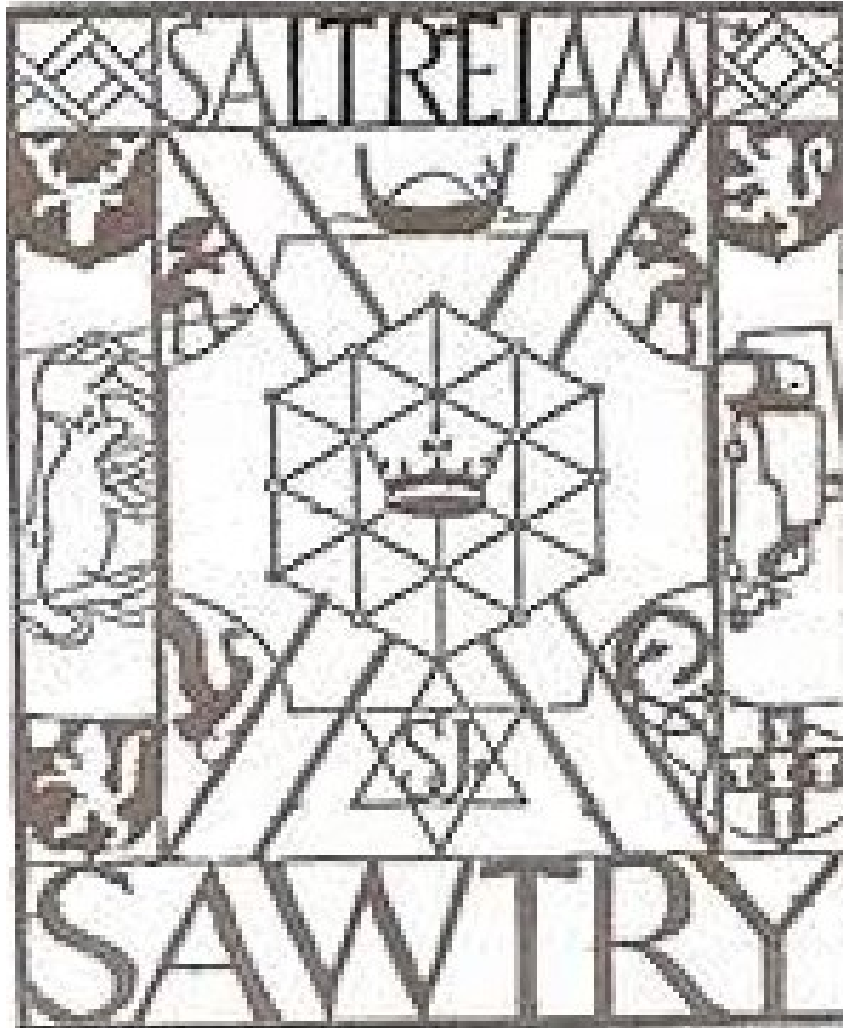


SAWTRY HISTORY SOCIETY



**ARCHAEOLOGICAL SURVEY RESULTS AND ANALYSIS
SHS 16-1/RA-2**

**GEOPHYSICAL EARTH RESISTANCE SURVEY RESULTS
AND ANALYSIS - SAWTRY ABBEY SURVEY (SHS 16-1)**

21 March 2018

by

Kevin Redgate BA(Hons)

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Archaeology Department	University Centre Peterborough

OASIS REPORT FORM

PROJECT DETAILS		OASIS No:	
Project name	Archaeological geophysical survey of Sawtry Abbey, Sawtry, Cambridgeshire		
Short description	Sawtry History Society archaeologists undertook an earth resistance and magnetometry survey of Sawtry Abbey in order to determine the accuracy of drawings made by Inskip Ladds during the period 1907-1912.		
Project type	Geophysical survey		
Site status	Scheduled Ancient Monument (SAM 27031) - HLE 1013280		
Previous work	None		
Current land use	Pasture		
Future work	Further geophysical survey		
Monument type/ period	Cistercian Abbey / c.1147-1536		
Significant finds	None		
PROJECT LOCATION			
County	Cambridgeshire		
Site address	Sawtry Abbey, Sawtry		
Study area	8,400m ²		
OS grid reference	TL19746 82565		
Height OD	8m aOD		
PROJECT CREATORS			
Organisation	Sawtry History Society (SHS)		
Project brief originator	Sawtry History Society (SHS)		
Project design originator	N/A		
Director/Supervisor	Philip Hill		
Project Manager	Kevin Redgate		
Sponsor or funding body	Sawtry History Society		
PROJECT DATE			
Start date	25 Jun 16		
End date	8 Dec 16		
ARCHIVES	Location	Content	
Physical			
Paper			
Digital	SHS Archaeological Digital Archive	SHS Archaeological Digital Records and Media	
BIBLIOGRAPHY			
Title	Geophysical Earth Resistance Survey Results and Analysis - Sawtry Abbey Survey (SHS 16-1)		
Serial title & volume	N/A		
Author(s)	Kevin Redgate		
Page numbers	031		
Date	21 March 2018 (Revised 11 June 2020)		

1. **Introduction.** The survey consisted of a geophysical earth resistance survey on 8 Dec 16, the purpose of which was to:

1.1. Determine the accuracy of drawings made by Inskip Ladds in respect of the east half of the nave, transepts and chapels, crossing, presbytery and cemetery area, and ascertain to what extent, if any, they were influenced by his visit to Roche Abbey.

1.2. Enable SHS archaeologists to gain further proficiency in the use of the Geoscan Research RM85 Resistance Meter System and PA20 probe array assembly.

1.3. Introduce first-year undergraduate archaeology students from University Centre Peterborough to the basic principles of geophysical earth resistance survey.

1.4. Enable SHS archaeologists to gain further proficiency in the use of Snuffler software, specifically; importing, filtering, interpreting and analysing data.

1.5. Enable SHS archaeologists to test geophysical survey procedures developed from lessons learnt from the previous survey undertaken on 25-26 Jun 16.

2. **Site Details.**

2.1. **Accession Number.** ECB6689.

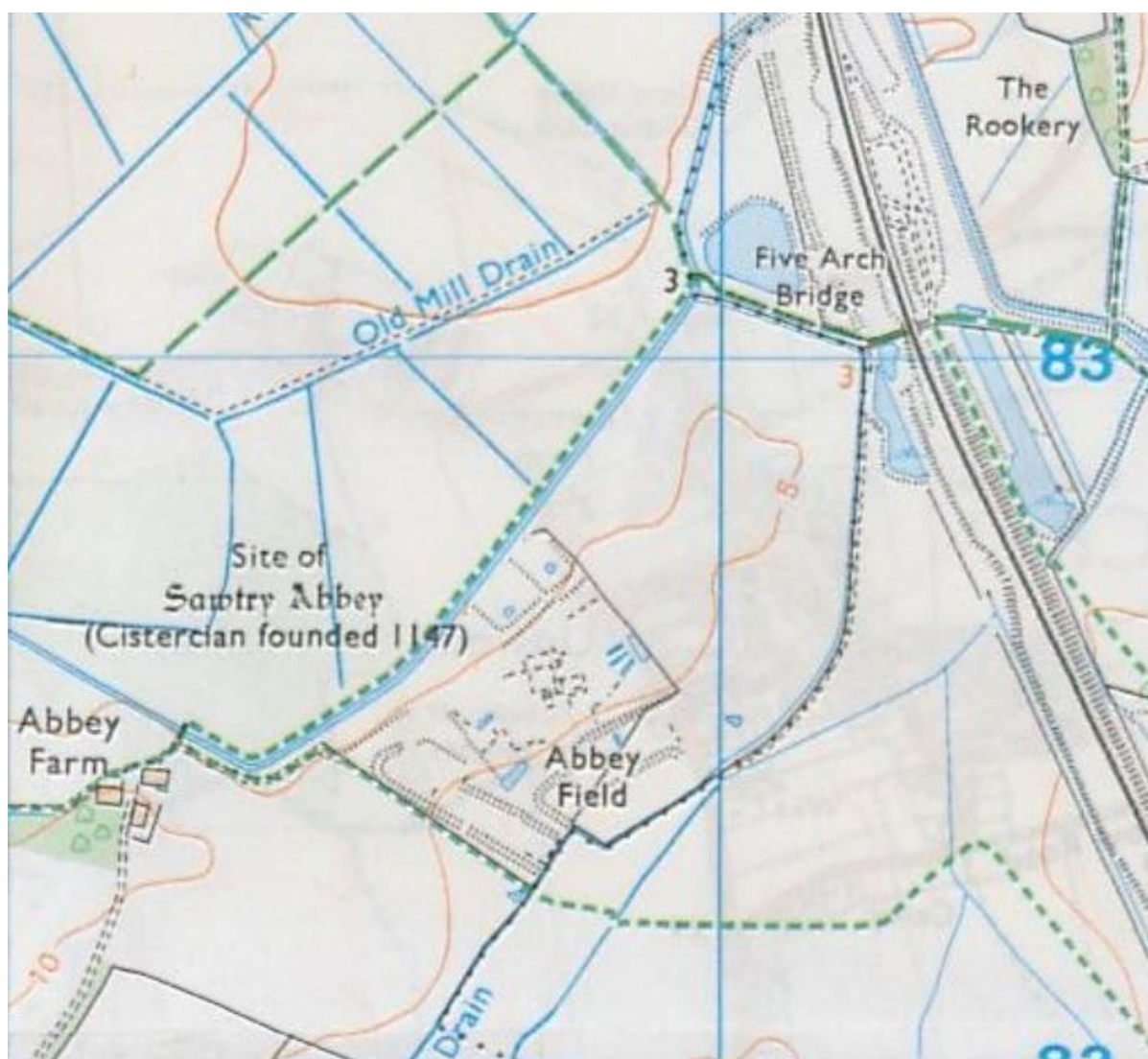


Figure 2.1: Sawtry Abbey Site with SBM in red (Ordnance Survey, 2006)

2.2. **Location.** Sawtry Abbey site rests on the eastern parish boundary (Figure 2.1) in the eastern half of National Grid Reference (NGR) square TL1982.

2.3. **Site Benchmark (SBM).** This has been set at the centre point of the southern nave wall of the Abbey church at NGR TL19746 82565 (Figure 2.1).

2.4. **Geology.** The site sits astride a narrow 5m contour on bedrock that is comprised of Oxford Clay Formation-Mudstone, with no superficial deposits, and lies directly below the top and sub-soils (Figure 2.2).

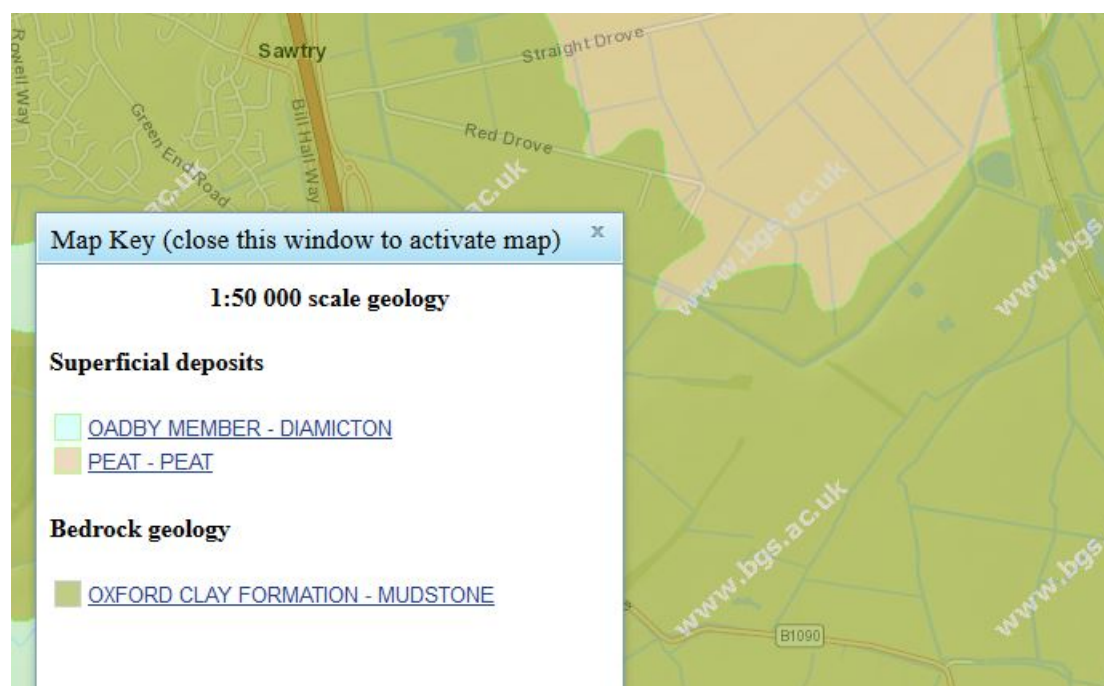


Figure 2.2: Site Geology (British Geological Survey, 2017)

2.5. **Protection.** Sawtry Abbey site is a Scheduled Monument under the Ancient Monuments and Archaeological Areas Act 1979 as amended, and is listed on the Historic England (HE) Heritage List (HLE 1013280). Licence to survey was given by HE on the condition that a survey report was submitted.

2.6. **Land Use.** The site is private land owned by St John's College, with Savills acting as the land agent. The land is managed by Abbey Farm and is held in pasture for livestock grazing.

2.7. **Utilities.** There are no known utilities within the site boundaries.

2.8. **Historical Background.** The remaining stone features of the dissolved Abbey precinct were extensively robbed-out in the mid-19th Century when a local land owner employed out-of-work railway labourers to remove all re-usable stone. The surviving earthworks suggest that, in addition to the removal of standing stone features, foundations were also excavated. During the period 1907-1912 an extensive survey of the Abbey Site was undertaken by Inskip Ladds which resulted in the publishing of a paper and informed drawings (Figures 2.2 and 2.3).

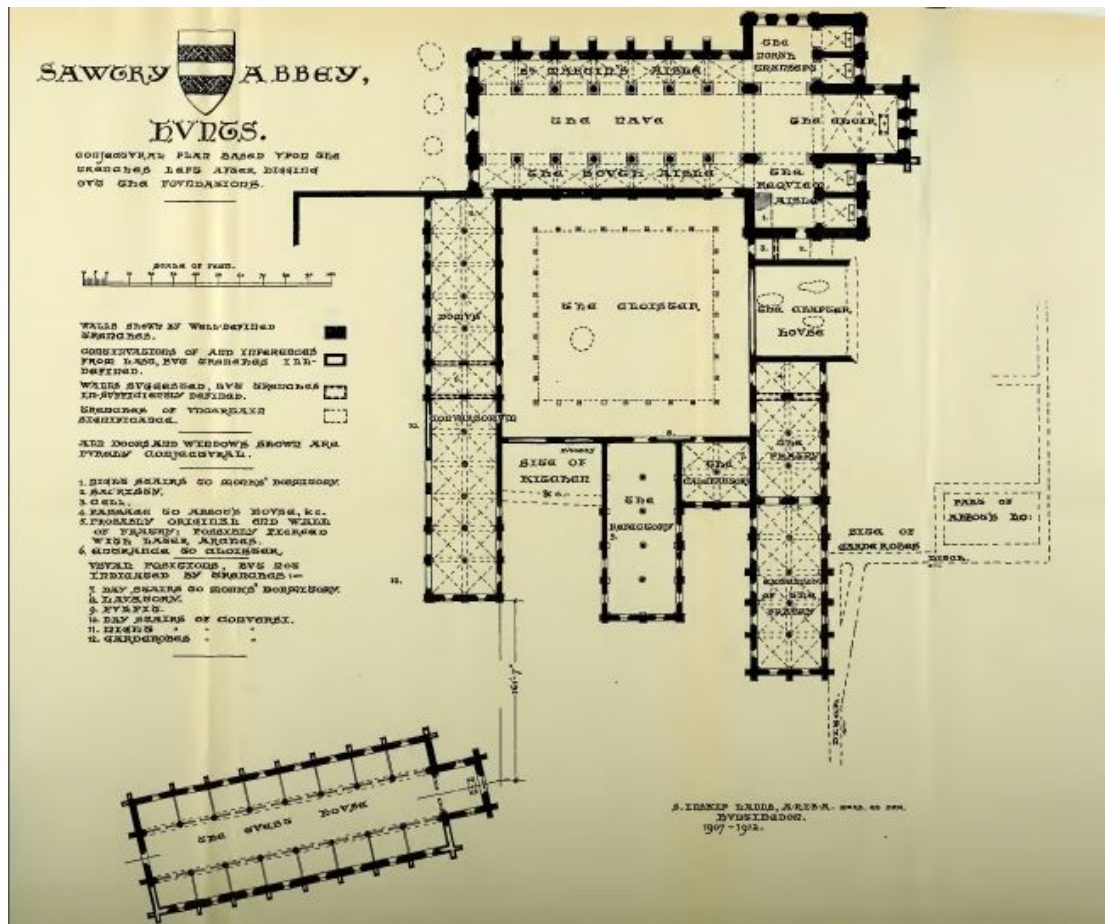


Figure 2.3: Abbey Plan (Inskip Ladds, 1913)

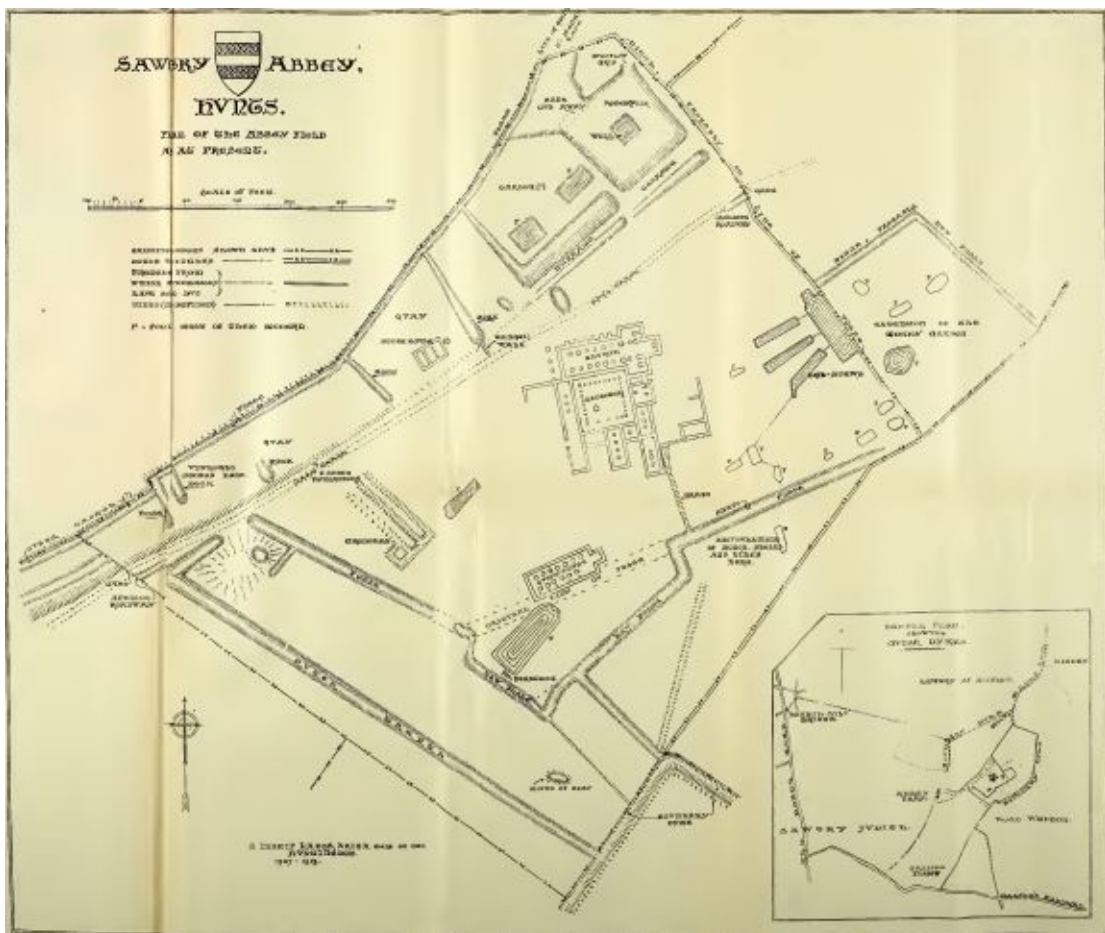


Figure 2.4: Abbey Plan (Inskip Ladds, 1914)

3. Methods.

3.1. **Survey Grid.** The survey grid east of the base line was extended north by 20m encompassing the east half of the nave, the transepts and chapels, crossing, the presbytery and cemetery area. This resulted in a survey area consisting of three 20x20m squares; with each square being allocated a unique reference number, G19-G21 (Figure 3.1).



Figure 3.1: Geophysical Survey Grid (Google Earth, 2016)

3.2. **Earth Resistance Survey.** This survey was carried out using the Geoscan Research RM85 Resistance Meter System and PA20 Probe Array assembly. The survey sequence was G19, G20 and G21 which can be identified on Figure 3.1 by the series R1/03-R3/03. Each grid consisted of twenty traverse lines with readings being taken at one metre intervals along each traverse. The traverses in each grid square started in the SW corner and followed a zig-zag pattern to end in the SE corner. The Survey Record Sheet is at Annex A.

4. **Results.** Survey data was imported into Snuffler (version 1.21) as earth resistance data set Res16-3. The data plots presented in Figures 4.1 to 4.5 are presented in the default linear display option and greyscale display type; other display options and types are provided at Annex B:

- black = low resistance; pits, ditches, clay dumps
- white = high resistance; walls, rubble, paving areas
- linear = display colour blocks are assigned to equal ranges of values
- non-linear = display colour blocks are assigned to equal numbers of readings
- relief plot = displays results as a 3D image
 - high resistance readings are high points
 - low resistance readings are low points

4.1 - **Raw Data Plots.** Raw data plots from the data set are provided as a pair; the first plot without grid lines in order to present an uninterrupted picture, the second plot with grid lines in order to aid with orientation (Figure 4.1).

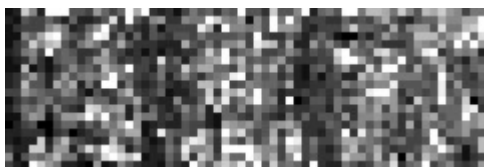


Figure 4.1a: Res16-3, raw data

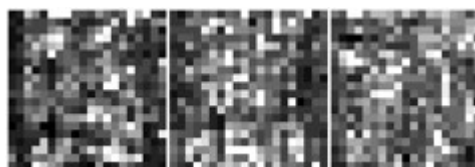


Figure 4.1b: Res16-3, raw data, grid

4.2 - Corrected Data Plots. Corrected data plots are provided in pairs; the first plot without grid lines in order to present an uninterrupted picture, the second plot with grid lines in order to aid with orientation. Correction to the raw data was applied in two stages, firstly through the application of clip, de-spike and edge correction (Figure 4.2) and secondly through the further application of sharpen (Figure 4.3).

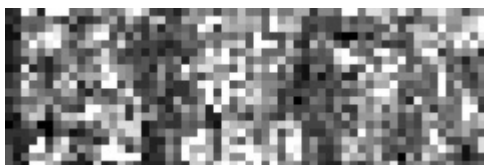


Figure 4.2a: Res16-3, corrected data #1



Figure 4.2b: Res16-3, corrected data #1, grid

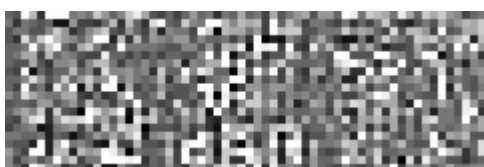


Figure 4.3a: Res16-3, corrected data #2



Figure 4.3b: Res16-3, corrected data #2, grid

4.3 - Filtered Data Plots. Filtered data plots are provided in pairs; the first plot without grid lines in order to present an uninterrupted picture, the second plot with grid lines in order to aid with orientation. The corrected earth resistance data plots in Figure 4.2 has been filtered by the application of interpolate (x2) (Figures 4.4), whilst the corrected earth resistance data plots in Figure 4.3 has been filtered by the application of remove geology and interpolate (x2) (Figure 4.5).



Figure 4.4a: Res16-3, filtered data #1



Figure 4.4b: Res16-3, filtered data #1, grid



Figure 4.5a: Res16-3, filtered data #2



Figure 4.5b: Res16-3, filtered data #2, grid

5. Analysis. The results in Figures 4.4 and 4.5 show several linear anomalies of both high and low resistance, along with anomalies of irregular shape. The ephemeral grid that underlies the results is probably survey induced or a processing discrepancy rather than being archaeological. Anomalies that are suggestive of commonly acknowledged interior church spaces, as detailed in France (2012, Ch 5), and Burton and Kerr (2011, Ch 3) are discussed below.

5.1. The transepts and crossing are discernible straddling squares G19 and G20, extending beyond the survey area to both the north and south.

5.2. High resistance linear anomalies in square G20 are suggestive of the northern of the two chapels in the south transept.

5.3. The form of the presbytery is discernible in the centre of square G20.

5.4. There are no identifiable linear anomalies that are indicative of the north and south walls of the nave; however, it is probable that any potential wall anomalies have been masked by the scatter of irregular high and low resistance anomalies that are suggestive of demolition and/or collapse rubble.

5.5 Two strong low resistance circular(ish) anomalies at the western end of square G19, along with a similar anomaly in square G20 are suggestive of robbed out column bases.

5.6. The group of anomalies to the east of the presbytery (square G21) are where the cemetery is typically located. As no buildings or elements of the water management system would be expected in this area it is unsure what these could be; however, evidence of graves cannot be completely ruled out.

6. **Summary.** The survey, on the whole, was a success and met most, if not all, its aims. Specifically:

1.1. In the area surveyed, Inskip Ladds drawings have been broadly verified. There is correlation between the survey results and drawings with linear anomalies suggesting the anticipated east nave, transepts and chapels, crossing and presbytery. There is also the expected absence of anomalies suggestive of buildings within the predicted cemetery east of the church. It is not possible to determine from the survey results themselves whether Inskip Ladds' drawings were influenced by his visit to Roche Abbey.

1.2. SHS archaeologists gained further proficiency in the use of the Geoscan Research RM85 Resistance Meter System and PA20 probe array assembly when operated using default settings.

1.3. The introduction of the basic principles of geophysical earth resistance survey to the participating first-year undergraduate archaeology students from Peterborough was successful.

1.4. SHS archaeologists gained further proficiency in the use of Snuffler software, the safe import and generation of raw data files, effective processing of raw data into accurate results, and provision of objective interpretation and analysis of the results.

1.5. Geophysical survey procedures developed from lessons learnt from the previous survey undertaken on 25-26 Jun 16 were successfully proven by SHS archaeologists.

ANNEXES

- A. Survey Record Sheets.
- B. Additional Data Plot Display Options.

BIBLIOGRAPHY

Burton, J. and Kerr, J. (2011) *The Cistercians in the Middle Ages*.

Available at: <http://www.amazon.co.uk/kindle-ebooks> (Downloaded: 22 February 2017)

France, J. (2012) *Separate but Equal: Cistercian Lay Brothers 1120-1350*.

Available at: <http://www.amazon.co.uk/kindle-ebooks> (Downloaded: 15 November 2016).

Google Earth (2016).

Inskip Ladds, S. (1913) 'Sawtry Abbey, Huntingdonshire', *Transactions of the Cambridgeshire & Huntingdonshire Archaeological Society*, 3(8), pp. 295-322.

Inskip Ladds, S. (1914) 'Sawtry Abbey, Huntingdonshire', *Transactions of the Cambridgeshire & Huntingdonshire Archaeological Society*, 3(9), pp. 339-374.

Ordnance Survey (2006) *Peterborough*, sheet 227 West, 1:25,000. Southampton: Ordnance Survey (Explorer series).

REFERENCES

Coppack, G. (2013) *Fountains Abbey*.

Available at: <http://www.amazon.co.uk/kindle-ebooks> (Downloaded: 15 November 2016).

Fletcher, J. (1919) *The Cistercians in Yorkshire*.

Available at: <http://www.amazon.co.uk/kindle-ebooks> (Downloaded: 15 November 2016).

Race, S. (2011) *Aelred of Rievaulx: Cistercian Monk and Medieval Man*.

Available at: <http://www.amazon.co.uk/kindle-ebooks> (Downloaded: 15 November 2016).

Robinson, D. and Harrison, S. (2006) 'Cistercian Cloisters in England and Wales Part I: Essay', *Journal of the British Archaeological Association*, 159(1), pp. 131-207.

Available at: <http://dx.doi.org/10.1179/174767006x147460> (Accessed: 26 April 2016).