the point of the two trackways (No.2) is further subdivided by a possible buried bank or wall.

#### **No. 6**

A series of short linear features, possibly ditches, are visible on the survey results orientated SSW – NNE on the northern edge of the lower trackway (No.2). Faint linear features may enclose the northern end forming smaller rectangular enclosures. The function of these possible enclosures is unclear, they appear too small for field enclosures and may represent enclosures surrounding structures. The structures themselves are not visible on the survey results.

#### **No. 7**

To the north of these small enclosures (No.6), and to the west of the possible chapel enclosure (No.1) are a series of mixed readings of unclear origin. At the NE end is a somewhat sinuous, although almost square, feature of strong magnetically positive readings. It is unclear if this represents an archaeological feature, the sinuous nature may be indicative of a naturally occurring phenomenon, although no similar features are visible in the area surveyed. It may also be of note that spread of disturbed stone was revealed in the recently ploughed field surrounding this feature at the time of the survey. These isolated patches of stone do not appear to be naturally occurring and may therefore indicate this is an archaeological, and possibly structural, feature.

Faint traces of a linear feature orientated NE – SW extend to the SW of this sinuous anomaly. This may represent a bank and ditched boundary, on the same alignment as the possible chapel enclosure (No.1).

To the west is a NNE – SSW orientated linear feature. The southern part of this linear feature appears to be picked out by bipolar magnetic readings, possibly indicating high ferric content in the infilling material. Such readings are often found to be relatively modern in origin, and this particular linear feature does lie within the area the previous landowner had identified as the site of temporary pipe/sewage trenches he excavated some years ago. It was during the excavation of these trenches that he claims to have come across a large slab of stone that he considered to be possible grave covering.

### **No. 8**

On the south side of the trackways (No.2) is an area of slightly mixed magnetic results that appear to be contained on its east side by a narrow linear feature. To the west the area is truncated by the quarry. The mixed readings indicate this may be an area of general archaeological activity. Within this further linear features suggest a square or rectilinear enclosure, or possibly even a structure. An area of slightly more magnetically negative readings appears to delineate the southern extent of this particular enclosure.

### **No. 9**

Immediately south of enclosure No.8 further rectilinear features suggests another enclosure. Both features appear to be aligned with the field boundary to the south, and both also appear to be truncated by the quarry to the west. Possible structural remains are also suggested within this enclosure by the presence of magnetically negative linear features. Immediately to the east of this an area of plough-disturbed stonework was noted during the course of the survey although it was not clear if this was building stone or broken bedrock.

### **No. 10**

To the east of these enclosures (Nos. 8 & 9) and to the south of the trackway (No.2) are a spread of discrete responses that may be indicative of pits of an archaeological nature, although it is entirely possible these may represent naturally occurring features. However, immediately adjacent to the trackway are two large responses that by their size and location would appear to be archaeological in nature.

## CONCLUSION

Crickchurch is believed to be the now-vanished site of a medieval and early post-medieval church (PRN 46799) and possible associated settlement (PRN 3524) to the east of Crickchurch Farm in the parish of Carew, Pembrokeshire (SN 0526 0373). The name is first recorded in the mid-16<sup>th</sup> century, and 17<sup>th</sup> century accounts refer to a hamlet with a chapel and possible cemetery. The outline of an east – west aligned building is apparently visible as a cropmark in particularly dry weather, and recent ploughing has disturbed large stones and pottery in its vicinity. There are also antiquarian reports of burials being discovered in nearby quarrying.

The geophysical survey of the site was undertaken in early September. The site of the east – west aligned building is not clearly identified on the survey, lying as it does on the edge of the survey in an area affected by interference from adjacent wire fencing. Historical map sources however appear to confirm the location of a building along the northern edge of the field, and its orientation is highly suggestive of a chapel or church building. The survey did reveal a variety of enclosures, possible structural remains, pits and trackways to the south. Taken together these features appear consistent with the site of a small settlement, which historical references would suggest is the hamlet associated with the possible chapel site.

By combining the geophysical results, historic mapping and topographical features it may be possible to suggest further elements to the settlement (Figures 7 & 8). The line of the northernmost trackway visible on the survey results is projected NW along the boundary of the cottage enclosure to the north of the surveyed area. If the southernmost trackway is also projected westwards then this forms a triangular area along with the current NE – SW road with the supposed chapel site at its centre. This would encompass part of the quarried area to the south and may help explain the reported presence of burials disturbed by the quarrying. To the west lies the current Crickchurch farmstead. It is not unusual for farmsteads to have formed over the site of an earlier settlement, but it may also mark the location of a local manor house, separated from the religious enclosure around the chapel by the current NE – SW road. The survey results suggest a smaller enclosure around the chapel site, within the triangular area formed by the trackways. Immediately south of this smaller enclosure are possible smaller property boundaries, perhaps indicating an encroachment of settlement into the chapel grounds.

The survey results also indicate possible further settlement to the south of the triangular enclosure. The eastern edge of this settlement appears to be defined on the survey results, with what appears to be agricultural land beyond. As the land begins to fall away into the small valley to the south it is unlikely any settlement would have extended beyond the line of the current field boundary, especially given the valley bottom would have been subject to tidal flooding. If the former settlement extended to the west of the current NE – SW road then it is likely the top of the small river valley formed the southern extent of any settlement. The tithe map shows the eastern edge of the field to the north of the farmstead divided into two narrow strips (together described in the apportionments as 'Wall Meadow'). These strips are reminiscent of fossilised strip fields often found around medieval settlements, as a way of dividing up the farmland between the occupants of the settlement. As such this field may indicate the northern limits of a settlement if it extended to the west of the road.

Further surveying may be able to suggest further settlement around Crickchurch farm, however more intrusive archaeology would be required to confirm the date, character and condition of any of these possible settlement

remains, including the existence of the chapel and the location of any associated cemetery.

It is clear from stonework and pottery fragments visible on the field surface at the time of the survey that ploughing is disturbing buried remains. No bones were visible within the plough soil, but this site would appear to now be undergoing regular ploughing for arable crops further degrading the potential archaeological resource.

## **ACKNOWLEDGEMENTS**

The survey was undertaken by Hubert Wilson and Phil Poucher of Dyfed Archaeological Trust. I am indebted to Mr D James for allowing access to the land and to Mr Eynon for his assistance and information regarding the site.

## **ARCHIVE DEPOSITION**

The archive will initially be held by DAT, before being passed to the National Monument Record, Aberystwyth.

## **SOURCES**

Anon c.1839 *Carew Parish Tithe Map*

British Geological Survey, 1994, *The Rocks of Wales* 1:250,000.

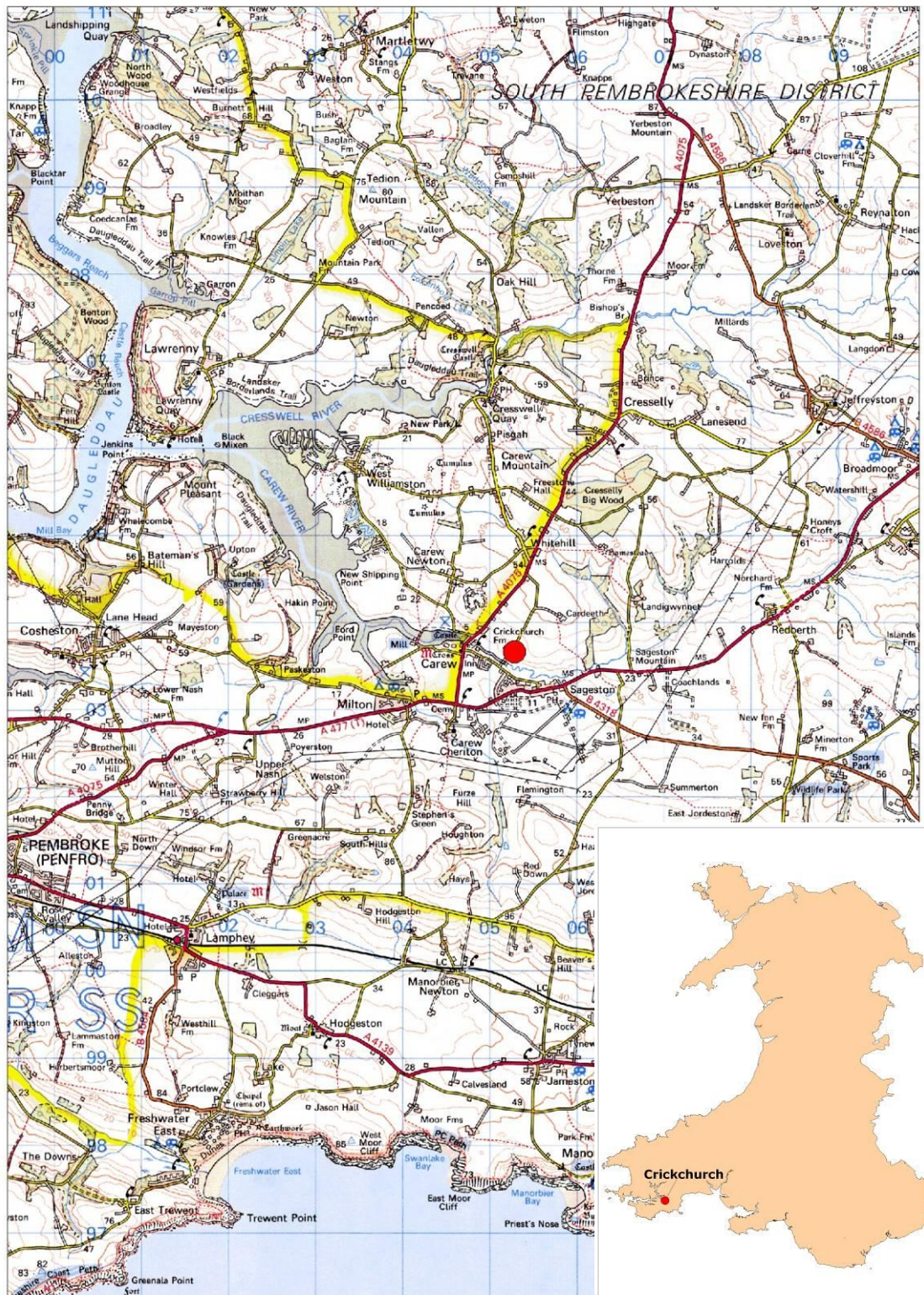
Charles, B.G 1992 *The Place-Names of Pembrokeshire, volume 2* NLW,  
Aberystwyth

Clark A J, 1996, *Seeing Beneath the Soil* (2<sup>nd</sup> edition). Batsford, London.

Ings M, Davies O, Murphy K & Page M 2011 *Medieval and Early Post-Medieval Churches and Chapels: A Threat-Related Assessment 2010-11*  
DAT Report No. 2010/47

Ordnance Survey 1889 1<sup>st</sup> edition 1:2500 Map, Pembrokeshire XXIII.15

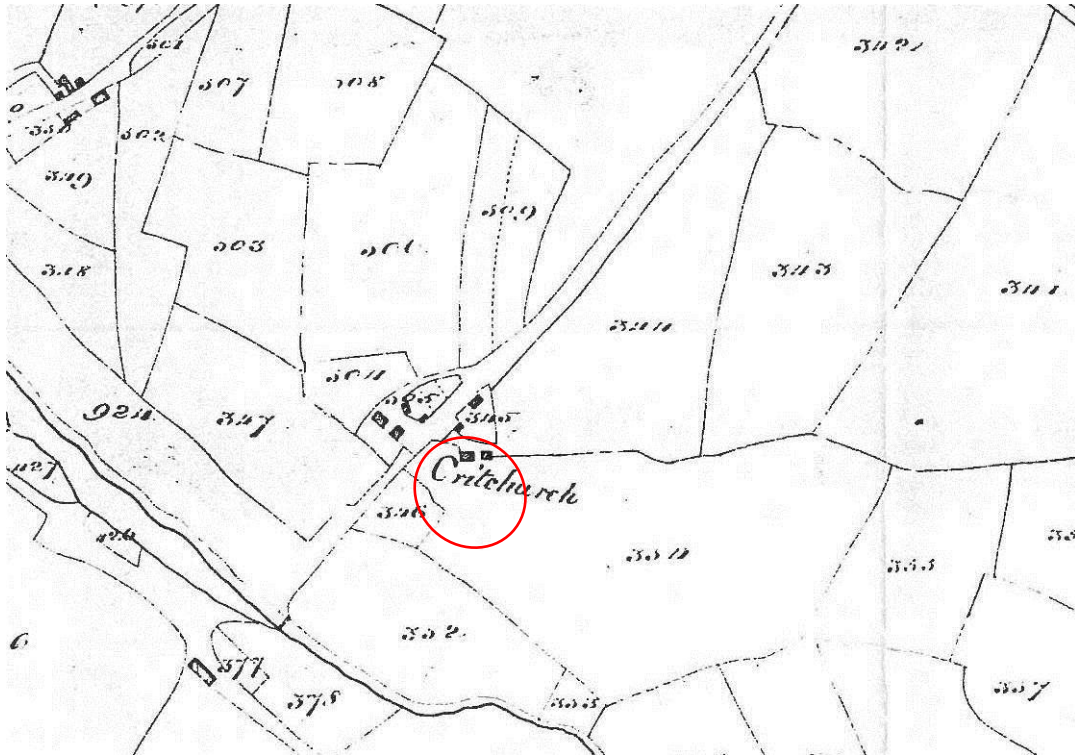




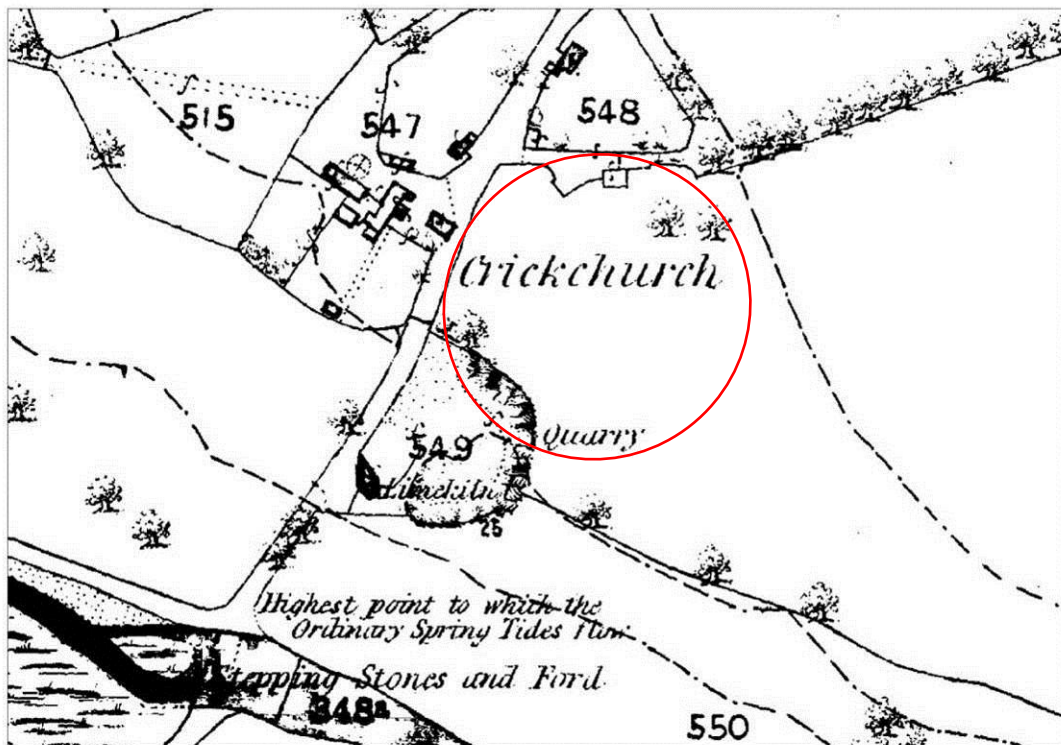
**Figure 1:** Location map, based on the Ordnance Survey.

Reproduced from the 1995 Ordnance Survey 1:50,000 scale Landranger Map with the permission of The Controller of Her Majesty's Stationery Office, © Crown Copyright Dyfed Archaeological Trust, The Shire Hall, Carmarthen Street, Llandeilo, Carmarthenshire SA19 6AF. Licence No AL51842





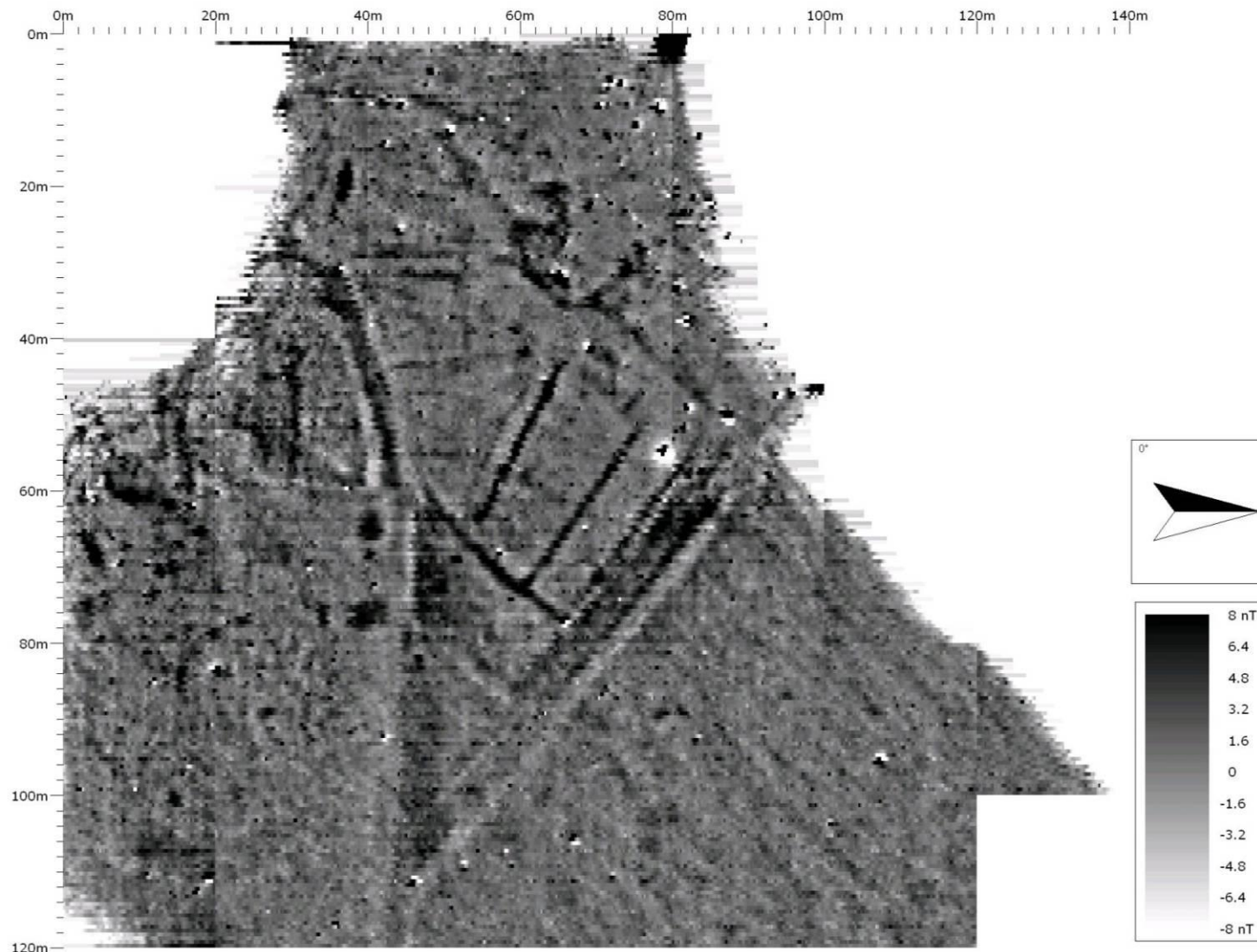
**Figure 2:** Extract from the Carew parish tithe map of c.1839, showing the possible chapel building(s). Survey area in red.



**Figure 3:** Extract from the 1<sup>st</sup> edition Ordnance Survey 1:2500 map, showing the possible chapel building. Survey area in red.



**Photo 1:** Aerial photograph of the field, taken in 1955 (Meridian Airmaps).  
Survey area in red.

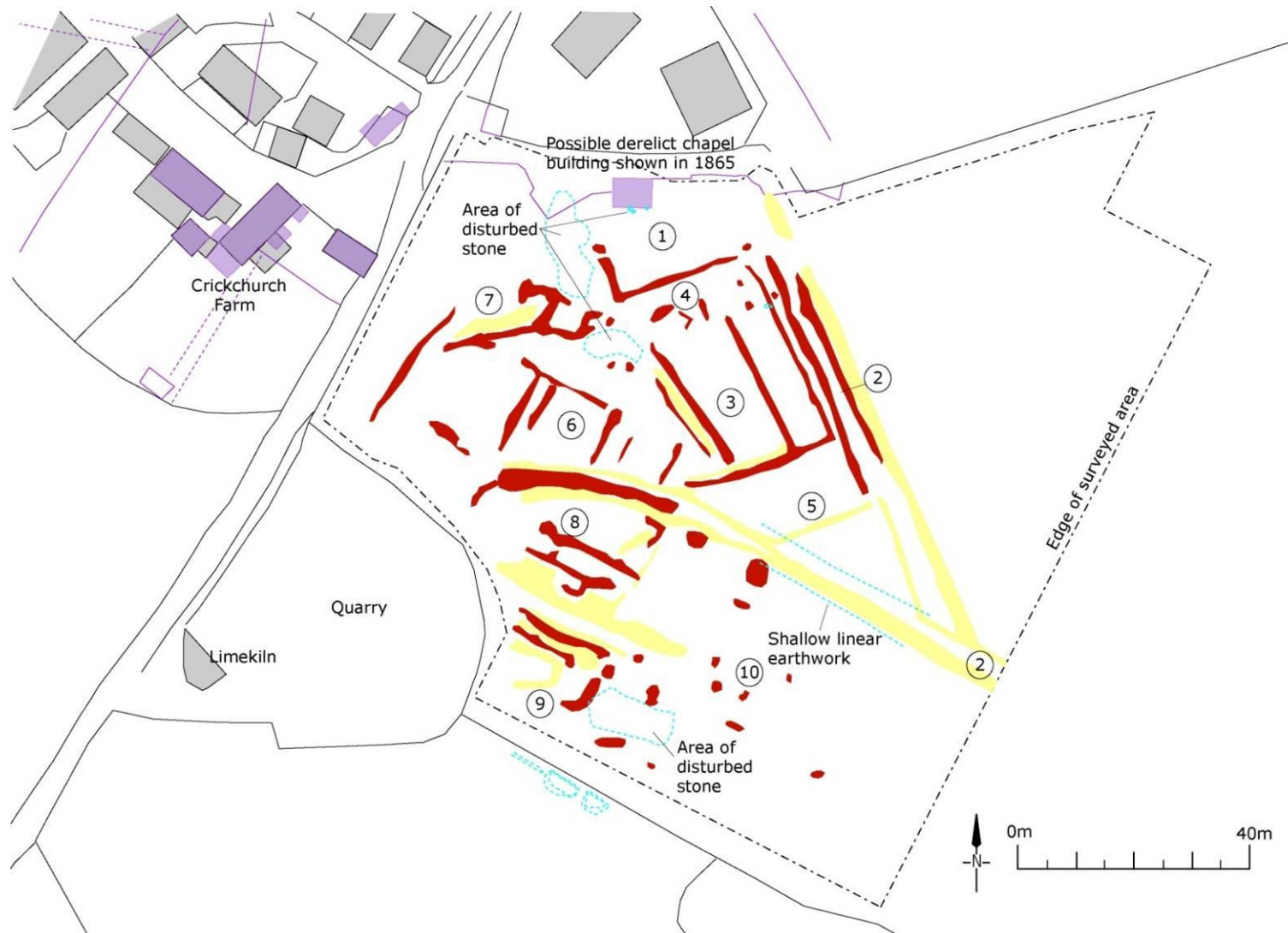


**Figure 4:** Geophysical results presented as a greyscale plot. The results have been clipped to a range from 8nT to -8nT, but otherwise unprocessed. The North arrow is approximate.

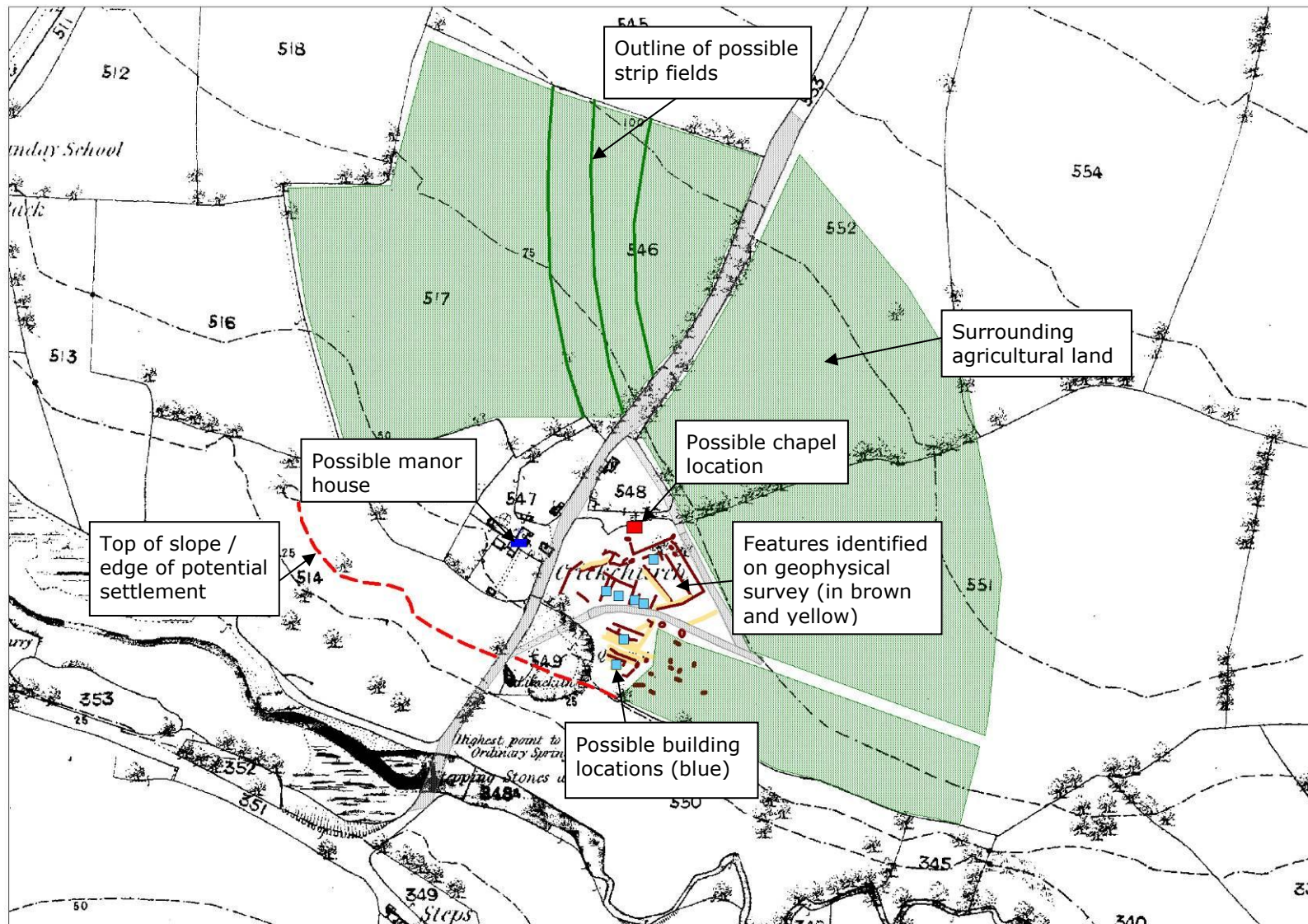




**Figure 5:** Geophysical survey results, orientated to north and overlaid on local topographical detail.

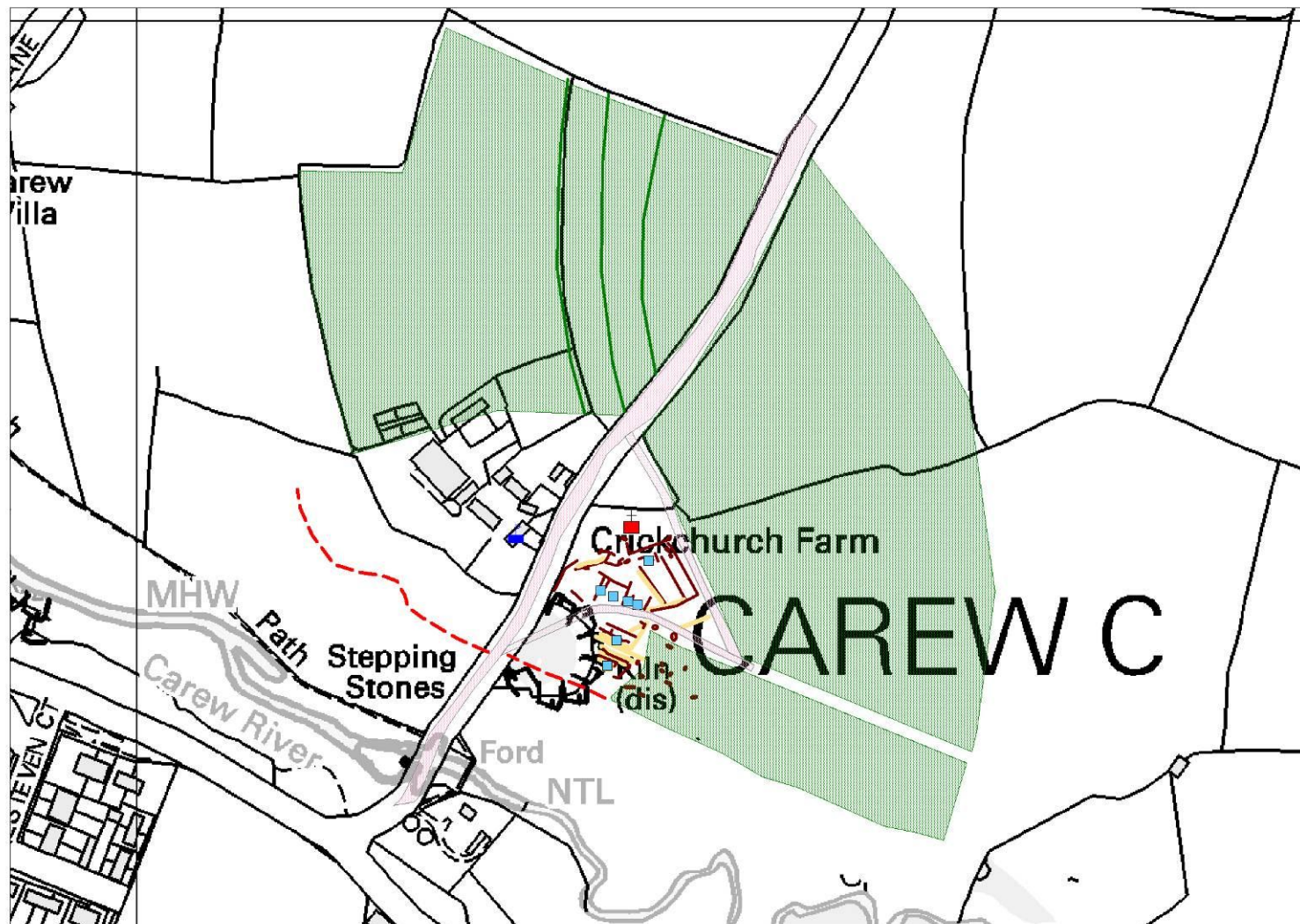


**Figure 6:** Interpretation of geophysical survey results with local topographical detail. Red highlights magnetically positive results, yellow highlights magnetically negative results. Features recorded on the 1865 Ordnance Survey map are shown in purple. Features noted during the course of the survey are shown in blue.



**Figure 7:** Suggested settlement features, overlaid on the 1865 1<sup>st</sup> edition Ordnance Survey map.





**Figure 8:** Suggested settlement features, overlaid on current Ordnance Survey map.

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**Photo 2:** Looking east over the supposed site of the chapel at the northern end of the field. Photo taken in 2011.



**Photo 3:** Looking south across the site at the time of the survey. Disturbed stonework is just about visible amongst the plough soil in the foreground. 1m scale.





**Photo 4:** Looking south from the surveyed area. The denuded field bank or wall is visible behind the modern post and wire fence, with a possible gateway in the centre. Sageston lies in the background.



**Photo 5:** The road that runs past the western side of the site down to the ford in the background.





**Photo 6:** Looking east across the ford up the Carew river.

## **APPENDIX 1: METHODOLOGY AND INSTRUMENTATION**

### **Geophysical Survey Instrumentation**

A fluxgate gradiometer survey provides a relatively swift and completely non-invasive method of surveying large areas.

The survey was carried out using a Bartington Grad601-2 dual Fluxgate Gradiometer, which uses a pair of Grad-01-100 sensors. These are high stability fluxgate gradient sensors with a 1.0m separation between the sensing elements, giving a strong response to deeper anomalies.

The instrument detects variations in the earth's magnetic field caused by the presence of iron in the soil. This is usually in the form of weakly magnetised iron oxides, which tend to be concentrated in the topsoil. Features cut into the subsoil and backfilled or silted with topsoil therefore contain greater amounts of iron and can therefore be detected with the gradiometer. There are, however, other processes and materials that can produce detectable anomalies. The most obvious is the presence of pieces of iron in the soil or immediate environs which usually produce very high readings and can mask the relatively weak readings produced by variations in the soil. Archaeological features such as hearths or kilns also produce strong readings because fired clay acquires a permanent thermoremanent magnetic field upon cooling. This material can also get spread into the surrounding soil leading to a more generalised magnetic enhancement around settlement sites.

Not all surveys produce good results as anomalies can also be masked by large magnetic variations in the bedrock or soil or high levels of natural background "noise" (interference consisting of random signals produced by material within the soil). In some cases, there may be little variation between the topsoil and subsoil resulting in features being un-detectable. It must therefore be stressed that a lack of detectable anomalies cannot be taken to mean that there are no below ground archaeological features.

The Bartington Grad601 is a hand-held instrument and readings can be taken automatically as the operator walks at a constant speed along a series of fixed length traverses. The sensor consists of two vertically aligned fluxgates set 1.0m apart. Their Mumetal cores are driven in and out of magnetic saturation by an alternating current passing through two opposing driver coils. As the cores come out of saturation, the external magnetic field can enter them producing an electrical pulse proportional to the field strength in a sensor coil. The high frequency of the detection cycle produces what is in effect a continuous output (Clark 1996).

The gradiometer can detect anomalies down to a depth of approximately one metre. The magnetic variations are measured in nanoTeslas (nT). The earth's magnetic field strength is about 48,000 nT; typical archaeological features produce readings of below 15nT although burnt features and iron objects can result in changes of several hundred nT. The instrument is capable of detecting changes as low as 0.1nT.

### **Geophysical Survey Data Collection**

The gradiometer includes an on-board data-logger. Readings in the surveys were taken along parallel traverses of one axis of a grid made up of 20m x 20m squares. The traverse intervals were either 0.5m or 1.0m apart. Readings were logged at intervals of 0.25m along each traverse giving 3200 readings per grid square (medium resolution on 0.5m traverses), or 1600 readings per grid square (low resolution on 1.0m traverses).

## **Geophysical Survey Data presentation**

The data was transferred from the data-logger to a computer where it was compiled and processed using ArchaeoSurveyor 2.5 software. The data is presented as grey-scale plot where data values are represented by modulation of the intensity of a grey scale within a rectangular area corresponding to the data collection point within the grid. This produces a plan view of the survey and allows subtle changes in the data to be displayed. A separate grey-scale plot with interpretation of the main features is also included as necessary.

## **Geophysical Survey Data Processing**

The data is presented with a minimum of processing although corrections are made to compensate for instrument drift and other data collection inconsistencies. High readings caused by stray pieces of iron, fences, etc are usually modified on the grey scale plot as they have a tendency to compress the rest of the data. The data is however carefully examined before this procedure is carried out as kilns and other burnt features can produce similar readings. The data on some noisy or very complex sites can benefit from 'smoothing'. Grey-scale plots are always somewhat pixellated due to the resolution of the survey. This at times makes it difficult to see less obvious anomalies. The readings in the plots can therefore be interpolated thus producing more but smaller pixels and a small amount of low pass filtering can be applied. This reduces the perceived effects of background noise thus making anomalies easier to see. Any further processing is noted in relation to the individual plot.

## **Reliability**

Geophysical survey is an immensely useful tool but it should be realised that while a survey will detect a wide range of features, it may not detect *all* buried features. A gradiometer survey detects changes in magnetic flux density and relies on there being a detectable difference between the archaeology and the substrate. This may not occur for many reasons (e.g. a cut feature being backfilled with subsoil). It must therefore be stressed that a lack of archaeological responses from a geophysical survey does not prove that there is no archaeology present.

## **Grid locations**

The survey grids were located by measurements to fixed points such as field boundaries located during the survey.

## **Bibliography**

Clark A J, 1996, *Seeing Beneath the Soil* (2<sup>nd</sup> edition). Batsford, London.

# CRICKCHURCH, CAREW, PEMBROKESHIRE: GEOPHYSICAL SURVEY 2012

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FEBRUARY 2013

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Yn unol â'n nôd i roddi gwasanaeth o ansawdd uchel, croesawn unrhyw sylwadau  
sydd gennych ar gynnwys neu strwythur yr adroddiad hwn

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