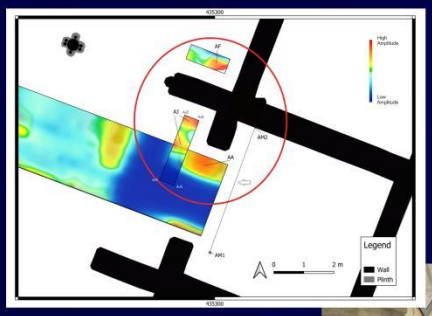
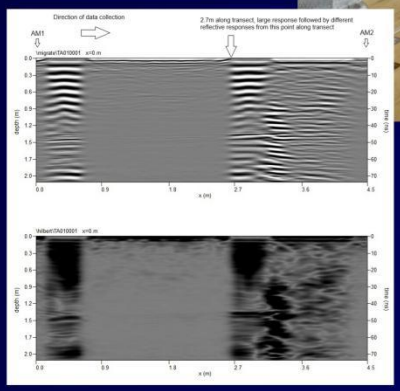
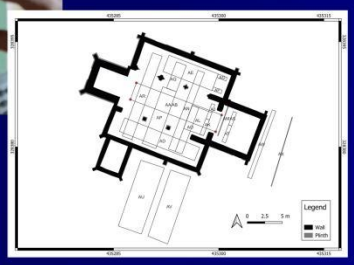
Archaeological Survey at St Wilfrid's Church, Barrow Upon Trent, Derbyshire







Andy Gaunt
Mercian Archaeological Services CIC
Report MAS054
20/03/2024

Mercian
Archaeological Services CIC

Archaeological Survey at St Wilfrid's Church Barrow Upon Trent

SK 35293 28385

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Mercian Archaeological Services CIC
Report No. MAS054
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Contents

Non-Technical Summary

An archaeological survey was undertaken by Mercian Archaeological Services CIC in June 2023, at St Wilfrid's church in Barrow-upon-Trent, Derbyshire. The project was funded by the National Heritage Lottery Fund. The fieldwork consisted of a geophysical Ground Penetrating Radar survey within the church and externally in the churchyard. Specific targets included a possible anchorite in association with a low-level squint built into the northern base of the chancel arch, possible plague pits in the churchyard, and a possible crypt mentioned on a plaque in the church. Although inconclusive in the search for the possible anchorite and plague pits, the survey appeared to detect the possible location of the crypt at the eastern end of the southern aisle. The survey also detected what may be the remains of walls which may offer the possibility of different phases of development including in the north aisle of the church. Mercian also undertook a survey of the church with Total Station and GPS, to create a plan, and measured survey of walls and features, alongside a photogrammetric survey of the church building. The survey data was used to undertake archaeoastronomical alignment calculations. The result tentatively suggest a possible St Wilfrid's day alignment on 12th October if the church was rebuilt between the 12 and 14th centuries. This was during the period when the church was in the control of the Knights Hospitaller, and it is possible that the order may have rebuilt the church on a saint day alignment. Alongside these findings Mercian also detected and recorded Medieval paint on the walls and masonry of the church, and examined worked alabaster fragments which are included in the report below.

As well as being an archaeological research project, all fieldwork was undertaken by volunteers under Mercian supervision, and enabled a large number of people to receive training in archaeological skills and techniques as well as learn more about the fantastic heritage of this wonderful church.

1. Project location and geology

1.1. Project Location

The survey was undertaken at St Wilfrid's Church, Barrow-upon-Trent, Derbyshire. The site is located within the church and churchyard located at grid reference SK 35293 28385. The location of Barrow-upon-Trent is show in figure 1_1, and the location of St Wilfrid's church within Barrow-upon-Trent is shown in figure 2_2.

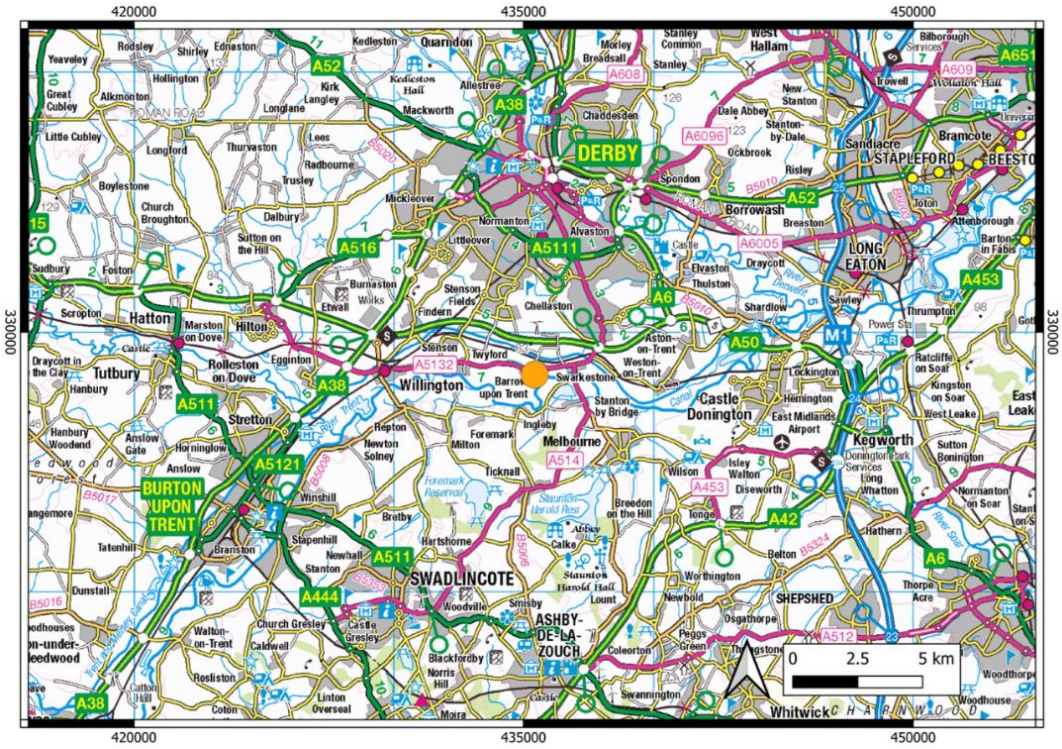


Figure 1_1: Location of Barrow-upon-Trent . Contains OS data © Crown copyright [and database right] 2024.

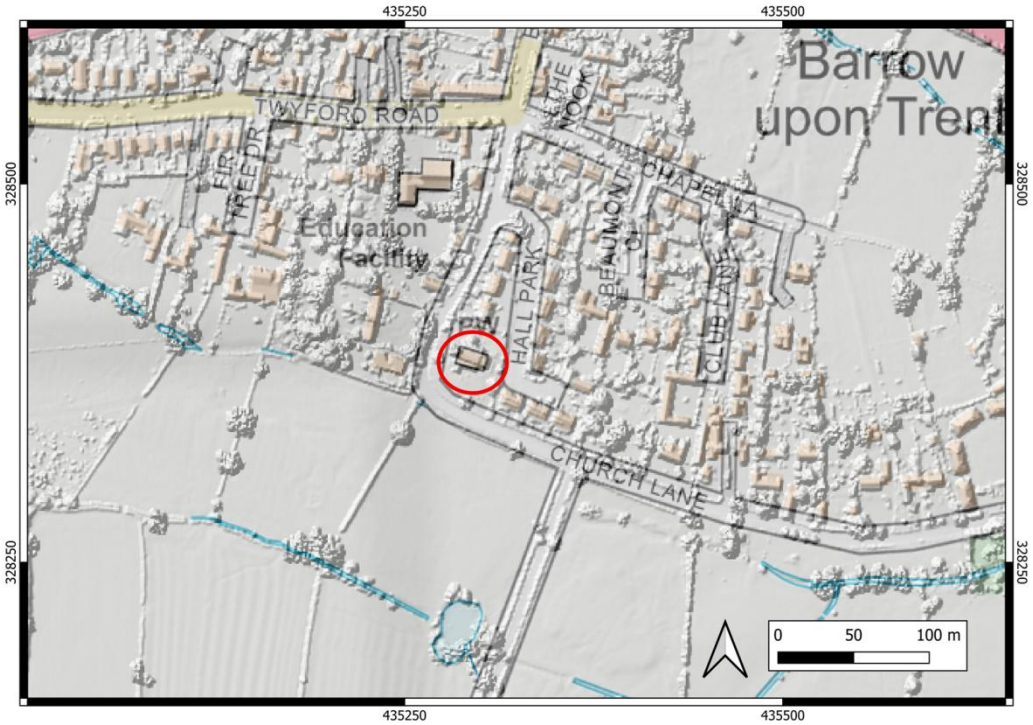


Figure 1_2: Location of St Wilfrid's Church, Barrow-upon-Trent, Derbyshire. Contains OS data © Crown copyright [and database right] 2024. Contains public sector information licensed under the Open Government Licence v3.0.

1.2. Geology

The study area is mainly underlain by rocks of the Gunthorpe Member - Mudstone. Sedimentary bedrock formed between 247.1 and 237 million years ago during the Triassic period. The rocks are Mudstone, red-brown, with subordinate dolomitic siltstone and fine-grained sandstone, greenish grey, common gypsum veins and nodules.

The Church of Saint Wilfrid's, sits on a superficial terrace of the Holme Pierrepont Sand and Gravel Member. These sedimentary superficial deposits of sand and gravel were formed between 2.588 million and 11.8 thousand years ago during the Quaternary period. These terrace deposits sit on top of the underlying bedrock, and provide an elevated position overlooking the Alluvium - Clay, silt, sand and gravel deposit (formed between 11.8 thousand years ago and the present during the Quaternary period), which make up the flood plain of the River Trent to the south of the site. (www.BGS.ac.co.uk - accessed 28/02/2024).

2. Historical Background and previous Archaeological work

The earliest reference to a church and priest in Barrow- Upon Trent comes from Domesday Book, in 1086:

Land of King William

Households

Households: 20 villagers. 6 smallholders. 1 priest.

Land and resources

Ploughland: 18 ploughlands. 1 lord's plough teams. 5 men's plough teams.

*Other resources: Meadow 24 acres. Woodland 1 * 0.5 leagues. 1 mill, value 3 shillings. 1 church.*

Valuation

Annual value to lord: 6 pounds in 1086; 10 pounds in 1066.

Owners

Tenant-in-chief in 1086: King William.

Lord in 1086: King William.

Lord in 1066: King Edward.

Other information

This entry mentions multiple places:
Barrow
[-upon-Trent]; Chellaston; Cottons; Normanton; Osmaston; Swarkestone; Melbourne.

Phillimore reference: Derbyshire 1,19

Land of Henry of Ferrers

Households

Households: 1 villager.

Land and resources

Ploughland: 0.5 men's plough teams.

Other resources: Meadow 8 acres.

Valuation

Annual value to lord: 2 shillings in 1086; 13 shillings and 2 pence in 1066.

Owners

Tenant-in-chief in 1086: Henry of Ferrers.

Lord in 1086: Henry of Ferrers.

Lords in 1066: Godwin <of Tissington>; Kolgrim <of Arleston>.

Other information

Possibly waste (ambiguous) when acquired by current owner.

Waste in 1086.

Phillimore reference: Derbyshire 6,82

Land of Ralph son of Hubert

Households

Households: 1 freeman. 1 priest.

Land and resources

Ploughland: 0.5 men's plough teams.

Other resources: Meadow 18 acres. 1 church.

Owners

Tenant-in-chief in 1086: Ralph son of Hubert.

Lord in 1086: Ralph son of Hubert.

Lord in 1066: King Edward.

Other information

Phillimore reference: Derbyshire 10,26

(https://opendomesday.org/place/SK3528/barrow-upon-trent/ accessed 09/02/2024)

The Historic England Listing for Saint Wilfrid's Church states the following:

"*PARISH OF BARROW-UPON-TRENT CHURCH LANE (north side) Church of St Wilfrid*

10.11.67

GV I Parish church. Mid C13, C14, C15 and early C19. Coursed, squared sandstone with sandstone dressings. Lead and plain-tile roofs, with coped gables. West tower, aisled nave, south porch and chancel.

West tower of two stages divided by a string course. Diagonal buttresses to west and angle buttresses to north and south, with five set-offs. Tall lower stage with chamfered plinth. The west elevation has a doorway with chamfered surround and plank door. Five-light window of c1300 above, with intersecting tracery and a cusped lozenge at the top. Hoodmould. The lower stage is blind to the other elevations. The upper stage has C14 two-light bell openings in each direction, with reticulated tracery. C15 battlements and four stumpy pinnacles. Gabled north aisle has a thirteen-light west window with intersecting tracery. Angle buttresses and one intermediate buttress. North doorway with moulded surround, hoodmould and plank door. To the left are two three-light windows with intersecting tracery. Three-light east window with reticulated tracery.

The north side of the chancel has a single chamfered priests doorway with hoodmould and plank door with decorative iron hinges. Curious low pointed window to right. C20 brick buttress in the angle with the aisle. The east elevation of the chancel has a shallow gable, thin buttresses and a broad four-centred arched window with chamfered surround, probably C18.

The south side of the chancel has a low single-chamfered round-arched priests doorway with hoodmould. To the left is a three-light flat-arched window with cusped ogee lights. Shallow gabled south aisle has a three-light east window with reticulated tracery. Diagonal buttresses and one intermediate buttress. The south side has two early C19 lancets with chamfered surrounds. Similar west window. Gabled south porch with broad pointed doorway. C20 plank doors. Diagonal buttresses with two set-offs. Round-arched niche above with moulded surround.

To the west and east are a pair of small chamfered lancets. Clerestory of three two-light windows with flat arches and the remains of the traceried arched lights of the C15 clerestory.

INTERIOR: three bay arcades, that to the north mid C13 with compound piers with shafts and shaft rings and moulded capitals. Much restored in the C19. The south arcade is C14 and has octagonal piers and abaci. Both have double chamfered arches. Unmoulded tower arch with an inner chamfered order on corbels. Double-chamfered chancel arch, the inner order dying into the imposts. In the south aisle is a round-arched tomb recess with a C14 alabaster effigy of a priest. Moulded hoodmould, to the left, a trefoil-headed recessed panel with moulded surround and traces of painting.

Squints from the aisles into the chancel that to the north forms a passageway from the aisle to the chancel and is lit by its own window. Plain octagonal font.

Monuments: tablet to Elizabeth Milward +1610 (north aisle). Plain tablet to John Bancroft +1803 (north aisle) by W Barton of Derby. Elizabeth Mozeley +1883 (nave) by R C Lomas of Derby. Richard Sale +1808 (nave) by Hall of Derby. Much damaged tomb chest with incised slab. C19 alabaster pulpit. Open backed C19 pews. Painted lozenge hatchment.

Listing NGR: SK3529428388"

(https://historicengland.org.uk/listing/the-list/list-entry/1096559?section=official-list-entry - accessed 20/022024)

Nikolas Pevsner describes the church in the following way:

"Barrow-upon-Trent, St Wilfrid. The most remarkable feature is the N arcade with (much restored) mid C13 piers, especially one circular with four shafts in the chief directions, the shafts being provided with shaft-rings. The arches are double-chamfered. The S aisle has a C14 arcade with the usual octagonal piers and the only medieval window is ogee-reticulated (in the N aisle E window). C15 the upper parts of the tower. These were altered in the C19, as was the clerestory. Squints in to the chancel from the N and S. - MUNUMENT. Alabaster effigy of a Priest with a long series of trough-like folds down the middle chasuble; C14." (Pevsner 1978)

In 2020, an archaeological watching brief at St Wilfrid's Church, was carried out by Archaeological Research Services Ltd (Tilt & Blues 2020):

"This was in relation to a Heritage Lottery funded project to renovate the interior and exterior of the Church with new lighting, flooring, drainage and other improvements designed to turn the church into a multi-purpose community space. St Wilfrid's is a Grade I listed Anglo-Saxon church that was extended between 1165 and 1540.

An archaeological watching brief was carried out between 8th July and 4th August 2020, which monitored the excavation of trenches in the churchyard in relation to a new exterior lighting system, as well as trenches and four soakaways which were part of a new drainage system.

Although nine inhumations were recorded and substantial amounts of disarticulated human bone collected for reburial, the watching brief did not reveal any structural features or illuminating archaeology in terms of the history of St Wilfrid's or wider secular activity in the area." (Tilt, C & Blues, S. 2020. p iv).

In 2013, an Historic Building Assessment was undertaken by Peter Ryder (Ryder 2013). The *Structural History* section of the report stated the following:

This is an intriguing building, and its development is not easy to reconstruct. Canon Cox, who has been followed by most subsequent writers, interpreted the following scenario:

Early 13th century; North arcade and the walls of both aisles as of the early 13th century.

c1300. Lower part of the tower together, three windows and doorway in north aisle.

c1320-1330. South arcade and south aisle windows, south porch, and east window of he north aisle.

'Perpendicular' (late 14th/15th century). Belfry, clerestory and the window and door on the south of the chancel.

Some other accounts have seen the nave being lengthened to the west in the 13th century.

As often with older church interpretations, there was a heavy reliance on stylistic dating of architectural features, and little observation of changes in fabric type. A longer and more complex chronology can now be tentatively offered:

(1) An Anglo-Saxon nave, identified on the basis of the substantial quoins glimpsed at its south-east angle. How much other fabric survives is questionable; the heavy roughly shaped blocks of the east wall of the nave seem likely to be coeval with the quoining.

(2) The rubble masonry of the north wall of the nave is very different of the shaped blocks of the east wall, and is presumably later, and probably pre-date the arcade. The north-west angle quoins are quite small and regular, and could be of the 12th

century; are they of the same build as the rubble walling?

(3) The blocked doorway on the south of the chancel looks like late-12th century work, although the walling here is not of any distinctive character. The chancel is as wide as the nave, suggesting it is a secondary build. Elongate chancels are very typical of the late 12th and more particularly the 13th centuries.

(4) The north arcade is of 13th century character, as are the paired buttresses at the angles of the north aisle. The two sections of the arcade would seem to be of different dates. It has been suggested that the two-bay eastern section was built first, and then the nave lengthened westwards and arcade and aisle extended. There is no real evidence of this in either the nave or aisle wall, although the fact that the aisle has a blocked door late replaced by one further west would tally with this interpretation. However, the present door near the west end replaces an earlier window in the same position, so was not in a new extension of the aisle. It is possible that the western bay of the aisle may not have been originally integrated with the body of the church (might it have served as a priest's residence?).

(5) In the 14th century the south aisle was added, the older nave wall being completely removed. The relationship between the west wall of the aisle and the tower is a real puzzle; it looks as if the aisle came first, but its wall was not butted up against an earlier nave wall, but something narrower. Was there a previous tower? The east window of the north aisle (and perhaps its north door, replacing an earlier one further east) are of the same period.

(6) The tower is a puzzle; it may be as late as the 15th century; the change in masonry at belfry level could indicate two phases, or perhaps just a change in supply. Only the cusped head of the west window suggests a 14th century date, but this could have been 10 re-used – certainly the intersecting tracery beneath (together with that of three windows in the north aisle) does not seem trustworthy and may be post-medieval. The clerestory clearly is of the same build as the tower. The three-light window on the south of the chancel is also problematic, and could be of the 14th or 15th century. The south porch clearly post-dates the aisle and may be of the 15th century as well, although the windows in its side walls could, on stylistic grounds, be two centuries older. Their horizontal sills are interesting; possibly they functioned as low-side windows are conjectured to have done, to house lanterns illuminating the churchyard at night to keep evil spirits at bay. Other later medieval changes are the creation of the squint between south aisle and chancel, and the strange tunnel occupying a corresponding position on the north. What was it for? Presumably access, and probably access for a priest, into the chancel. Medieval builders were notorious for taking liberties with their fabrics, but one rarely sees so much of the eastern angles of a nave quarried away as here; it is a wonder that collapse did not ensue.

(7) The church clearly underwent various post-medieval vicissitudes, at some time losing the eastern part of its chancel (and perhaps a vestry, which may have been on he north of the sanctuary); the present east window, decried by many, seems to re-use the jambs of its late medieval predecessor. The windows of the clerestory and those on the south and west of the south aisle were crudely enlarged by the cutting

away of mullions and tracery. All the old roofs of the building seem to have been lost; the trusses of the north aisle may be of the late 18th or early 19th century, but the others are more recent.

(8) The church seems to have escaped any heavy programme of 19th century restoration; the Parish Magazine documents some works carried out in 1908, H.M.Haigh of Derby being the architect, when the columns of the north arcade were restored (the western being completely rebuilt) and works carried out on the South Porch, including the insertion of stone seats" (Ryder 2013, pp 8-10).

With reference to point 1 outlined by Ryder above (regarding the tentative Anglo-Saxon dating of the nave from the quoins on the south-east corner), Archaeological Research Services (ARS) suggested in their report that these stones although possibly being of Anglo-Saxon age period, may not be in-situ Anglo-Saxon masonry, but having been re-used later:

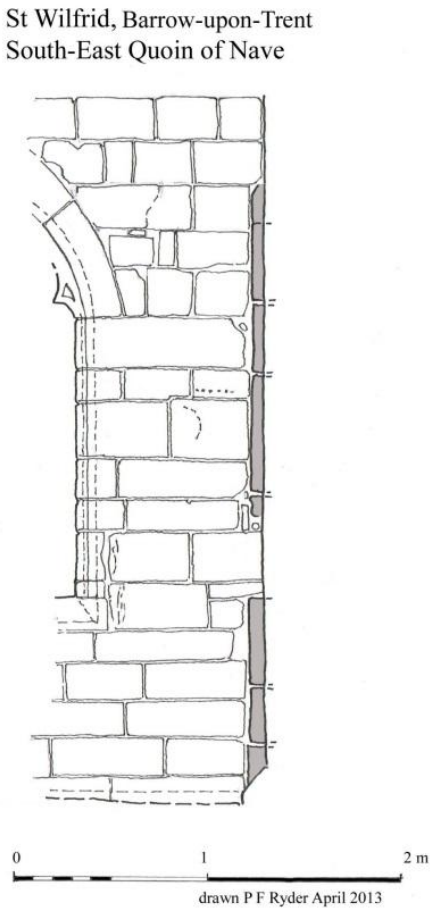


Figure 2_1:Possible Anglo-Saxon Quoins, reproduced from Ryder 2013, p 11.

"St. Wilfrid's Church, Barrow-upon-Trent is a Grade I listed building (Historic England List Entry 1096559) described by the Diocese of Derby as having no remains of the Norman church that was originally on the site (Diocese of Derby 2012), though the Historic Building Assessment undertaken in 2013 identified isolated structural components that might have been re-used and likely date to the Anglo-Saxon period (Ryder 2013). The church has undergone multiple redesigns with structural fabrics dating back to the late 12th century (Chancel), 13th century (North aisle), 14th century (South aisle), later medieval period (tower and porch) and with subsequent additions and renovations through the postmedieval and modern periods (Ryder 2013, 12)."

It should be noted that this claim is made with reference to Ryder's report from 2013.

So whether we are dealing with an Anglo-Saxon nave is open to question, having only been tentatively suggested by Ryder in 2013. This will be looked at below in relation to the findings from the alignment of the church.

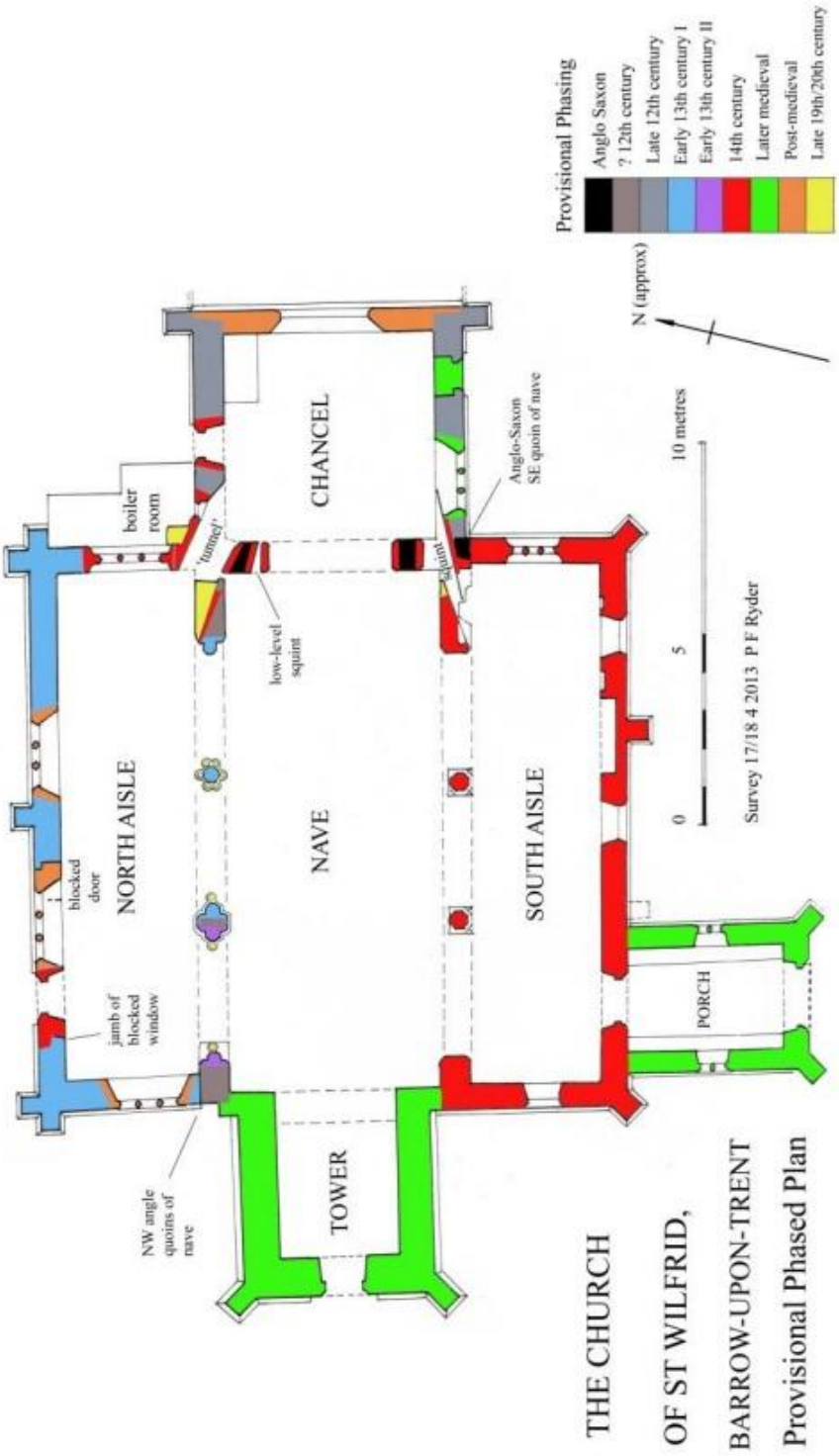


Figure 2_2:Provisional Phased Plan, reproduced from Ryder 2013, p 12.

3. Research Aims and Objectives

Mercian Archaeological Services CIC were contracted to undertake a Ground Penetrating Radar survey at St Wilfrid's church Barrow-upon-Trent. The specific objectives were to:

- Survey (GPR) the as much as possible of the floor area of the church with its additional aisles and porch.
- Ascertain if there is a crypt in the church- referred to on a plaque that describes its position.
- Survey around the area of a possible anchorite cell.
- Survey two areas outside in the churchyard that are thought to be plague pits backed up by information passed down through generations of churchwardens.

In addition to these requirements Mercian also undertook:

- A photogrammetric survey of the building internally and externally, with the aim of recording the masonry and the structures of the building.
- An investigation the orientation of the church
- Survey of the building using a combination of Differential GPS (Global Positioning System) and EDM (Electronic Distance Measuring) Total Stations, to produce a more accurate plan f the church.

4. Methodology

4.1 Ground Penetrating Radar methodology

The objective of the project was to search for potential buried remains inside and outside of St Wilfrid's church. The geophysical technique employed was Ground Penetrating Radar (GPR). The survey was undertaken in June 2023.

In GPR surveys, electromagnetic waves of frequencies between 50MHz and 1.5GHz are transmitted into the ground or structure. This energy is reflected back to the receiver on the device when it encounters significant changes in the structure of the ground, or more precisely contrasts in dielectric properties.

The survey undertaken here utilised a Leica DS2000 dual antenna, broad spectrum (250-700MHz) ground penetrating radar (GPR).

Survey grids were created with parallel transects spaced at 0.5m intervals. These grids were located primarily in the chancel and adjoining chapel to the south, with the aim of searching for the subterranean vaults. The grids were designed to best cover the available space in these locations in order to survey both north-south and east-west orientations. The grids were each marked out by the community volunteers using tape measures and chalk.

Each grid was given and alphabetical identifier AA, AB. AC…The corners of each grid were numbered in sequence AA1, AA2, AA3, AA4, AB1, AB2, AB3, AB4… and so on, with the '1' representing the bottom left corner of the grid, the '2' corner representing the top left corner, '3' representing the bottom right corner and '4' representing the top right. This method allows the directions of data collection to be understood for each grid, and thus the orientation of each grid to be known from the corner numbering. Data collection begins at point 1 (bottom left corner) with the first transect being walked along axis Y, to the top left corner (point 2). Transects increment to the right along axis X, with the final transect of each grid being from point 3 (bottom right) to point 4 (top right). This is replicated across all grids.

The location of the grid corners were recorded using Total Station. Horizontal measurement along each transect was recorded using a wheel odometer mounted to the BPR antenna. The Total Stations were orientated using control points created by a Leica Differential Geographic Positioning System (DGPS). DGPS is accurate to +/-100mm (Crutchley 2010). This level of accuracy for control complies with English Heritage (now Historic England) requirements for control of archaeological survey (Lutton 2003). In this way the Geophysical survey was undertaken in accordance with the 'Geophysical Survey in Archaeology Field Evaluation' guidelines produced by English Heritage, 2008.

Please see the results section for the location of grids.

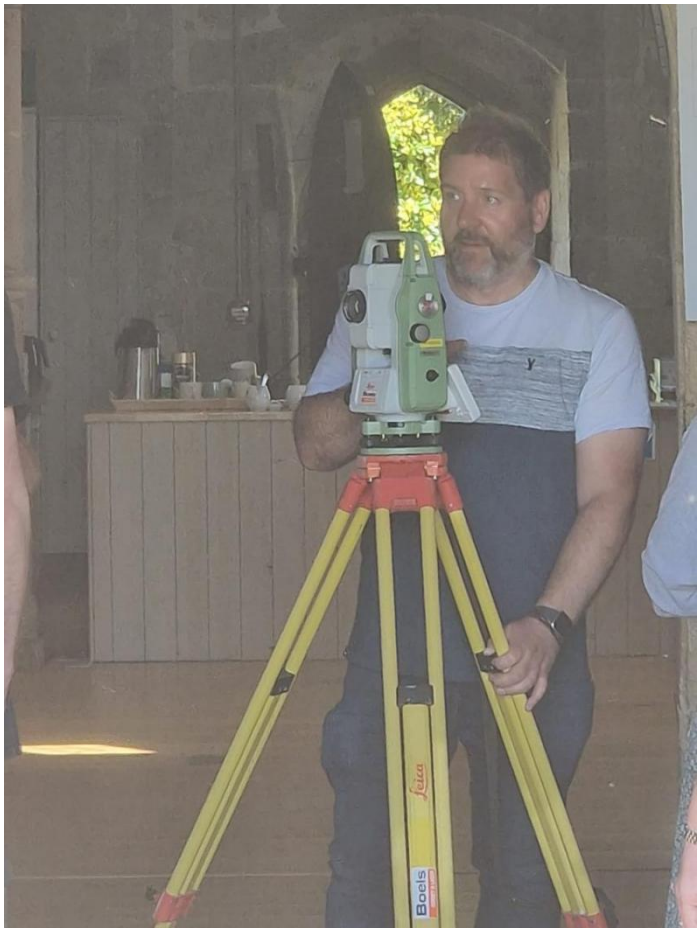
Photograph 4_1: Volunteers being briefed on Ground Penetrating Radar survey techniques. The Leica DS2000 GPR is in the foreground.

4.2. Total Station Survey methodology

The Ground Penetrating Radar grid corners were tied in to Ordnance Survey National Grid co-ordinates using a combination of Electronic Distance Measuring Total Station, and Differential GPS (described below). Alongside the recording in of GPR grid corners, Mercian also took the opportunity to survey the building outline to a high precision to provide measurements of the building, and for working alongside the photogrammetric survey (see below). Key features such as windows, doors and architectural elements were recorded as well as points across the top, middle and bottom of walls, pillars, doorway openings etc.

As sated the GPR grid corners, and the church building survey were undertaken using differential survey grade Global Positioning System (GPS), combined with Electronic Distance Measuring Total Station. The GPS system used was a *Leica GPS Viva* enabled to use Smartnet technology. This GPS system operates using Differential GPS (DGPS), where corrections are made to errors in the location data received from the satellites. The GPS rover was set to record static points, and the Total Station was used to allow recordings where satellite link was absent as recommended in Ainsworth, S. & Thomason, B. (2003) such as within the church building. The DGPS device is mounted on a 2-metre-high carbon fibre pole. The height of the pole is entered into the DGPS. The DGPS is therefore held by the operator 2m above the ground to help improve communication with satellites and mobile phone signals. The

DGPS records its location in 3D, receives corrections from a remote source to correct its location, and then removes the 2m staff height before recording and storing its location in a data logger. Alongside Leica GPS Viva the survey was undertaken using a Leica TS07Total Station.



Photograph 4_2: Leica TS07 EDM Total Station being set up in the entrance to St Wilfrid's from GPS control points outside.

Figure 4_3: Leica VIva DGPS being shown to volunteers during training session before use.

4.2.1. Control of survey

"*Control is the accurate framework of carefully measured points within which the rest of the survey is fitted"* (Ainsworth, et al. 2007). Section 2.1 Control of Survey in Metric Survey Specifications for English Heritage (Lutton 2003) states that metric survey "*must provide reliable and repeatable control capable of generating the required coordinates within the tolerances stated"* (Lutton 2003). Using DGPS and Total Stations in combination not only allows the surveying to fall within the accepted tolerance levels, this technique also fulfils the requirement that the control must be repeatable.

4.3. Photogrammetric Survey Methodology

Photogrammetry is the method of recording measurements from photographs. The process enables the recording of high accuracy point locations on surfaces. In very basic terms a Photogrammetric survey consists of a large number of photographs being taken of an object of feature. These are then combined together using computer software to create models.

The project utilised photogrammetric survey, using Structure from Motion techniques, to create a detailed record of standing remains of the church and to produce elevations for analysis etc.

The methodology of the survey was undertaken in line with current best practice and standards and guidance, including but not limited to that in the bibliography.

The survey was undertaken using the Ordnance Survey British National Grid. The coordinate system and vertical datum was established using the control of survey mentioned above, and points recorded from a combination of Leica GPS Viva and TS06 Total Station, and the OSGM02 transformation. The image control points for each survey were provided to a three dimensional accuracy of +/-3mm. No permanent survey marks were established on the site.

The photogrammetric survey used a Nikon D5100 16.2 megapixel DSLR with stock 18-55mm lens. Structure from Motion techniques was utilised.

Methodology of the photogrammetric survey followed Waldhäusl and Ogleby (1994), Grussenmeyer, Hanke K, Streilein A (2002), Historic England (2017), and other technical papers and standards and guidance, including those referenced therein, as appropriate.

The photogrammetric survey employed a camera base to subject distance ratio of no more than 1:4. Overlap between adjacent stereo images was of at least 80% and an overlap between adjacent strips of stereo image of at least 40%. The ground sample distance was a maximum of 3mm.

Community volunteers undertook part in the image capture process. All project volunteers received training and guidance from Mercian staff to ensure the images met the specifications and parameters for SfM photogrammetric survey. Image capture by project volunteers was supervised in the field by competent staff from Mercian Archaeological Services CIC to ensure compliance with the standard and guidance.

The photographs taken for the photogrammetric survey were used to produce a 3D point cloud model of the church, and various parts of the church in detail, via structure from motion algorithms built in to 3DFlow's Zephr software. This software was used generate and output a textured point cloud that was manipulated and edited in Meshlab software (Cignoni et al 2008).

Photograph 4_4: Volunteer moving camera on tripod to take overlapping photographs of the church interior for photogrammetric survey

4.4 LiDAR Analysis

LiDAR data was acquired from the Environment agency website https://environment.data.gov.uk/survey. This data was received in the form of Digital Surface model (DSM) and Digital Terrain Models (DTM). Digital surface models include vegetation and buildings. Digital Terrain models are of the ground surface with vegetation and buildings removed.

The DTMS and DSM were processed in Geographic Information Systems (GIS) and multi-directional hill-shade models were created of each 400m x 400m LiDAR tile, using the Relief Visualisation Toolbox plug-in in QGIS. This created simulated hill-shade from 16 different directions simultaneously, with a sun elevation at 35 degrees.

In this project LiDAR data was utilised for the production of report maps, and also in the analysis of the orientation of the building.

4.5 Building orientation Archaeoastronomical survey

Survey data points collecting during the project were used along with photogrammetric survey results to produce an accurate outline of the church. This

outline was used to calculate the orientation of the nave (possibly Anglo-Saxon in date, or 13th century).

The orientation was then entered into Stellarium software to calculate the orientation in relation to possible historic sunrise angles, to see if any dates were possibly significant in the construction of the church.

The data was centred on the Longitude and Latitude co-ordinates for St Wilfrid's church, and the resulting dataset was exported to Stellarium Software version 23.3. Stellarium software is a free open source computer based Planetarium software package that shows a 3D simulation of the night sky. Stellarium renders 3D photo-realistic skies in real time with OpenGL. It displays stars, constellations, planets, nebulae and others things like ground, landscape, atmosphere, etc. (https://stellarium.org/en_GB// accessed 21/09/2023). Stellarium software automatically accounts for the change from the Julian to Gregorian Calendar.

4.5.1 Solar Astronomy

"*With the advance in astronomical software it is possible to see the sky as it would have appeared for any date in antiquity. This is because the heavens are governed by physical laws so the solar, lunar, planetary and stellar movements can be predicted retrospectively with a high degree of accuracy"* (Henty 2015, p27). Visual reconstructions can now be produced for any latitude and longitude and any azimuth in the world (Henty 2015, p27).

The movement of astronomical objects is accurately recorded, and can be displayed from any location on Earth, with their apparent movements in relation to the movement of the Earth being tracked. The Earth travels around the Sun yearly, and spins on its axis daily. From the position of the Earth the Sun appears to move through the sky in a predicable motion. This is of course caused by the movement of the Earth and not the other way around. This results in a phenomenon where the Sun appears to rise towards the east and *set towards the west each day.*

The Earth is tilted on its axis at an angle of 23.5° with respect to the Ecliptic (the Ecliptic is the apparent path of the Sun's motion on the celestial sphere as seen from Earth). As a result, the Sun appears to follow an arc through the sky when observed from Earth. Due to this tilt of the axis, the Earth's movement around the Sun over the course of the year results in the seasonal variations experienced. This results in the northern hemisphere summer being the time when the northern hemisphere is orientated towards the Sun, and the northern hemisphere winter being the time when the axis is orientated away from the Sun.

As a result of the Earth's axis tilting towards the Sun in the northern hemisphere summer and away from it in the winter; the Sun appears to move from north to south and back again over the course of the year, as well as the apparent movement from east to west on a daily basis. The Sun reaches its highest altitude (the angle above

the line of the equator) in the northern hemisphere during the summer and the lowest altitude in the winter.

At the point at which the northern axis of the Earth is pointed towards the Sun, the Sun rises at its most north-easterly location, and reaches the most northerly point in the sky overhead (altitude), before setting at its most north-westerly location. This is the northern hemisphere summer solstice. It is conversely the southern hemisphere winter solstice. The point at which the northern axis of the Earth is pointed away from the Sun, the Sun rises at its most south-easterly location, and reaches the most southerly point in the sky overhead (lowest altitude), before setting at its most south-westerly location. This is the northern hemisphere winter solstice. It is conversely the southern hemisphere summer solstice.

At these two times, the Sun's motion from north to south and vice versa appears to slow to a standstill. This is where the name Solstice comes from the Latin 'solstitium', from sol 'sun' + stit- 'stopped, stationary'
(https://en.oxforddictionaries.com/definition/solstice accessed 15/05/2-17).

Following the summer solstice, the Sun appears to begin progressing southwards across the sky, progressively rising and setting further to the south-east and south-west respectively, and following the winter solstice the pattern is reversed with the Sun appearing to move northward, progressively rising and setting further north-east and north-west respectively.

When the Earth is either quarter or three quarters of its yearly journey around the Sun (or half way between the solstices), the Earth's axis is orientated parallel to the Sun, and day and night are both 12 hours long. These two dates in March and September are known as the Vernal (Spring), and Autumnal equinoxes respectively. Following the equinoxes, the Sun appears to continue its march toward the solstice.

This pattern means that the location of the sunrise for any day of the year can be predicted on the eastern horizon. In the northern hemisphere, all dates before the Vernal equinox (currently March 20th) will see the Sun rise south of east, and all days after the Vernal equinox up until the summer solstice will see the sunrise to the north of east. The relative distance each way is dependent on the date. The same is apparent for sunset, with the Sun setting towards the south of west on dates prior to Vernal Equinox and to the north of west on dates after.

The pattern is reversed for the following six months with dates before the Autumnal equinox seeing the sunrise north of east and sunset north of west, and dates after the Autumnal Equinox seeing the sun rise to south of east and set south of west.

4.5.2. Problems inherent in analysing the Alignment of Churches

The aim of the survey was to see if there was any possible significance in the orientation of St Wilfrid's church. Of particular interest is the possibility that the church could be orientated on the Saint day of Saint Wilfrid on the 12th October. St Wilfrid's

day is celebrated on the 12th October (https://www.britannica.com/biography/Saint-Wilfrid accessed 02/02/2024).

A few of the problems inherent in such a study are outline below, as is the manor in which the methodology of the survey has been developed to mitigate some of the issues raised.

The orientation of medieval churches has been discussed on many occasions (Hoare 2014; Hoare & Sweet 2000; Hinton 2010, Hinton 2006) and historically many aspects have been suggested including; orientation to the east for liturgical reasons, or reasons of Christian religious belief; that they faced Jerusalem; that they faced the sunrise on the date of construction; or that they faced the sunrise on the patron saints' day (Hinton 2010 p2). Hoare and Sweet state in their 2000 paper "*The orientation of early medieval churches in England"* that "*Christian churches in western Europe, with notable exceptions, chiefly in Italy, are broadly in alignment with east. It has been asserted that the many buildings which are not oriented sensu stricto are aligned with sunrise on the feast day of the saint to whom they were originally dedicated, one of the solstice days, the day the foundations were prepared or on 1 May. Rodwell, however, believed that these structures were accommodated within the existing townscape or landscape"* (Hoare & Sweet 2000 p162).

Their study of Early medieval (seventh to early twelfth century) churches in central and southern England showed that Early Medieval Churches *"display an average alignment which is close to true east ($\bar{x}$=88°T, n=183). This near liturgically-correct orientation can only have been achieved by astronomical means. Sixty-two per cent of the measured buildings lie within the range 80°–100°T; such relatively minor discrepancies may be due largely to foundation setting-out errors. A considerable proportion of those churches which deviate significantly from true east were probably established on sites which were constrained by older structures in towns, and perhaps by the natural topography in rural areas"* (Hoare and Sweet 2000, p162).

There are usually many complications and problems associated with determining the reasons for the orientation of churches including calendar drift, horizon elevation, problems determining the date of construction of the church, and problems with the historiography of church dedication (Hinton 2010).

Calendar drift is caused by the Julian Calendar and the difference between the calendar date and the solar date, which progressively increased over time. This was corrected by the change to the Gregorian Calendar introduced in the 16th century in Catholic countries. By 1582 the Julian Calendar had created ten days of drift, and so in order to fix this problem Pope Gregory declared that the day after the 4th of October 1582 should be the 15th of October 1582, thus correcting the error. This change was not universally applied across countries, and Britain did not adopt the changes until the 18th century (https://www.nottingham.ac.uk/manuscriptsandspecialcollections/researchguidance/datingdocuments/juliangregorian.aspx - accessed 26/08/2017).

The following table is taken from the University of Nottingham Manuscripts and collections page on their website (https://www.nottingham.ac.uk/manuscriptsandspecialcollections/researchguidance/datingdocuments/juliangregorian.aspx - accessed 26/08/2017) it provides the calculations applicable for the number of days that had to be added to the Julian Calendar dates when different countries moved at different dates to using the Gregorian Calendar:

"After 5th October 1582 add ten days to the Julian Calendar

After 28th February 1700 add eleven days to the Julian Calendar

After 28th February 1800 add twelve days to the Julian Calendar

After 28th February 1900 add thirteen days to the Julian Calendar" (https://www.nottingham.ac.uk/manuscriptsandspecialcollections/researchguidance/datingdocuments/juliangregorian.aspx -accessed 26/08/2017).

"In Great Britain, the new calendar was adopted in September 1752. In order to deal with the discrepancy of days, which by now had grown to eleven, it was ordered that 2nd September 1752 would be immediately followed by 14th September 1752. This led to crowds of people on the streets demanding, 'Give us back our 11 days!' It also explains why our financial year begins on 6th April. The official start of the year used to be Lady Day (25th March), but the loss of eleven days in 1752 pushed this back to 5th April. Another skipped day in 1800 pushed it back again to 6th April".

(https://www.nottingham.ac.uk/manuscriptsandspecialcollections/researchguidance/datingdocuments/juliangregorian.aspx -accessed 26/08/2017)

By this rule St Wilfrid's day on the 12th of October became the 24th October in the Gregorian Calendar.

However, to complicate things further, when searching for possible alignments in a building it is necessary to know when a structure was built. When Britain adopted the Gregorian Calendar, this effectively put the dates back to where they would have been if the Julian Calendar had been correct. However, by the date of construction in the 12th century the calendar had already drifted by seven days. As a result, a building for instance which may have been aligned on the 12th of October in the 12th century will have a seven-day variance with the date following the correction, and will therefore align with the 19th October in modern times. Or in reverse a building demonstrating an alignment on the 19th October today would have had an alignment on the 12th of October in the 12th century. The seven days of drift which had accumulated by the 12th century is therefore fossilised in the alignment of the building. This alignment variation is only in relation to the calendar date, and not to astronomical events themselves. It only affects alignments based on a particular date, such as sunrise on a particular saint day. It does not affect Solstice or Equinox alignments.

"The calendar change has a particular impact when sunrise on a specific date, such as a saint's feastday, is considered, as the sun appears at a different place on the horizon today from where it did on the same calendar date in the year that the church was set out. During the period between the middle of the tenth century and the middle of the fourteenth century, when most churches were being built, the error grew from six days to nine days (Duncan 1999, 41-52). The difference between a specific date in the twelfth century, a period of much church building, and the same date today, is approximately seven days – sunrise, according to the calendar date, occurring effectively seven days earlier then" (Hinton 2010 pp15-16).

As stated previously Stellarium software automatically accounts for the change from the Julian to Gregorian Calendar in 1582.
(http://aa.usno.navy.mil/data/docs/JulianDate.php accessed 15/05/2017).

It is possible that the church at Barrow was orientated on magnetic East. Hoare and Sweet demonstrate that the magnetic declination (the difference between true north and magnetic north) increased from 8°E to 28°E between 800AD and 1000AD, and then slowly decreased to 20°E by 1100AD. However, they also demonstrate in their examination of the orientation of 181 churches in central and southern England that the churches in their study were centred on true, rather than magnetic, east. They go as far as to suggest there is no evidence for the use of magnetic east in their survey data (Hoare & Sweet 2000).

Other explanations include Hinton's findings which show that where churches are built on sloping sites, their chancels are found to be downhill-facing (Hinton 2006).

In relation to church Alignment with the position of sunrise on a particular day, Hoare and Sweet list the following (which they refer to as) 'imponderables':

(1) In only a very few cases can the early medieval dedication of a church in our survey be verified. Furthermore, certain saints have several feast days, although one is usually more highly regarded than the others.

(2) Calculation of the sunrise position is only reliable for level sites with an unimpeded view of the eastern horizon. Intervening land masses, woods and buildings will delay the (apparent) sunrise, perhaps by as much as 20°. Conversely, the sun will appear earlier than is indicated in tables, and thus farther to the north, on hill-top sites with a low, distant horizon.

(3) Relatively minor differences in the position of sunrise are given by the various 'proper moment of observation' strategies: 'first flash' (when the upper limb of the sun just appears above the horizon), exposure of half the sun or 'whole orb'. (Hoare & Sweet 2000 p168).

They conclude that: *"Despite these considerable uncertainties, a general test of the sunrise proposals may still be undertaken. The festival dates of saints known to have been favoured by early medieval dedications are distributed throughout the year; more significantly, several occur when sunrise is close to the limits of the solar arc. Thus, we would have recorded a much more widely dispersed set of data if the*

measured churches had been aligned with sunrise on the patronal festival day. Similarly, we may reject the suggestion that sunrise positions at the summer (>21 June) and winter solstice (>21 December) and on 1 May are preserved in the orientation of the buildings in our survey. We therefore contend that the widespread and time-honoured support for the various sunrise models is misplaced (although an occasional building may have been so aligned)" (Hoare & Sweet 2000, p 168).

These points raised by Hoare and Sweet and others have helped to shape the methodology of this project in order to eliminate many of the problems associated with understanding potential church orientation.

The methodology used Differential GPS and EDM Total Station to record terrestrial points on-site. These were tied into Ordnance Survey Grid Reference and orientated on grid north. This removes any problems inherent in earlier survey methods used in the past for determining church orientation which often consisted of the use of holding a liquid-filled magnetic compass against the wall of a church, (Hoare & Sweet 2000 p164).

It is likely if the orientation is deliberate that the angle could have easily been achieved in Saxon times as "*It is evident from Bede's (672/673–735) writings that early medieval folk in England possessed a significant knowledge of astronomy*" (Hoare & Sweet 2000, p166).

The methodology includes the local horizon estimate from LiDAR data to allow accurate astronomical predictions and also includes a number of the phases of sunrise to address points 2 and 3.

Barrow is a small settlement and it is likely to some extent to have developed around the church and was only a small settlement of a few houses by the time of Domesday Book and so the alignment of the church is unlikely to have been affected by surrounding buildings.

The effects of Calendar drift have been countered through the use of Stellarium software.

In order to test the possibility that the church at Barrow is orientated on the saint day of St Wilfrid on the 12th October, it is important to state that Hoare and Sweet do suggest that *"an occasional building may have been so aligned"* (Hoare & Sweet 2000, p 168).

Peter Hoare states that *"the arrangement of relatively few structures has been explained beyond reasonable doubt, and tests of the overwhelmingly popular festival orientation theory are often insufficiently rigorous to provide convincing answers" (Hoare 2014, p1712).* The aim of the methodology created for this project is to provide the sufficiently rigorous data collection and testing called for by Hoare to enable a serious discussion regarding the popular festival orientation theory to which he refers.

4.6. Data preparation and analysis.

All survey data was processed in QGIS Geographic Information Systems (GIS) software.

Ground Penetrating Radar data was processed using GPR-Slice Sotware.

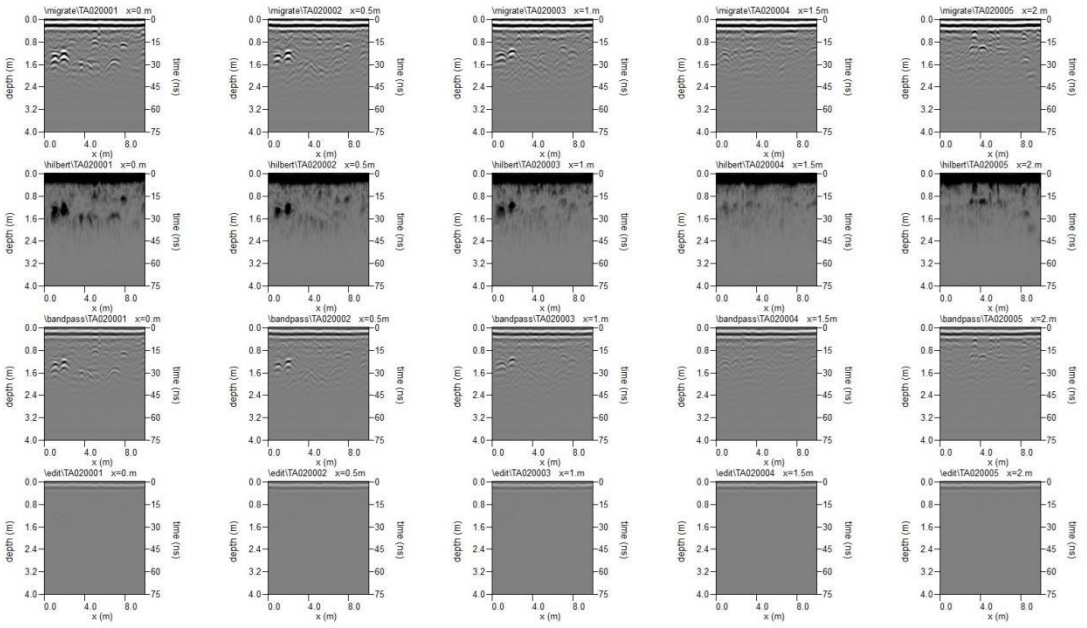


Figure 4_1 GPR Filtering of Radargrams using GPR-Slice software.

4.7. Archiving and reporting

4.7.1. OASIS

An OASIS entry pertaining to the work has been created. The OASIS identifier for the project is OASIS Id: merciana2-523006. A copy of the final archive report will be uploaded via OASIS, and logged with the Derbyshire Historic Environment Record (HER).

4.7.2. Public Dissemination on-line

Mercian Archaeological Services CIC will publish free downloadable versions of this end of project report via our website, as part of our Open Series Reports.

5. Results

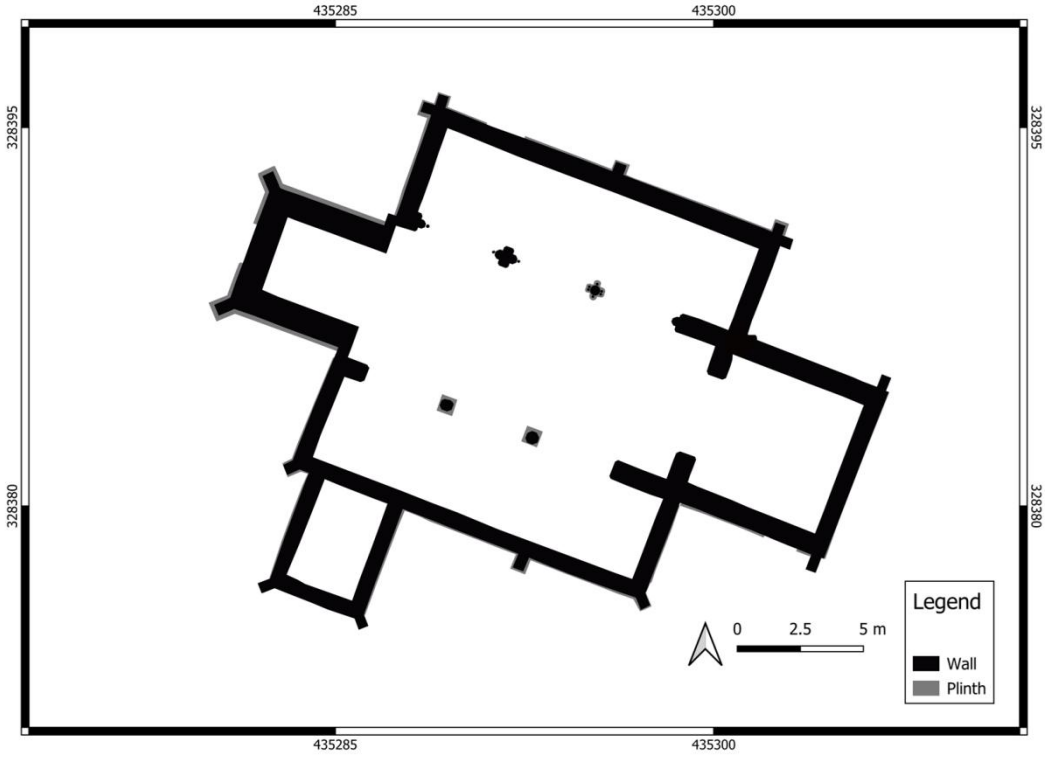


Figure 5_1: Plan of St Wilfrid's church, from Total Station survey and photogrammetric survey results

5.1 Ground Penetrating Radar Results

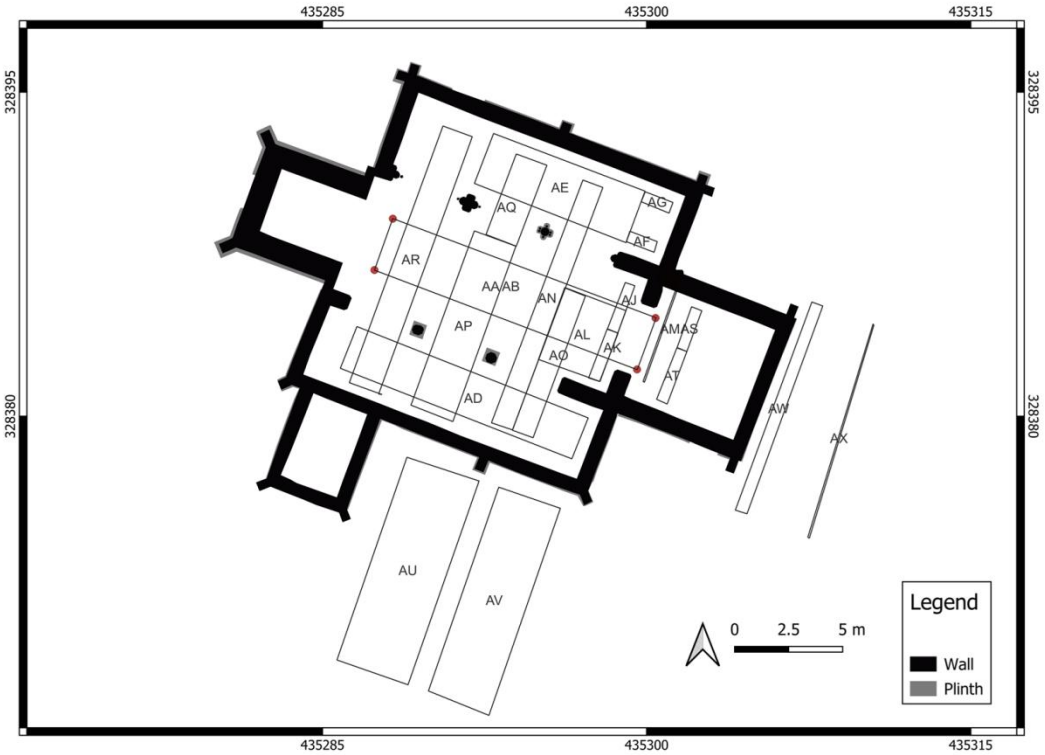


Figure 5_2: Location of Ground Penetrating Radar Grids inside and outside the church

The Ground Penetrating Radar survey was undertaken on using the grids shown above in figure 5_2. This grid layout was created to enable to best overall coverage of the church interior, with particular focus on the areas outlined in the aims and objectives section above. A number of grids we also surveyed outside in the churchyard to search for possible plague pits, and possible previously elongated chancel. The results section below discusses the results for selected areas within the church and churchyard which were prioritised for investigation, alongside additional results of interest.

Area A - Anchorite:

The area surrounding the northern side of the chancel arch has been suggested to be the former location of a semi-subterranean anchorite cell. The reasons for this assumption seem to arise from the presence of low-level squint inserted to provide views into the chancel from a possible subterranean location. The squint is mentioned above in Ryder (2013).

The area was subject to GPR survey as parts of grids AA, AB, AJ, AF, and a single transect line AM. Features such as the pulpit, font, chancel arch, and north arcade respond, made good coverage of the area difficult, and thus limited to the areas outlined below in figure A1.

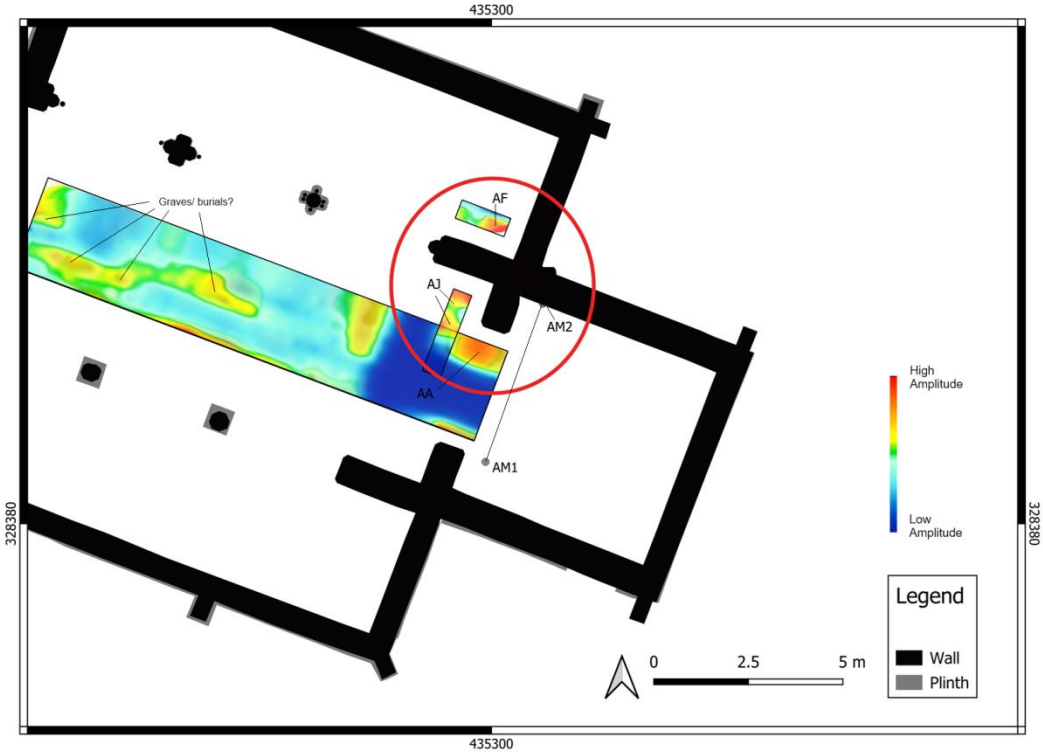


Figure A1: Area of possible anchorite, inside red circle.

Figure A1 above shows the area of the possible anchorite cell. The area is difficult to interpret and large amounts of rubble are present as seen in photograph A_1 below. However high amplitude responses which could represent walls or foundations can be seen in grids AA, AJ and AF. A 3-Dimensional (3D) ISO model of grid AJ is shown below in figure A3

Photograph A_1: Rubble under flooring in area of possible anchorite. Photo courtesy of Anne Heathcote.

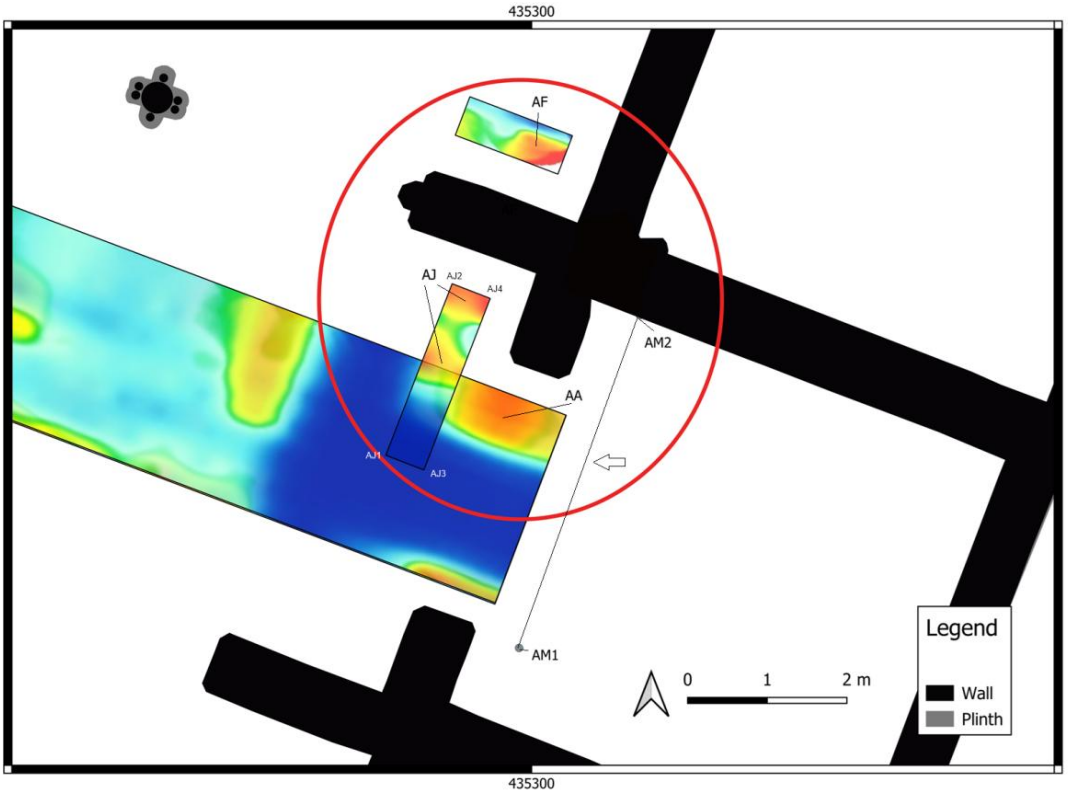


Figure A2: High Amplitude responses marked in grids AA, AF, and AJ.

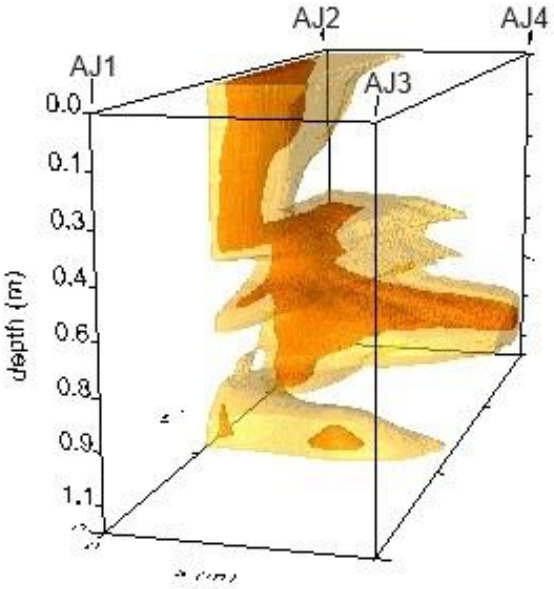


Figure A3: Three-dimensional Iso model of Grid AJ, facing north. Dark orange highest amplitude (90), light orange (75).

Figure A3 above is a Three- dimensional ISO model of grid AJ. The image has been annotated to aid in understanding of what is depicted. The grid corners are marked AJ1, AJ2, AJ3, and AJ4. This follows the methodology outline above. The four corners mark the outline of thee ground surface of the model. Depth is shown on the scale on the left hand side. AJ1 to AJ3 is the X axis of the grid, and transects were recorded

from AJ1 to AJ2 and subsequently at 0.5 metre intervals incrementing along the X axis, until the final transect was walked from AJ3 to AJ4. The Iso model creates a surface for data of the same value. In this image the highest amplitude responses are shown in dark orange (90), and these are shown with other high responses (75) in light orange. The higher the response the more solid the buried feature. This in effect crates a three dimensional image of what appears in the data to be below ground, as if viewed into the ground. It is possible that these features could represent archaeological remains.

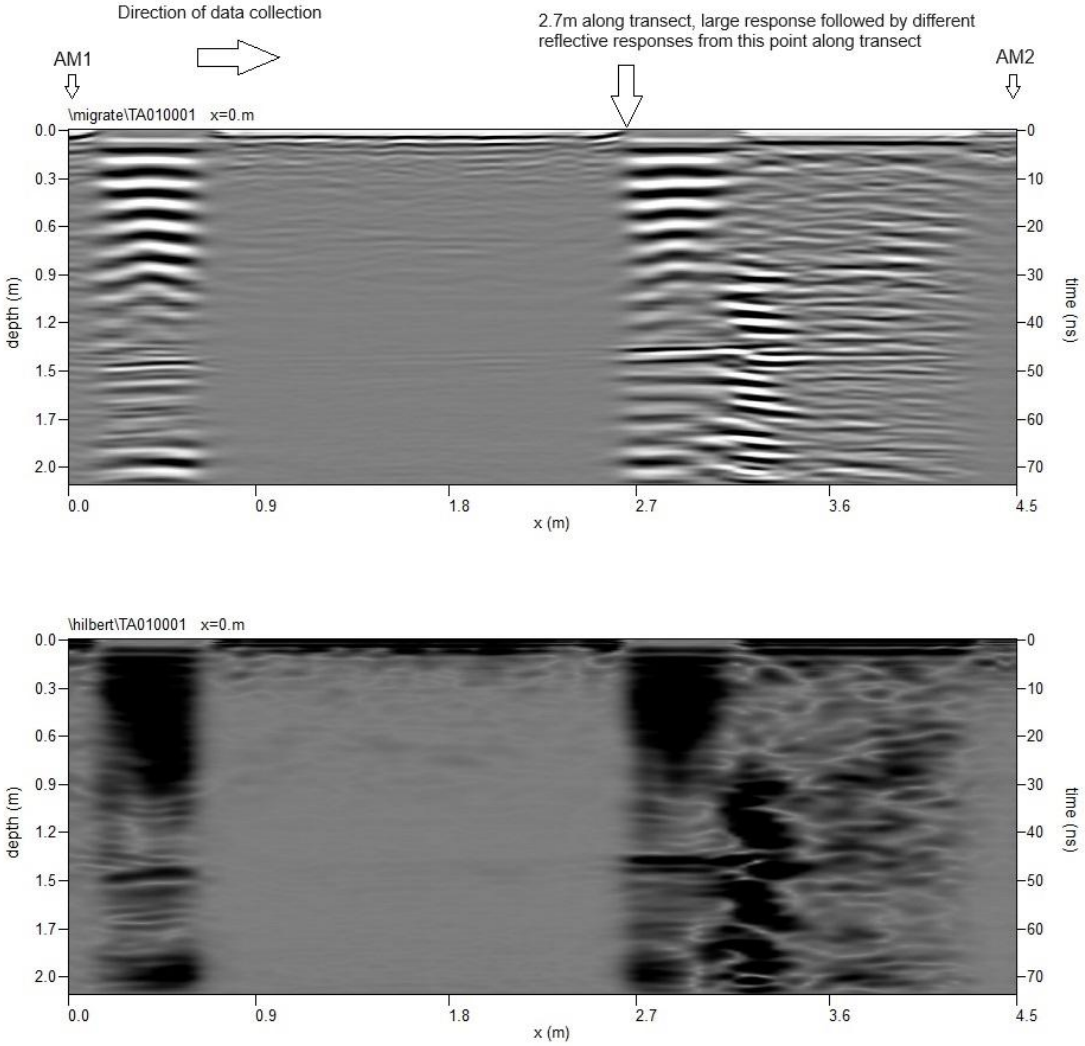


Figure A4: Radargrams of transect AM. Note change 2.7m along transect (see top plot).

It was only possible to fit a single transect into the space east of the chancel arch, and the raised area of the altar. This transect 'AM' is marked on figures A1 and A2, with point AM1 showing the start point and AM2 the end point along the line. The radargrams are shown in figure A4 above. These are annotated to show the direction of data collection. They also show the point (marked with an arrow) 2.7 metres along the transect where a high amplitude reflection was encountered and after which a

change in the reflections from underground were experienced. This point is marked with an arrow in figure A2, and can be seen to line up with the high amplitude response seen in Grid AA (see figure A2). It is possible that this represents a continuation of the same feature which may be a wall or foundation with infill behind.

There may well be features some of which could represent walls and foundations that might be associated with a former anchorite in the area surrounding southern side of the north base of the chancel arch, to accommodate the low-level squint. It has not been possible to determine whether this is indeed and anchorite, and that would not be possible without more intrusive methods. Unfortunately due to the logistics of surveying in a church with all its stonework and fittings, along with the centuries of change and re-development of the building, getting clear results through prospection methods may prove elusive. It must be remembered here that absence of evidence is not evidence of absence, but what evidence there is unfortunately cannot strongly point one way or the other to any possible cell or anchorite in this vicinity.

Photograph A_1: Volunteers undertaking Ground Penetrating Radar Survey in the vicinity of the ow-level squint (visible on left hand side of photograph, to right of pulpit at base of chancel arch, and possible anchorite cell.

Area B - Vaults:

A plaque located on the wall of the southern aisle, hints at the location of a crypt complete with interments. It is said to lie at the eastern end of the south aisle, shown in the red circle in figure B1. This area was examined in GPR grid AD.

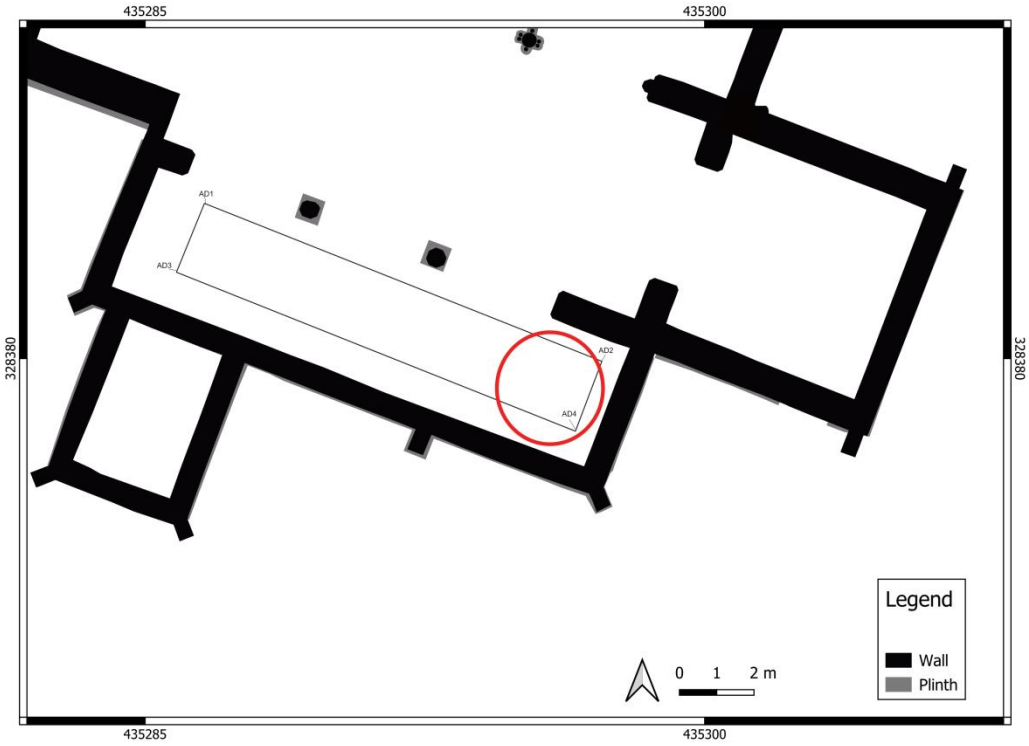


Figure B1: Location of Grid AD in relation to possible crypt (red circle).

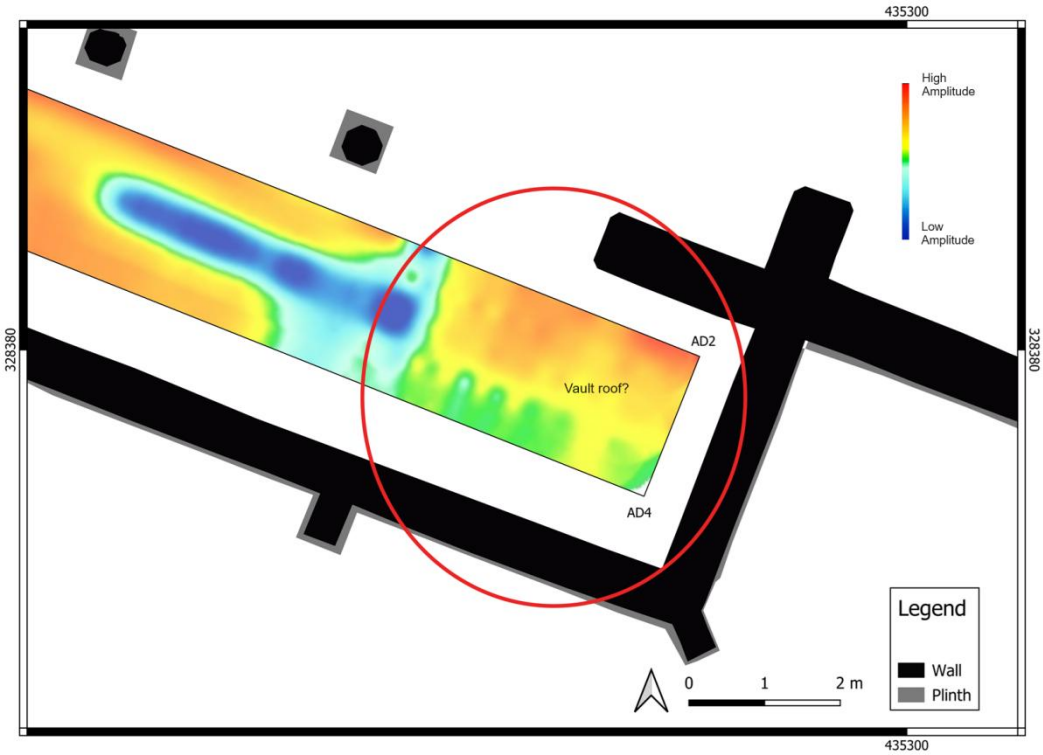


Figure B2: Results showing possible vault roof, depth of time-slice 0.3m

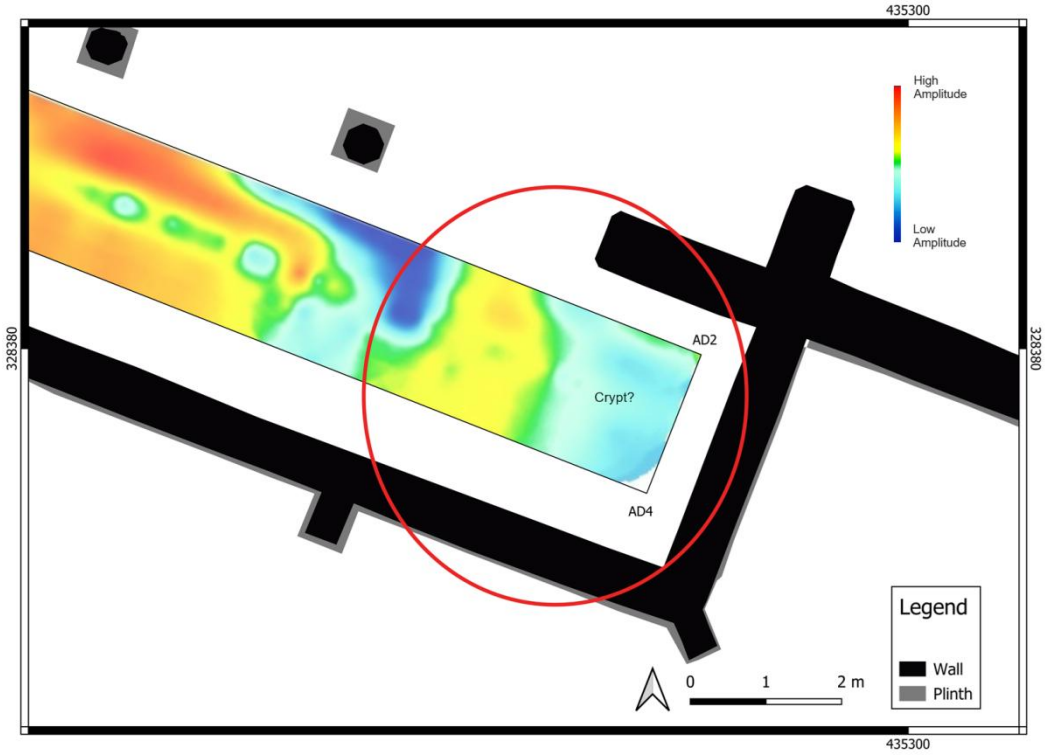


Figure B3: Results showing possible crypt, depth of time-slice 1.0m

The results of the survey show a solid high amplitude response at the eastern end of the aisle at a depth of 0.3m. This feature disappears after a further 0.2m of depth to reveal a void which is interpreted here as a crypt ans shown on figures B3, and B4.

The 3D Iso model in figure B4 shows in effect a cross section through the ground. This image suggests a curved roof to the possible crypt, which is annotated in the image.

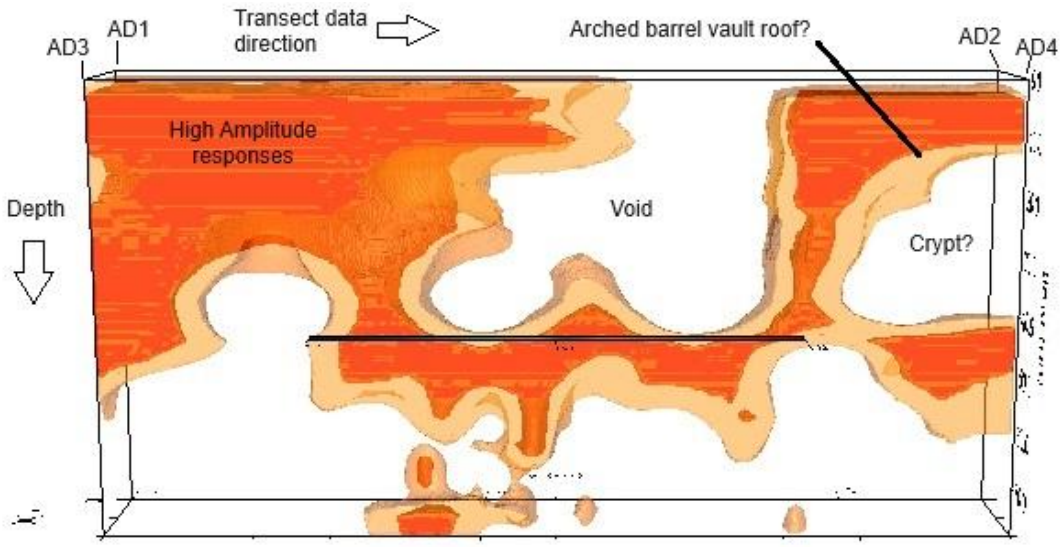


Figure B4 3D Iso model ISO. Highest amplitude red (95), high amplitude orange (85). showing possible crypt location and possible curved vault roof?

If the crypt has a curved roof it is possible it is part of a barrel vault as shown in figure B5 below. Access to the crypt may have been from outside of the church entering under the east wall of the aisle.

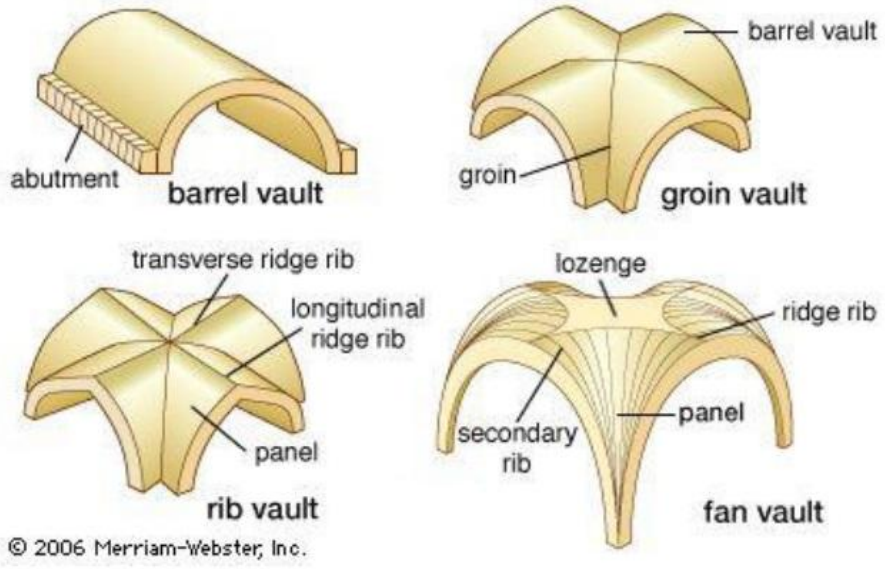


Figure B5: Image showing Barrel vault (top left) and Groin vault (top right) . Picture fromhttps://www.britannica.com/technology/groin-vault - accessed 21/03/2019. © 2006 Marriam-Webster Inc.

The high amplitude responses at the western end of the aisle- marked on the left hand end of figure B4, appear to be substantial and may represent buried archaeological remains. Their location within the southern aisle which was added to the church in the 14th century, could suggest they represent the remains of a former porch. This is

discussed again in relation to the south aisle below.

Area C - Chancel (exterior)

A survey gird was positioned on the exterior of the church adjacent to the east wall of the chancel. This grid was positioned to search for possible wall foundations associated with a previous phase of the building where the chancel may have been longer than it is currently. This is suggested above in the work of Ryder (2013).

Figure C1 below shows the location of the survey grid along with high amplitude responses in line with the current north and south walls of the chancel, in line with where they would be expected to be if the chancel had once been longer. It is possible they represent the remains of the chancel walls. Unfortunately a series of chest tombs which stand in a row parallel to the east wall, approximately a metre from it, prevented any further survey to the east. So it was not possible to see if the possible wall remains extended further to the east, and how they may have historically terminated, perhaps with in a apsoidal curved end, or at a former east wall of the once longer chancel.

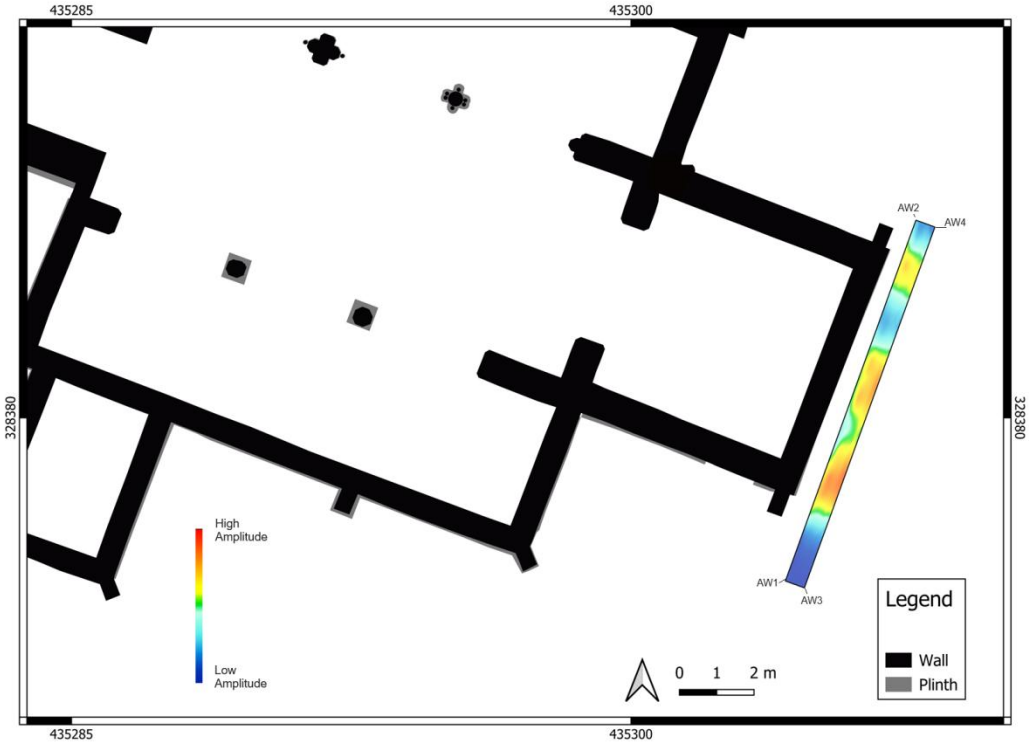


Figure C1: Location of Grid AW to search for possible former extended chancel. High amplitude features detected at 0.25m depth shown- possible wall foundations?

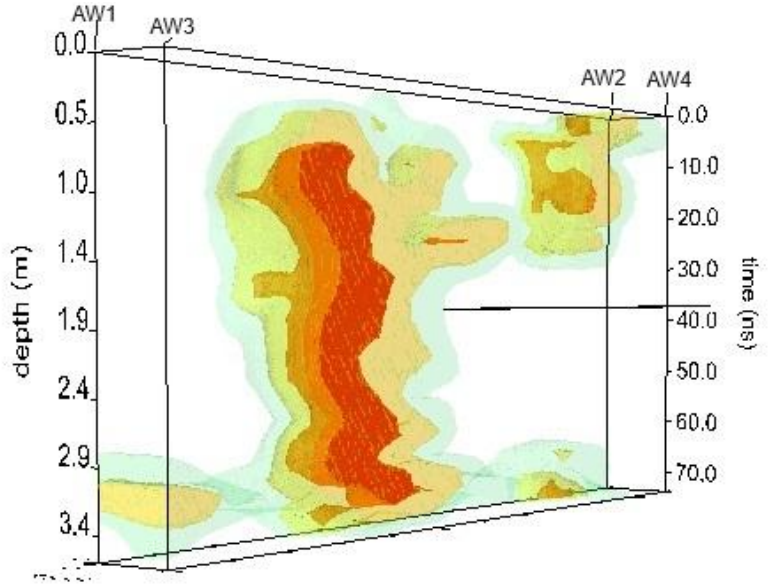


Figure C2: 3D Iso model grid AW. Red Highest amplitude (90), Orange High (70), yellow medium (50).

Area D - Nave:

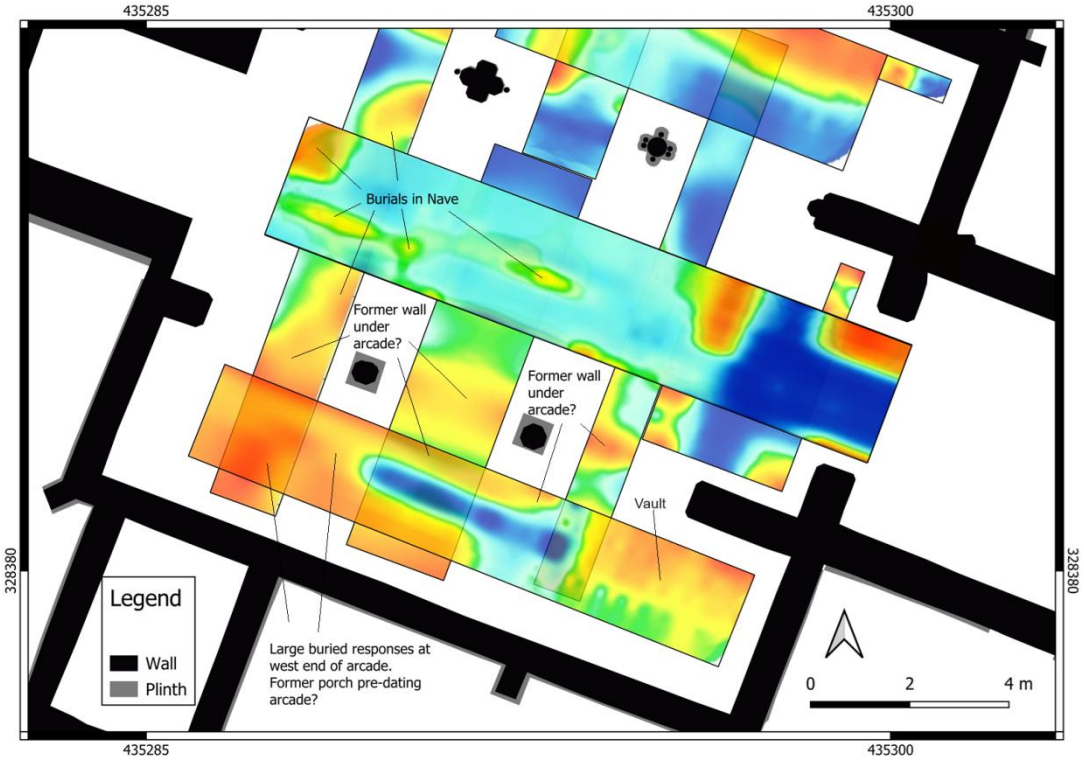


Figure D2: Nave and South Aisle of church GPR results.

The survey of the nave was undertaken across a number of different grids, which attempted to provide the best possible coverage between obstacles such as arcade columns.

The nave surveys showed a number of burials were present. These are shown in figures D1 above and E1 below. They may well be prominent burials of important people and may be in stone coffins. It is likely that over the centuries hundred of bodies will have been interred inside the church, ad the ones showing up are likely among the best preserved ones.

Area E - North Aisle:

Figure E1 below shows the result of the survey in the North aisle. Of interest is the absence of a wall under the arcade, which might indicate that the church was built with an arcade in-situ. There is also a large linear response which runs on the same alignment as the current North aisle wall, but extending up to 2m into the church from the current wall. It is suggested here that this might represent an earlier wall base for a smaller former North aisle. There is also a large response at the Western end of the North arcade, which could possibly be associated with a priest house speculated by Ryder and Cox in Ryder, 2013. Of course these are only speculative suggestions which cannot be proven without invasive investigations.

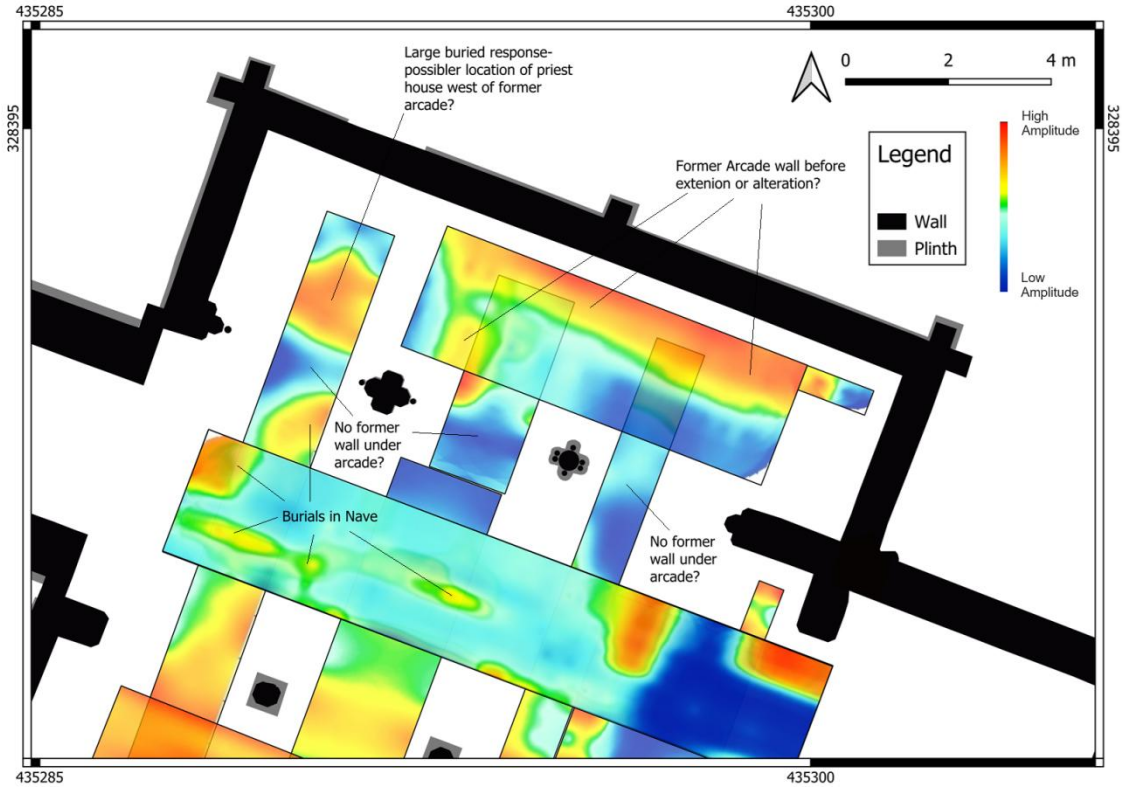


Figure E1: North Aisle of church GPR results.

Area F - Exterior of church to south

The area to the south of the church, outside and adjacent to the south aisle and east of the porch has long been suggested as a possible location of Plague pits - The story has reportedly been passed down by generations of Church Wardens and the priest in Barrow died in a plague year. The ground south f the church in the area surveyed was said to have been raised into a mound, up to this century before it was flattened to ease mowing (Llynda Baugh, Heritage Activity Delivery Manager, St Wilfrid's Church, pers comm, 30/11/2023).

The area was surveyed with two grids AU and AV seen in figure F1 below. The results detected burials probably in caskets due to high responses, at depth of 1m - 1.7m as shown in the figure. This correlates well with the depth at which articulated burials were first encountered in the 2022 watching brief (Tilt & Blues 2020, p12).

Figure F2 shows and 3D Iso model of grid AU. The corners are marked on the figure and correspond with the grid as marked in figure F1. These results show the burials between 1m and 1.7m depth but also show an number of other possible burials and responses which could be human skulls?

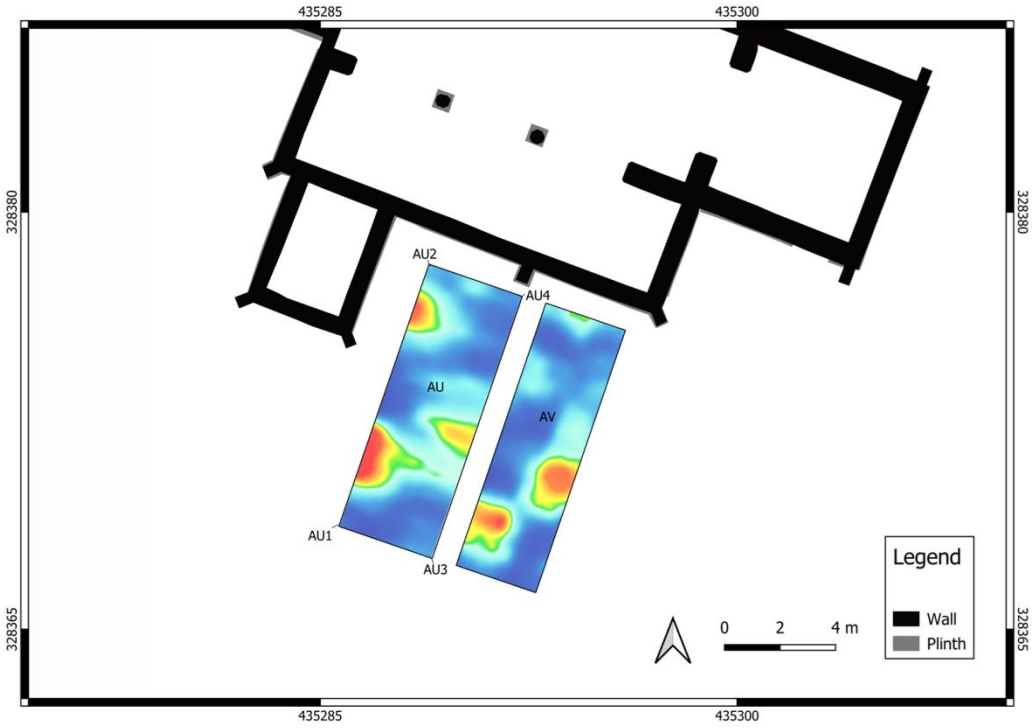


Figure F1: Location of possible Plague Pits identified through anecdotal evidence. The Grids show Burials between 1m to 1.5m depth.

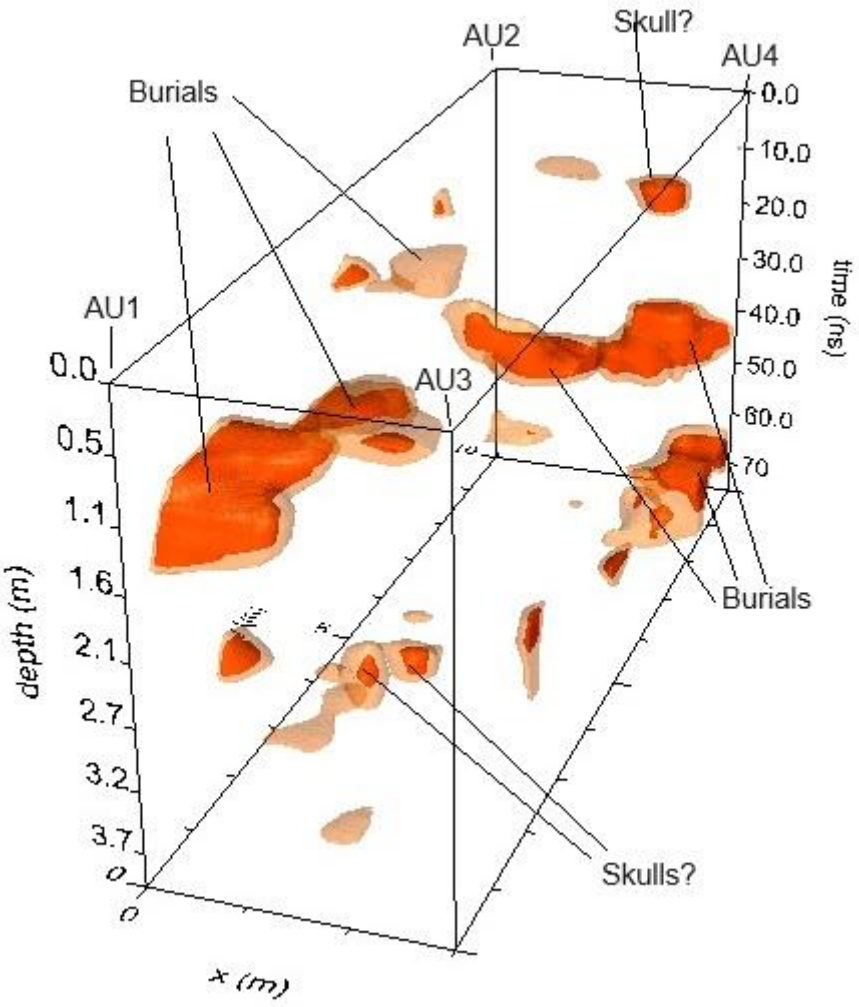


Figure F2: 3D Iso image of grid AU showing possible burials.

There is no clear evidence of what might be interpreted as a mass-burial. The higher burials seem orderly and related probably to the stones in the graveyard. The presence of these stones from the mid-19th century in-situ, raises questions regarding the ground level suggested above- which was apparently raised up in this location until the 21st century when it was flattened for mowing. These graves do not appear to have been moved and seem to have stood in their locations since the mid 19th century. If plague pits are present in the graveyard a wider survey may be necessary which is not dependant on eye-witness accounts of location and word of mouth testimony which can be unreliable, and may have given the wrong location. Unfortunately, it has not been possible therefore to confirm plague pits at these locations.

5.2 Church Orientation

St Mary's church in Edwinstowe, Nottinghamshire, is orientated at an angle of 107°. Calculations by the author have shown that this orientation gave an alignment on the sunrise on the 12th October in the year 1175 (see calendar drift section above), when that church was rebuilt. This is the feast day of Saint Edwin of Northumbria, who is linked to Edwinstowe. His feast day was celebrated with a vigil and fair in Edwinstowe in the medieval period. It is suggested that Edwinstowe was a cult centre to Saint Edwin in the 12th to 15th centuries (at least) (Gaunt 2018). St Helens church in Ashby de-la-Zouch, Leicestershire, is orientated at an angle of 63°, which using archaeoastronomical calculations, the author suggested may have indicated an Easter alignment of the church, which brought forth 3 possible dates for the rebuild in the 14th century (Gaunt 2019). Following these previous projects Mercian were asked to look into any possible alignments at Barrow-upon -Trent.

St Wilfrid's Church is orientated approximately at an angle of 111°. With a building with such a complex architectural history it is impossible to be precise, but lines draw along the north and south arcades on the plan in figure 52_1 below and along the centre of the nave (see image) both align at 111°. These lines have been used to create a central line through the nave which is show to follow and angle of 111°.

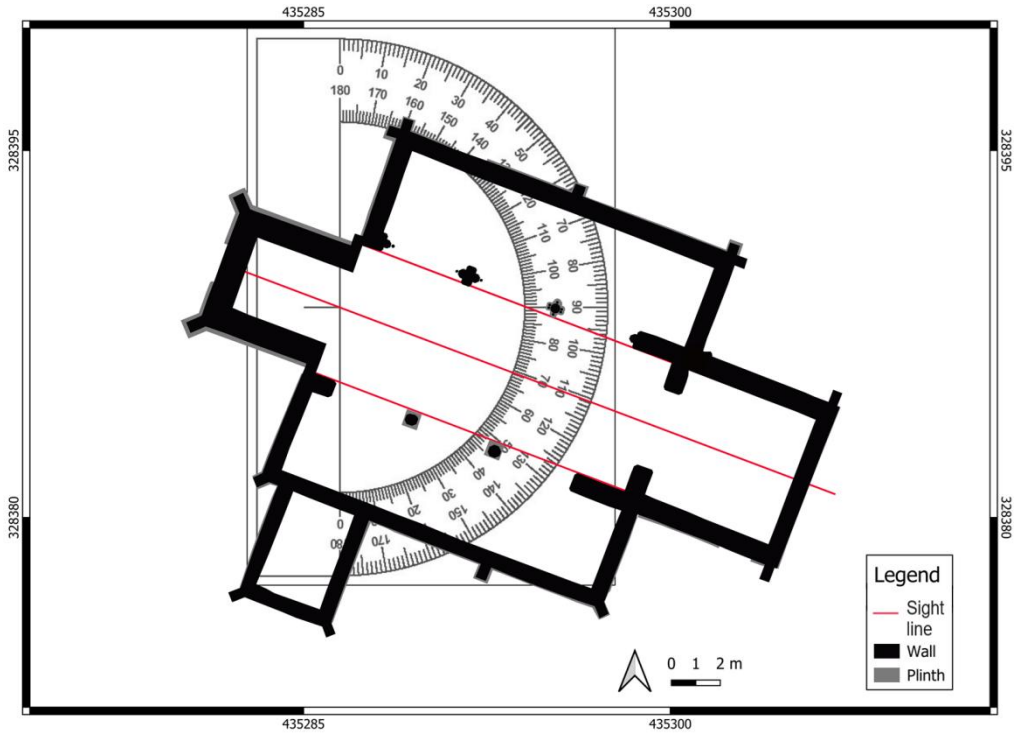


Figure 52_1. Approximate overall orientation of the nave at Barrow Upon Trent (suggested as earliest part of church either Anglo-Saxon, 12th or 13th century in origin), at 111°.

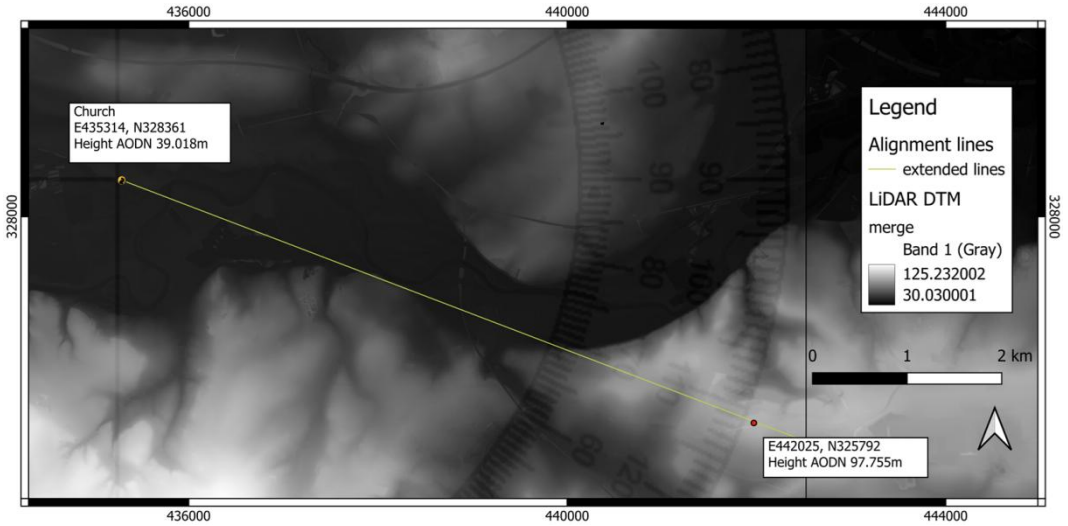


Figure 52_2: Extended line of site along 111° from St Wilfrid's Church to high distant horizon maximum of 97.75metres or circa 100m AODN from LiDAR data. .5m LiDAR DTM hill-shade model. Contains public sector information licensed under the Open Government Licence v3.0

The church is situated at a ground level elevation of approximately 40 metres above sea level (Above Ordnance Datum Newlyn - AODN), shown in the image in figure 52_2, at 39.018m AODN, from LiDAR data. The image above in figure 5_2 shows the line of sight from St. Wilfrid's church along 111°. Much of the view is across the flood-plain of the River Trent (sinuous black zone in figure 52_2). The horizon reaches a maximum elevation along this line of approximately 100m above sea-level, at the location of East Midlands Airport E442025, N325792, Elevation 97.76m AODN from LiDAR data. The distance between these two points is 7,219m. Trigonometry calculation suggests a vertical angle of 0.47° between these two points. Variations in the local horizon are important in calculating the azimuth of sunrise (degrees from grid north around the horizon). It is worth noting that vegetation both local (trees) to the church and on the horizon cannot be calculated as they are not available for historic periods, so some discretion is required in terms of relative horizon height.

The location of St Wilfrid's church (required in Longitude and Latitude N52°51'7.00", W1°28'38.00") was given as the location information for the software, with a height of 40°. The angle of sunrise was then calculated (based on full orb clearance of horizon) for the present day along 111° site line (figure 52_3), and for the 12th October in circa 2024 (in figure 52_4), then 900, 100, 1150, 1200, 1250, 1300, 1350, and 1400 (Figures 52_5 to 5_12 respectively).

The figures below are extracts from Stellarium software. Please note the photographic background is not Barrow-upon Trent, but is a default image in the software provided for aesthetic reasons. Each image shows a grid of the celestial sphere- of most importance is the arc of sunrise (labelled "sun") and the numbered lines running near vertically upwards from the ground, these are marked every 5 degrees of azimuth. The vertical degrees of elevation are also shown. Lines showing equinox and solstice

arcs, and heavenly bodies such as the moon, are also provided. The cardinal directions are shown in red. The sun is shown in each a few degrees above the flat horizon to allow for the elevation of the horizon local and vegetation. Each image shows the full orb of the sun having cleared the horizon.

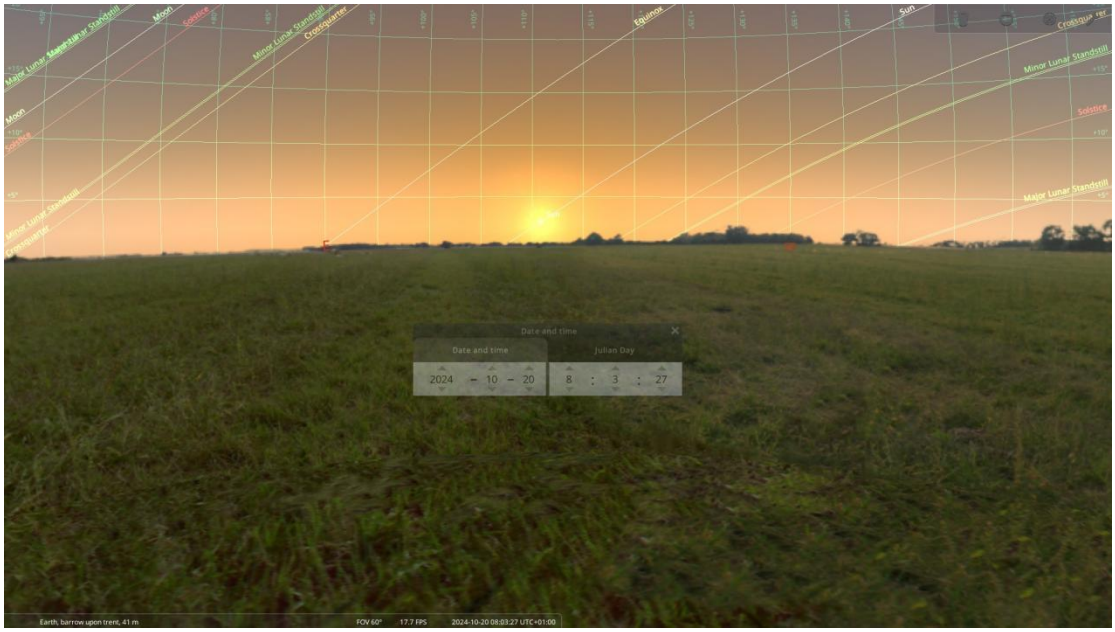


Figure 52_3: Stellarium software, showing full orb clearance of sightly elevated local horizon, 20th October 2024. Circa 111°.

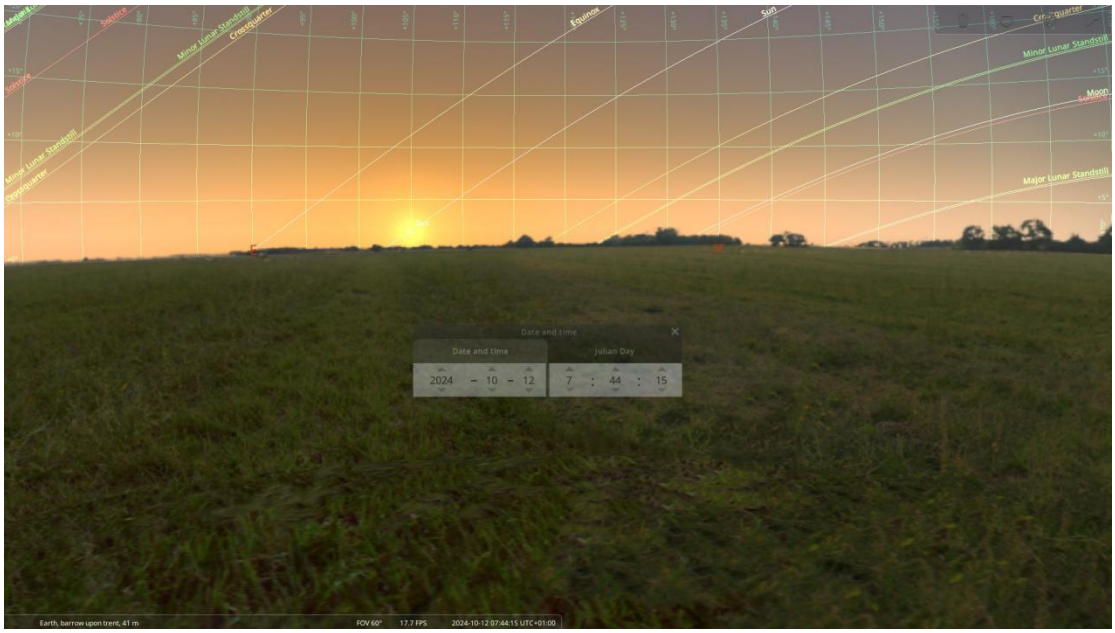


Figure 52_4: Stellarium software, showing full orb clearance of sightly elevated local horizon, 12th October 2024. Circa 106-7°.

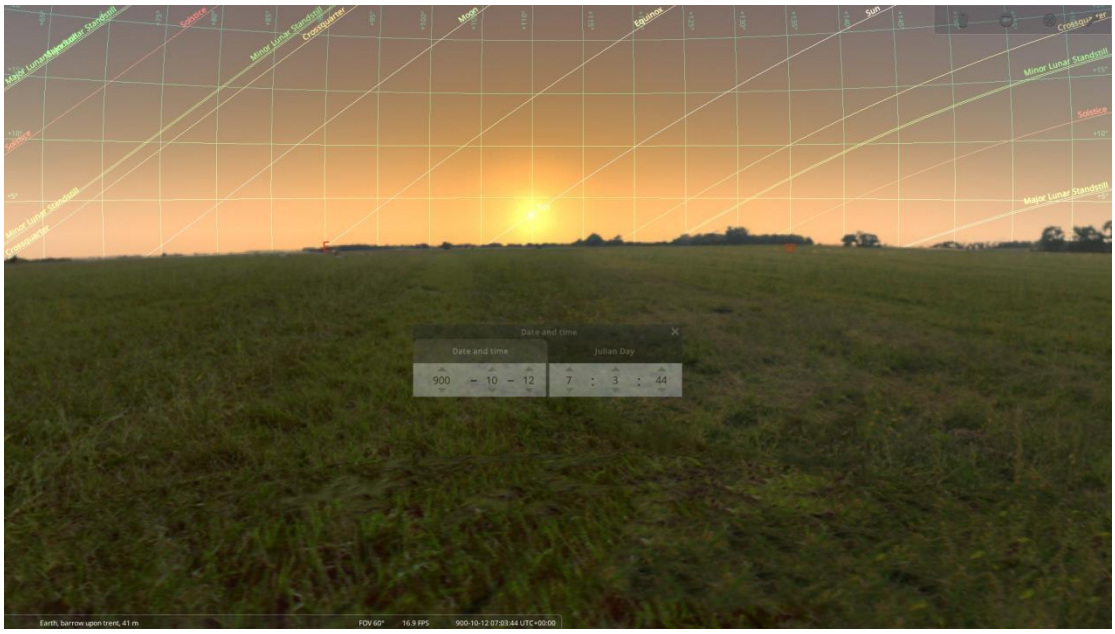


Figure 52_5: Stellarium software, showing full orb clearance of sightly elevated local horizon, 12th October 900. Circa 109-110°.

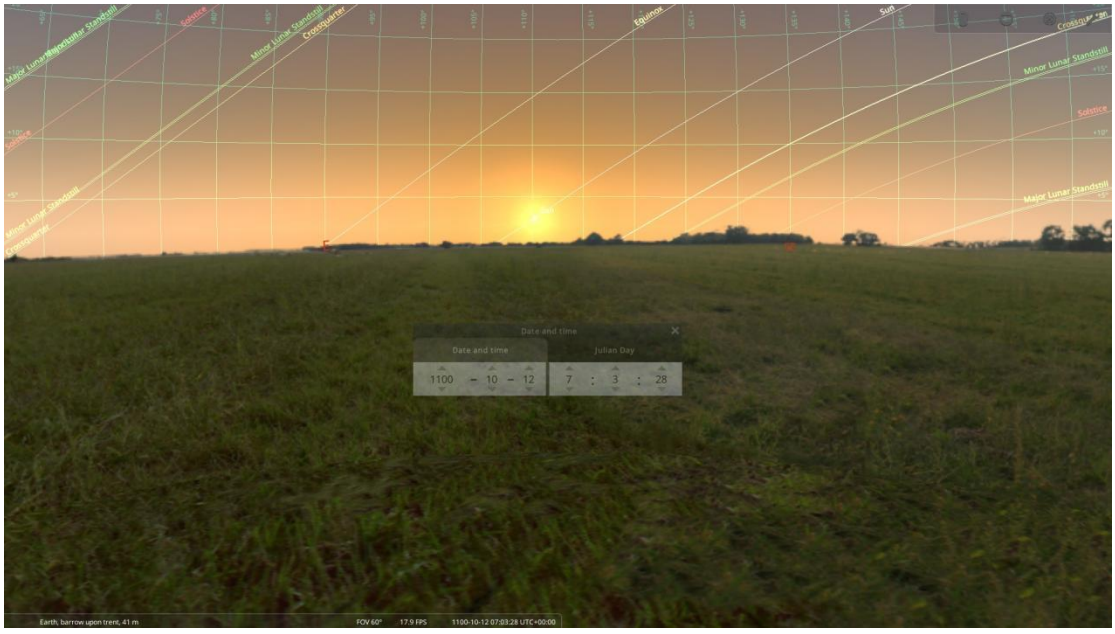


Figure 52_6: Stellarium software, showing full orb clearance of sightly elevated local horizon, 12th October 1100. Circa 110-111°.

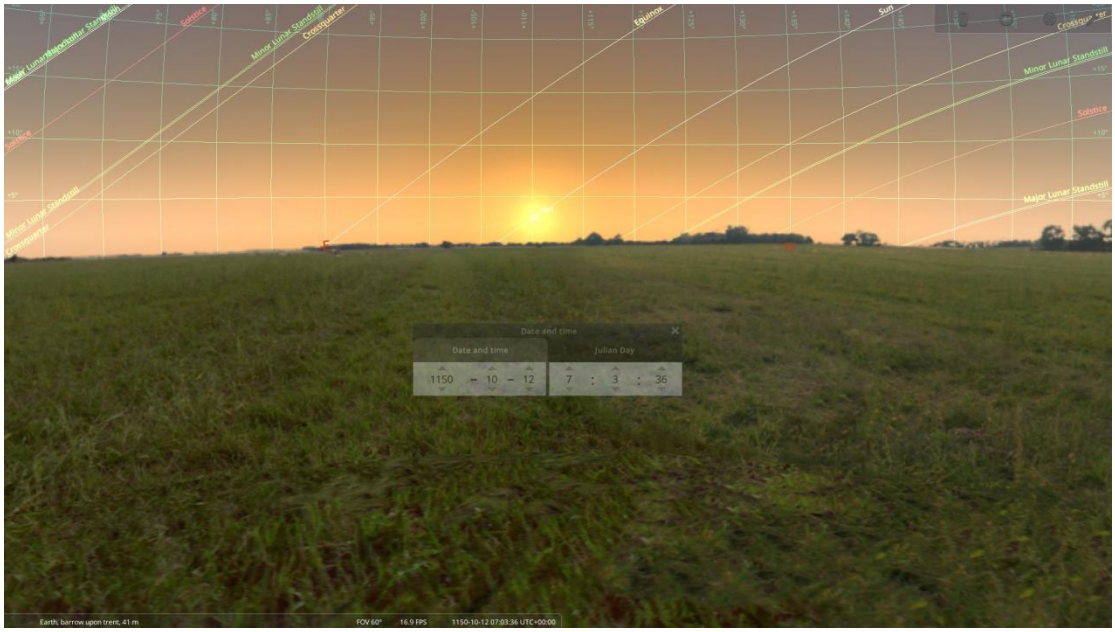


Figure 52_7: Stellarium software, showing full orb clearance of sightly elevated local horizon, 12th October 1150. Circa 110-111°.

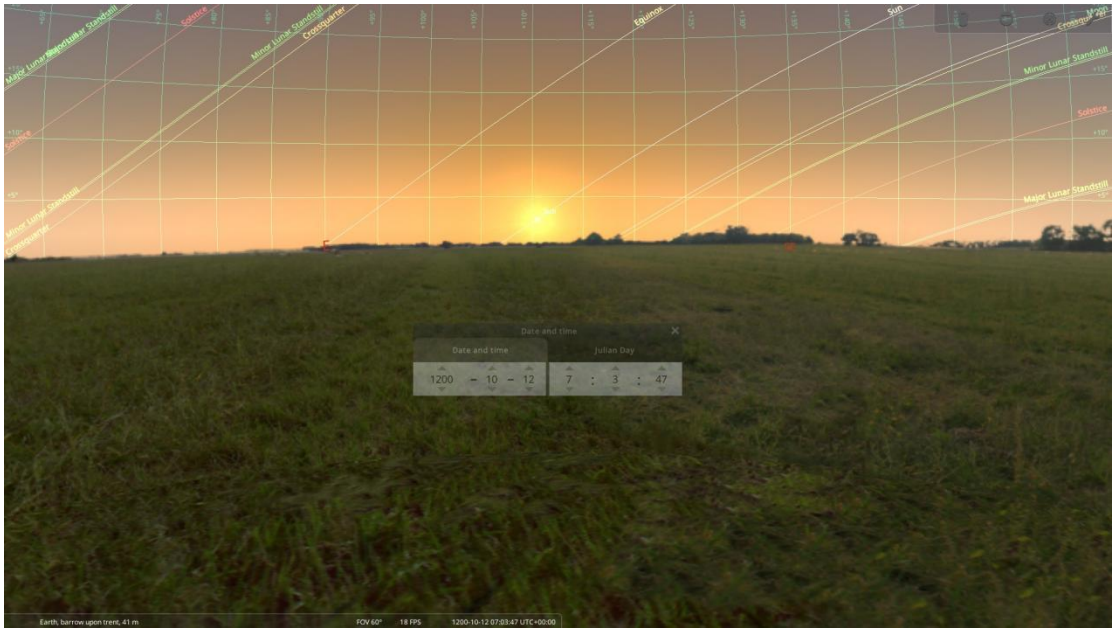


Figure 52_8: Stellarium software, showing full orb clearance of sightly elevated local horizon, 12th October 1200. Circa 111°.

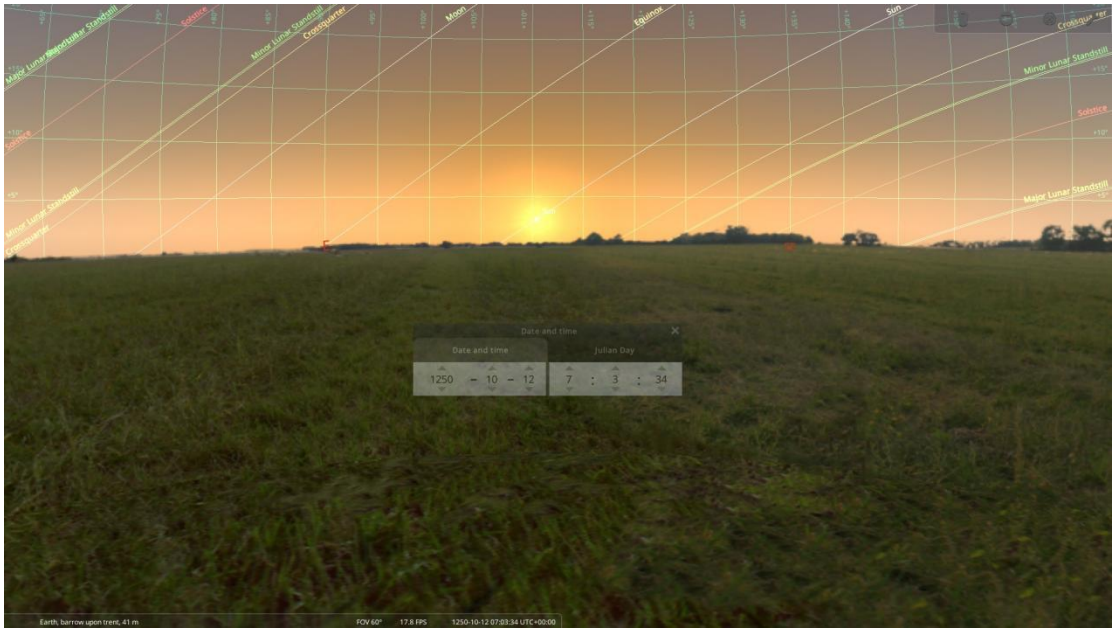


Figure 52_9: Stellarium software, showing full orb clearance of sightly elevated local horizon, 12th October 1250. Circa 111°.

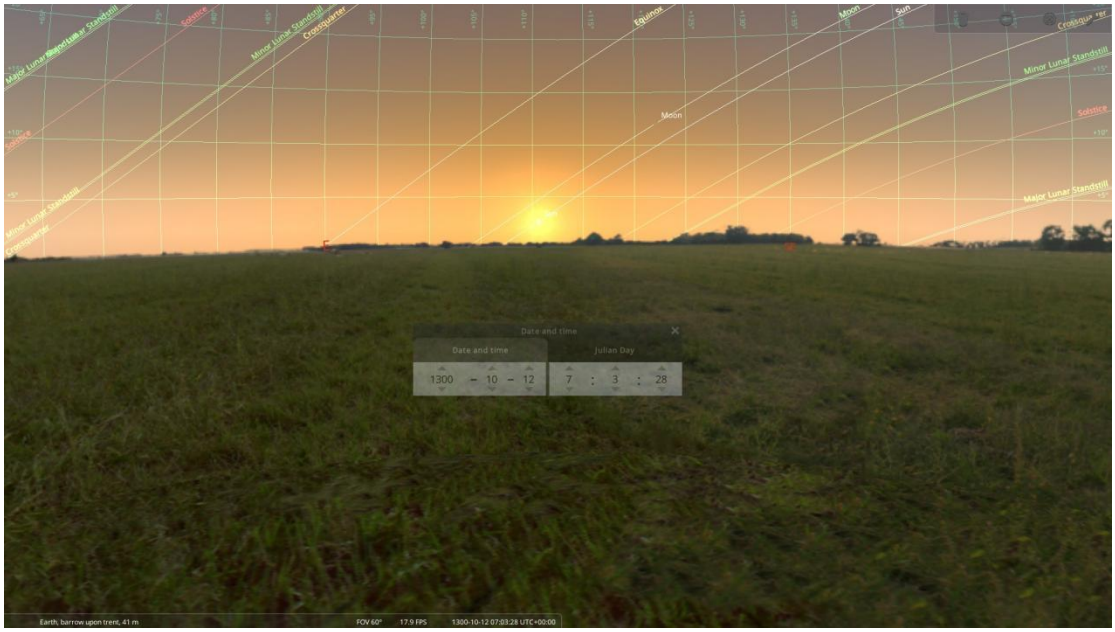


Figure 52_10: Stellarium software, showing full orb clearance of sightly elevated local horizon, 12th October 1300. Circa 111°.

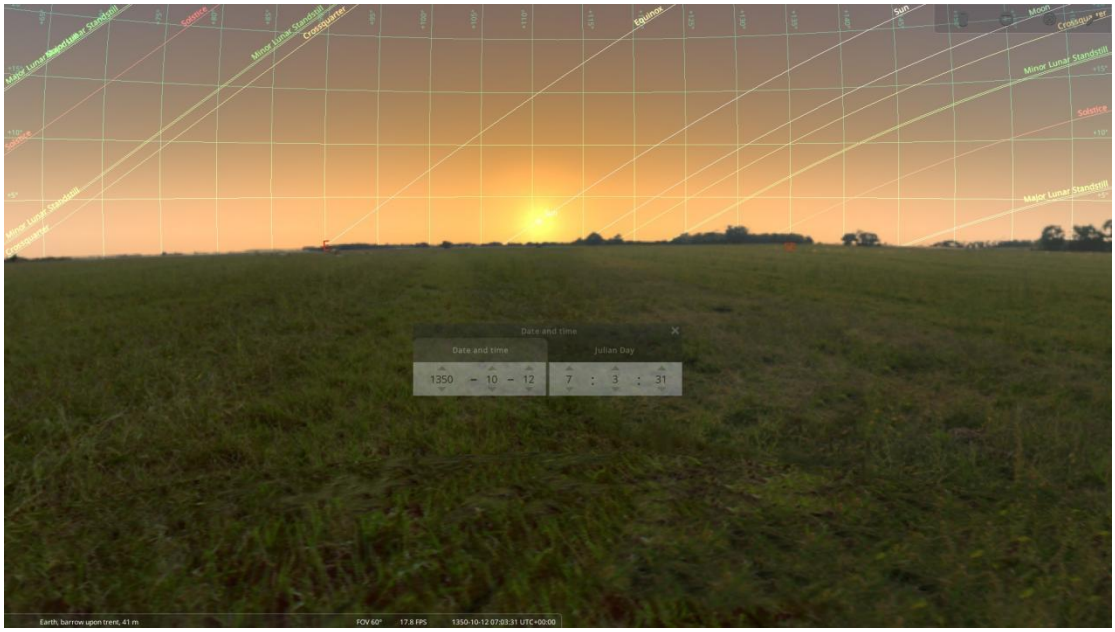


Figure 52_11: Stellarium software, showing full orb clearance of sightly elevated local horizon, 12th October 1350. Circa 111°.

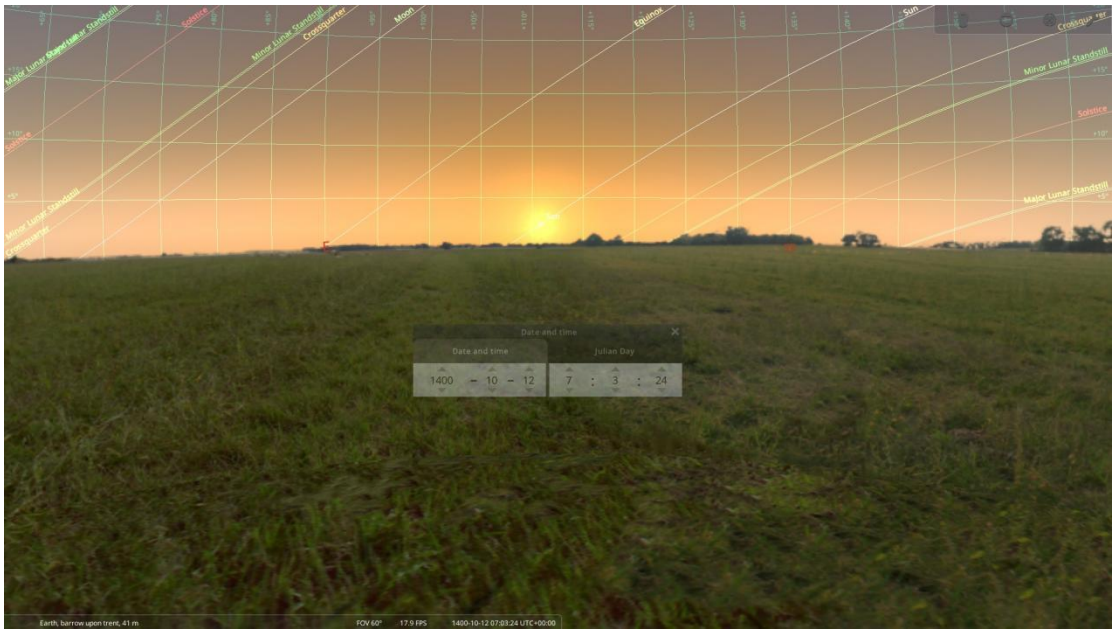


Figure 52_12: Stellarium software, showing full orb clearance of sightly elevated local horizon, 12th October 1400. Circa 112°.

Although not conclusive, it is possible to suggest that due to a fairly unusual angle of 111° of the church orientation, which is unlikely due to ground slope, or fitting in with pre-existing buildings in a crowded town setting etc, there may be significance as to the choice of alignment of the church. Its angle of 111° aligns with the saint day of St Wilfrid, if calculated using the full-orb clearance of a slightly elevated local horizon.

Also for human error etc in aligning. The likely timing for the reconstruction of the church on this alignment (if intentionally aligned on 12th October), from the calculations shown in figures 52_5 to 52_12, is between circa 1100 and 1350, when the angle is closest to 111°. Prior to this date the angle is less than 111°, and by 1400 it is 112°. If this alignment is tentatively suggested as deliberate, then it is likely the Anglo-Saxon quoins on the south-eastern corner of the nave represent re-used and not in-situ masonry. Ryder gives 12th to 13th century dates for the likely oldest surviving elements (Anglo-Saxon masonry aside). This period con-insides with when the site was church was held by the Knights Hospitaller, having been granted to the order in 1165 by Robert de Bakepuiz. They held the building until around 1540. Recent studies of Cistercian monasteries in Wales have shown intentional alignment on theologically significant days (Brady, B., Gunzburg, D. and Silva, F. 2017).

6. Conclusions & Discussion

The geophysical Ground Penetrating Radar survey within the church and externally in the churchyard helped to give an insight into the remains that survive. Although it was not possible to categorically confirm the presence of an anchorite cell, sufficient anomalies were present to also not categorically disprove its presence. As stated previously absence of evidence is not evidence of absence. There was also insufficient evidence to suggest plague pits in the locations surveyed in the churchyard. It has been possible however, to suggest the likely presence of a crypt at the eastern end of the southern aisle. The survey also detected what may be the remains of walls which may offer the possibility of different phases of development including in the north aisle of the church, and in the south aisle.

The Total Station and GPS, survey alongside the photogrammetric survey has produced measured plans and elevations of the church (see Appendix below) which will allow much new information to be acquired in the future, regarding phasing, interpretation, and condition.

The survey data was also used to undertake archaeoastronomical alignment calculations, and the results suggest a possible St Wilfrid's day alignment on 12th October, and suggested a likely construction date in the period between the 12 and 14th centuries. This was during the period when the church was in the control of the Knights Hospitaller, and it is possible that the order may have rebuilt the church on a saint day alignment. As a medieval religious order they may have intentionally aligned the church on this significant date, as recent research mentioned above, on Cistercian Monasteries in Wales, has shown was prevalent at the time.

Alongside these findings Mercian also detected and recorded Medieval paint on the walls and masonry of the church, and examined worked alabaster fragments which are included in the relevant appendices below.

All this evidence has added greatly to the story of the church, which has provided much to the local community and to those who were directly engaged in the project.

This project was sponsored by the National Lottery Heritage Fund, and as such, was also designed to be about engagement and training for people. All fieldwork was undertaken by volunteers under Mercian supervision. This enabled a large number of people to receive training in archaeological skills and techniques as well as learn more about the fantastic heritage of this wonderful church.

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8. Disclaimer

Geophysical techniques are not a map of the ground and are instead a direct measurement of subsurface properties. Detecting and mapping features requires that said features have properties that can be measured by the chosen technique(s) and that these properties have sufficient contrast with the background to be identifiable. The interpretation of any identified anomalies is always subjective. While the scrutiny of the results is undertaken by qualified, experienced individuals and rigorously checked for quality and consistency it is often not possible to classify all anomaly sources; while there will be degrees of certainty for others. Where possible an anomaly source will be identified along

with the certainty of the interpretation. The only way to improve the interpretation of results is through a process of comparing excavated results with the geophysical reports.

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9. Acknowledgements

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Llynda Baugh and Anne Heathcote,

All the wonderful volunteers who helped with the surveys, and project as a whole.

St Wilfrid's Church, Barrow-upon-Trent, the congregation and helpers.

Appendix I - Wall Paintings

David Budge.

A number of areas of medieval painted decoration were noted on surviving fragments of plaster and limewash in the interior of the church during the photogrammetric survey. These are highlighted here, though they were not recorded systematically. It is likely that detailed study of the walls would reveal further traces of painted decoration. While the surviving areas of paint are small and fragmentary, their study could allow some hints of the original decoration of the interior of the building to be determined.

Medieval wall painting

The medieval church was a highly decorated place and even the neatly faced stones of arcades and window surrounds were usually intended to be plastered or lime washed over and painted, even if only with a simple masonry pattern that to some extent may have mirrored the stones beneath (e.g. Rouse 2004, 35). The painting of the walls was regarded as a final stage in the completion of the works, not a separate operation to be applied at some later time (Caiger Smith 1963, 119); writers such as William of Malmesbury in c.1200, noted that a building was not considered complete until its walls 'glistened with colour' (Rosewell 2008, 154); Keyser noted that 'it may be stated here, without fear of contradiction, that there is not a single pre-reformation church in England which was not adorned with painted decorations' (Keyser 1883, xxxiv). When wall paintings were damaged by insertion of new architectural features, became obscured by grime and dirt, were 'unfashionable' or otherwise in need of replacement, the surfaces were usually simply lime washed or plastered over and a new scheme painted on this new surface (e.g. Tristram 1944, 2). That this practice was essentially ubiquitous is testified by the survivals of earlier painting beneath later in our churches (just a few examples that will be mentioned later include Lakenheath, Suffolk, with up to four superimposed schemes visible (LWPP) and Stoke Orchard, Gloucestershire, where at least five painted schemes were superimposed (Rouse and Baker 1966, 81)). A hint of the transience with which many wall paintings may have been regarded in the medieval period is also provided by archaeological evidence such as that from the Templar Preceptory at South Witham, Lincolnshire. Here the chapel was painted with a decorative scheme in the first quarter of the 13th century that had deteriorated and been whitewashed over by the end of the same century (Rouse 2002, 141); the Preceptory itself was demolished by the first quarter of the 14th century (Mayes 2002, 6).

In many churches the reformation of the mid 16th century lead to extensive defacing of images, including wall paintings, and their 'destruction' by whitewashing the walls (Rosewell 2008, 215); an act that often had the (unintended) effect of preserving the earlier painting (Babington et al 1999, 23). The same processes of dirt accumulation that had affected the medieval paintings, along with accidental damage, affected the post reformation white washes and probably resulted in similar, fairly regular, additional coats of limewash being applied. The wall paintings thus survived largely protected under these limewash and plaster layers (Tristram 1944, 2-3) until the 19th century. At this time learned architects and historians were developing views that held that painted decoration was not part of the original appearance of medieval buildings, and that wall painting was something added later, barbarously, polluting the original purity of the buildings. Rosewell highlights the roles of the Cambridge Camden Society and noted author on Gothic architecture G E Street in the development of these views (Rosewell 2008, 220). The entirely erroneous idea that exposed stone walls were 'the original scheme as conceived by the first builder' (Rosewell 2008, 220) lead to the fetish of Victorian and later restorers for 'stripping plaster (whether sound or not) from the walls "to show the

beautiful stonework" - which was never meant to be seen' (Rouse 1991, 9): this practice has been variously described as 'most reprehensible and unreasonable' (Keyser 1883 xxxiv); 'perverted' (Tristram 1944, 71) and 'wicked and senseless' (Rouse 2004, 9).

The opposite, the whitewashing of medieval decoration rather than the complete destruction of it by stripping, was sometimes also (though sadly much less often) the case. Wyatt's late 18th century monochrome limewashed interior of Salisbury Cathedral was commended by Dodsworth as 'a true representation of the original appearance' (Dodsworth 1814 in Horlbeck 1960, 116).

Architect George Gilbert Scott was one who contested these views and, writing in 1881, called upon his readers to 'imagine a handsome apartment, say in Grosvenor Square "restored" upon the principle of a spurious truthfulness - its painted decorations, its enriched plaster work all removed; and the naked, honest brickwork carefully pointed in coloured mortar: - after the application of such a process, it would not, I think, be fair to judge of the intention of the architect who had designed the room, from the appearance which it might then present' (Scott 1881, 100-1). His comment, that the wilful destruction of the medieval plaster and painted decoration during restorations of churches 'serves to illustrate the barbarism, not of the eleventh century, but of the nineteenth' (Scott 1881, 101), requires no elaboration.

The widespread stripping of plaster and limewash in the restorations that most churches were subjected to in the 19th century thus occasionally revealed, but more often destroyed, the medieval wall paintings that had survived to that time.

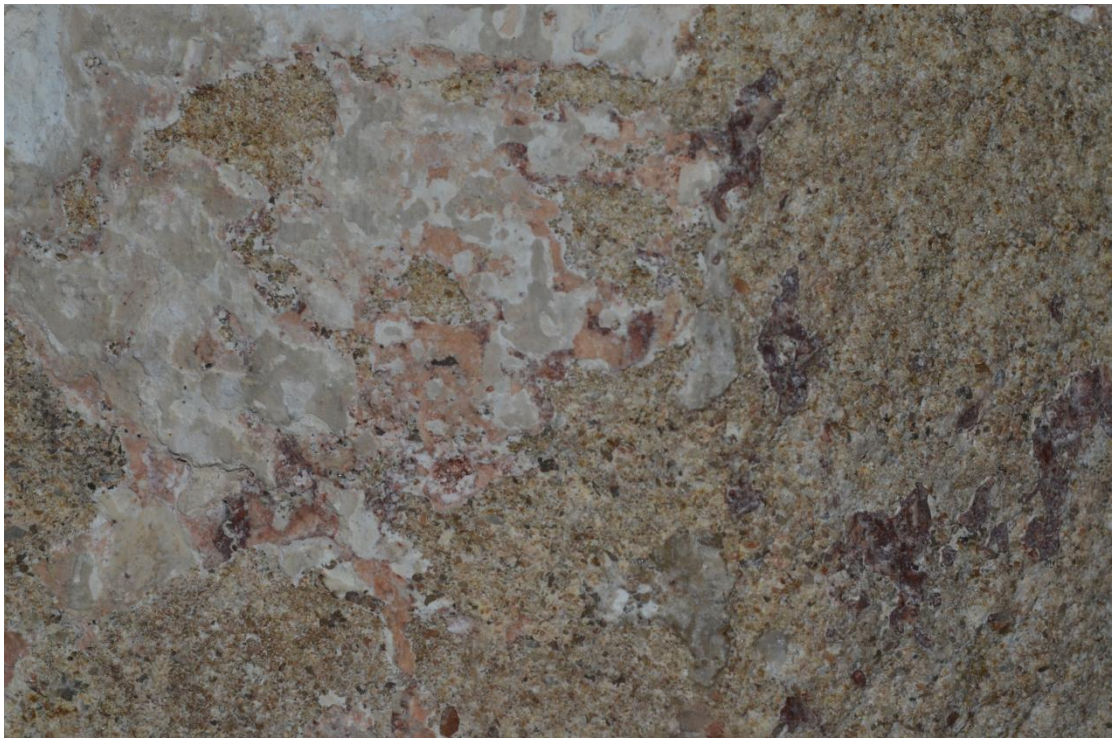
The wall paintings:

St Wilfrid's interior today presents the typical appearance of an English parish church, with the exposed stonework so beloved of Victorian 'restorers'. However, a closer look at the surface of the stonework, even the neatly shaped masonry in the south aisle, indicates that it was once limewashed or plastered over and painted. The presence and location of surviving traces of medieval painting in a church often depends on the zeal of the architect (or their workmen) in stripping off the original layers of plaster. Thus, as fine ashlar was more pleasing to the eye than rubble walling, ashlar is often heavily stripped and scrubbed of all traces of plaster and paint, while rubble walling may be less comprehensively stripped and more traces of painting may survive. The underside of mouldings may receive less attention, and the zeal for removing all traces of limewash on piers and columns often faded towards the ground and on the base. However, the places that are most likely to escape the full attention of the plaster stripper are also the places where the original decoration was least focussed – the lower sections of piers and walls, for instance, were prone to damp and damage from abrasion and knocks from the users of the church moving around the building, so were often only given very simple decoration or a colour wash that gives little clue about what was usually richer and more complex decoration higher up.

Traces of painting are conspicuous in St Wilfrid;s on the south wall of the south aisle, the lower parts of the piers of the south arcade, the original splay of the squint in the south arcade; and the north door of the chancel. Further traces could likely be discovered with a more systematic survey, though the upper parts of the arcade, capitals and arches, and much of the generally good quality masonry in the building, have suffered rather comprehensive stripping. Unfortunately the renewal of the majority of the stonework of the north arcade and the hacking off of the hood mould of the arches meant that no traces of the original decoration of the north arcade could be seen.

The painting appears to have been applied on a base coat of thin plaster or limewash

in all cases. Two paint colours survive. The main colour, present in all painted areas, is a typical dark red. This was probably produced using red ochre, which occurs locally, the writer having found pieces in the fields at Ingleby on the south side of the Trent, for instance. A golden yellow also occurs, though this is only present in a few areas. In many places the original painting can be seen to be covered with multiple layers of whitewash, some of them with accumulated dirt (soot from candles and general grime) suggesting that those layers were exposed for some time, before themselves being limewashed over (see images overleaf).



Traces of red and pink paint partially surviving on the SE face of the western pier of the south arcade. The paint can be seen to be overlain by one or two coats of limewash with dirty (grey) surfaces.

Traces of red and yellow paint in the eastern splay of the squint in the south aisle showing overlying limewash layer with dirty surface.

The paint in specific areas is now described:

South Aisle:

South Arcade:

The south arcade is of three bays. The two octagonal piers have substantial (given the degree of stripping) traces of paint on their lower sections. On the north side of the eastern pier an expanse of red paint is visible (see below). This appears to be on the lowest coat of plaster or limewash and can thus be considered likely to represent the first (original) decorative scheme of the arcade. When so heavily stripped it can be difficult to determine if areas of paint such as this were originally areas of solid colour or part of a design with heavy use of red paint.

Traces of red paint on the eastern side of the eastern pier of the south arcade. Photo looking west.

Traces of red paint on the SE side of the base of the eastern pier of the south arcade. Photo looking north west.

The eastern and south eastern faces of the western pier also show traces of red and pink paint; they occur in proximity and appear to be applied to the same layer indicating a two tone design.

Traces of pink and red paint surviving on the heavily stripped SE and E faces of the western pier of the south arcade. Photo looking north west. See below for detail.

Closer view of traces of pink and red paint on the SE and E faces of the western pier of the south arcade. Photo looking north west.

South wall:

Fragmentary traces of paint include a yellowish wash and possible red paint in several locations, though no overall pattern to the decoration could be discerned. A trace of yellow paint beneath the central window of the aisle (see below) appears to be applied on a skim of plaster overlying the earliest layer of plaster, so may represent part of a second scheme of decoration.

Trace of yellow paint on the south wall of the south aisle, just below the sill of the central window, to the west of the tomb recess. The decoration appears to include an area of golden yellow paint (the present shape is the result of the stripping) with traces of darker painting, possibly a dark red or a discoloured pigment that was originally another colour. It is partially obscured by at least one coat of limewash with dirty surface, and appears to be applied on a layer of plaster that overlies the first coat on the masonry. Photo looking south

Tomb recess:

A tomb recess in the south wall contains a high quality mid-14th century alabaster figure of a priest with traces of paint, reported on elsewhere. The mouldings of the arch of the tomb recess also retain traces of paint, with areas of golden yellow and patches of red paint. These are mostly covered by later limewash and more evidence of the decorative scheme will survive under the later limewash. The golden yellow decoration is applied to a layer of limewash that can be seen to overly at least one, and possibly two, earlier coats of limewash. With the exception of a single fragment of possible red paint on the later of these layers no decoration can be seen, suggesting a sparser pattern may have been employed in the earlier decoration of the recess, or colours that have not survived were employed.

Yellow paint on the moulding on the eastern side of the tomb recess in the south wall of the south aisle. Photo looking south east.

Squint to chancel at eastern end of north wall:

The squint shows evidence for modification: the western splay has been very crudely hacked back. The eastern side is, however, made in the same high quality ashlar as the rest of the walling of this aisle. This could suggest that the sight lines of the squint as originally constructed were found to be insufficient for later use of the aisle, and it was desirable for the high altar in the chancel to be visible from more of the aisle.

Both the decent ashlar of the eastern splay and the hacked off masonry of the western splay preserve traces of painting, as does the tomb recess below the squint. It is the crudeness of the original hacking of the western splay that has preserved such a large area of paint; it is likely that restorers found it to be too much work to strip plaster from the undulating surface. The unevenness and consequent variable stripping does, however, make determining the pattern of the paint difficult.

The eastern splay has what may be an overall wash of yellowish brown with a series of dark red vertical lines of different thickness, with three horizontal lines above (see below). The overall pattern is somewhat masked by some areas having been stripped away and others retaining thin coverings of later limewash.

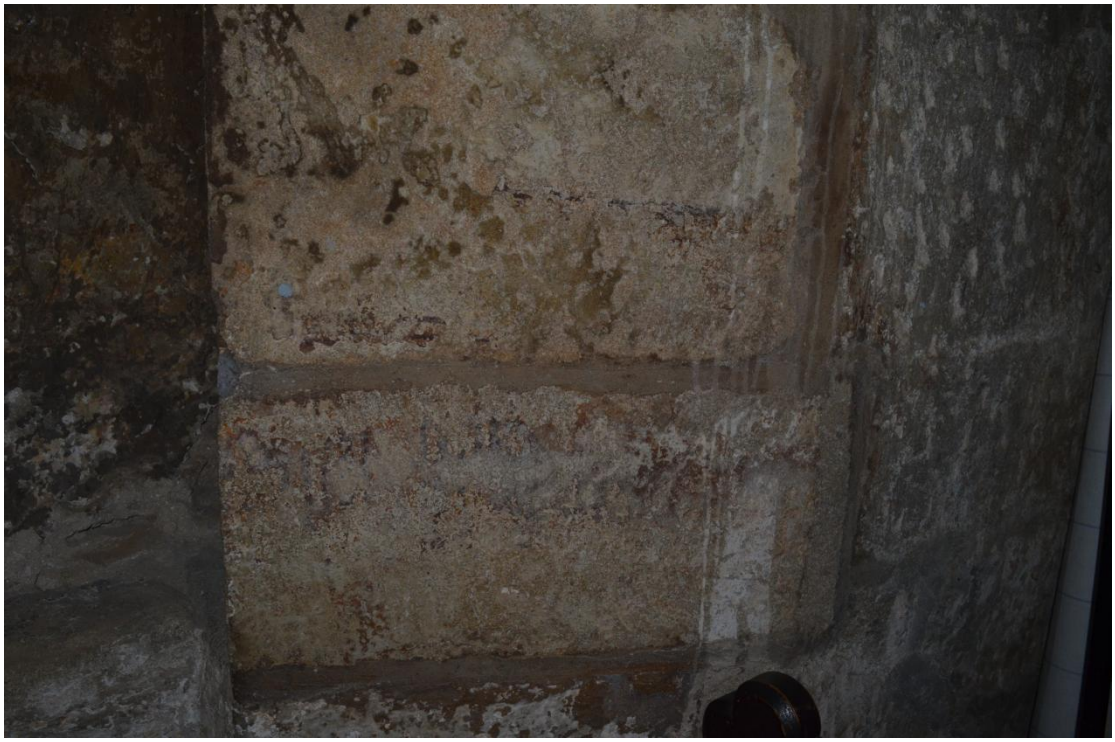
The western splay has a similar yellowish wash and traces of red paint. No overall pattern can be discerned, likely due to the very incomplete stripping owing to the undulating surface, resulting in only partial exposure of the original paint.

The tomb recess below has areas of similar yellow paint, though the plaster is somewhat water damaged.

This area would be a prime candidate for remote sensing to see what, if any, traces of paint survive beneath the later coats of limewash.

Traces of yellow and red paint on the hacked off masonry of the western side of the squint in the south side of the eastern respond of the south arcade.

Traces of mainly yellow paint on masonry of the south face of the eastern respond of the south arcade, between the tomb recess (below) and squint (above). Photo looking north



Traces of paint on the eastern splay of the squint in the south aisle, showing general location of the traces of paint shown in close up in the next two plates. Photo looking north east.

Decoration on the eastern splay of the squint in the south aisle showing yellow ground with parallel horizontal red lines. For decoration on the stone beneath, see below. Photo looking north east.

Decoration on the eastern splay of the squint in the south aisle, showing yellow ground with broadly parallel curving vertical red lines, partially obscured by limewash with dirty surface. This stone located immediately beneath that with the horizontal lines above. Photo looking north east.

Chancel:

Paint is visible on the west wall of the chancel, around the chancel arch. On the south side are two traces of red paint (see below), possibly floral or figurative. A further area of colour that may be paint is present on the north side of the arch.

Internally, the north door has a round-headed arch with a simple chamfer. An area of solid red paint survives on the chamfer. to the west of the apex, with other more fragmentary traces elsewhere on the chamfer. Plaster survives on the stonework around the door and so there is the possibility that further painting could survive in this location.

Traces of paint over the south side of the chancel arch, looking west from the chancel.

Trace of red paint in the chancel, on the chamfer of the western side of the arch over the north door.

Fragmentary trace of red paint on the chamfer on the eastern side of the arch over the north door.

Discussion:

Painting survives in several places in the church of St Wilfrid, most notably in the south aisle. In some cases (e.g. the south arcade) the visible paint appears to represent the original scheme of decoration; in other locations it may be (western splay of squint from south aisle to chancel) or definitely is (tomb recess containing alabaster effigy of priest) from a later phase of decoration. There is potential to discover more about the decorative schemes employed in the church in those areas where painting still survives under later coats of limewash and should the opportunity arise, further investigation of these areas should be undertaken. These should be done using remote sensing techniques or under professional supervision – no attempt to physically remove plaster or limewash should be attempted as damage or destruction of evidence may result.

It is not possible to reconstruct the decorative schemes based on the limited evidence recovered here. However, it can be said that the original decoration of the arcade of the south aisle included heavy use of red paint on parts of the piers in its original phase. A wide range of motifs could be employed in the decoration of arcades at this time, from geometric designs such as chevrons (see below), to the extremely common painting of mock ashlar (even on top of genuine high quality ashlar!); motifs based on plants (particularly the vine), through to figures of saints etc on solid coloured backgrounds.

It can also be said that the decoration of the interior of the south aisle at some point included a rich mixture of golden yellows and reds. The yellow colour was not noted anywhere else in the church, though the survival of paint elsewhere was limited, It is therefore not clear if the decoration of the south aisle was different to that of the rest of the church. The two tomb recesses suggest it may have had a sepulchral function and may have been linked to a wealthy patron. However, little more can be said at present.

It may be worth following up on the decoration of the church should the opportunity present itself as the application of scientific techniques may reveal more about the decoration. The decoration of the church may take on special significance with the recent association of the church with the Hospitallers.

Western bays of the arcade at St Agatha, Easby, Yorkshire, with red painted chevron decoration, looking south Direct flash.

Appendix II - Grave Slabs

David Budge.

During the project the client requested that two fragments of worked alabaster be examined. This material had been found inside the church by workmen when the pews were removed and the new floor installed as part of the HLF project (Anne Heathcote pers comm. 2023). They have not previously been reported on. Both are parts of alabaster memorial slabs. They are most likely to have been part of floor slabs or chest tombs.

One of the fragments includes part of the figure of a knight in armour and is part of a fairly typical military memorial of approximately late 15th to early 16th century date. The other fragment has part of an inscription, surviving as two lines of blackletter text. Unfortunately there is not enough of the text surviving to allow it to be deciphered. It is of late medieval to early post medieval date. It comes from a slab or tomb of less standard layout than the first.

The objects were examined by eye and recorded using Structure from Motion Photogrammetry, with the methodology as described for the survey of the church.

1 – Fragment of greyish white alabaster (appears bright white in areas of modern damage) with no signs of iron oxide impurities. It is incised with part of the figure of a knight in armour. (Plate 01, Fig 01) The piece has maximum dimensions of approximately 0.24 m x 0.25 m and is a maximum of 0.096 m thick (?c. 3 feet). The surviving surface has maximum dimensions of 200 mm x 208 mm. The incised design includes a semi-circular area ornamented with alternating interlocking crescents and various lines around. The surviving original surface is not perfectly flat and is perhaps a little worn, with the carving 'blurred' over the chain mail. The edges of some of the incised lines are also quite ragged. No original edges of the slab remain. There is a large hemispherical blob of soft grey mortar on the surface obscuring part of the design. Mud is retained in most of the incised lines and as a result it is not possible to see if any original colouring material survives (please note - the slab should NOT be washed or cleaned in any other way without first consulting a professional conservator, as traces of original pigments or colourants that may survive beneath or within the dirt could easily be destroyed by careless treatment).

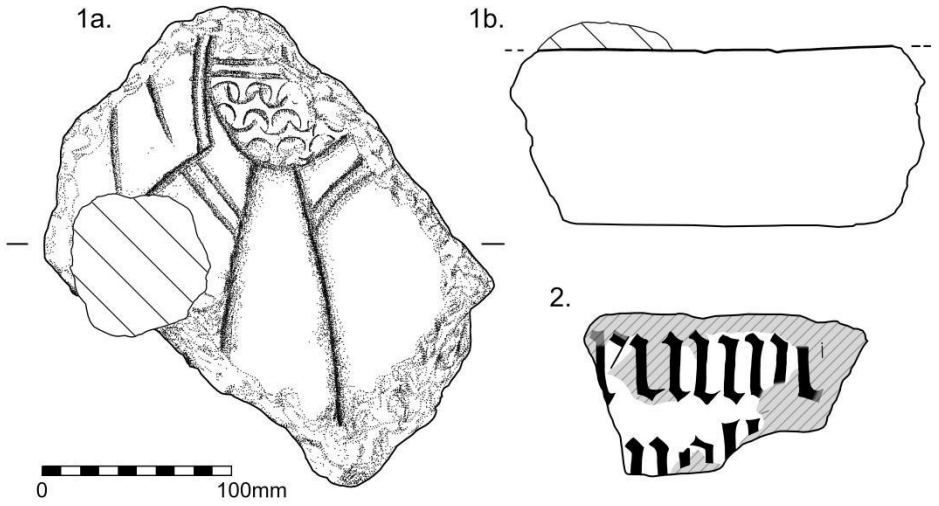


Figure 01 – fragments of incised alabaster slabs; 1a with figure of armoured knight and section (1b); 2 with two lines of blackletter inscription. Wide hatching in 1a and b is mortar; greyed out hatching in 2 represents areas of surface damage of the stone.

Scale: half actual size (when printed at A4 with no scaling).

Plate 01 – fragment of tomb slab with incised design. Tape measure divisions = mm

2 – Fragment of friable white alabaster with two lines of blackletter text incised in the surface, one above the other (Figure 01:2). The fragment is a maximum of 0.17 m x 0.09 m in size, with a thickness of about 0.042 m. The surviving face has maximum dimensions of approximately 130 x 79 mm. There is old damage to the surface, particularly near the edges, as well as some fresh damage exposing the very white stone, likely resulting from when it was discovered. The decoration comprises a fragment of an incised inscription, of which two lines of text are partially visible. There are traces of a dark substance surviving at the edge of some of the cuts of the letters. This is likely to be remnants of the original colourant inlaid into the slab to pick out the lettering. No analysis of this material was undertaken, but the dark colour suggests it could be pitch, which was commonly used to pick out linework and lettering on alabaster slabs.

The partial inscription is on two lines. The top line includes the letter 'X' followed by seven minims. A mark on the surface of the stone to the right of the last of these suggests the presence of another character, though the stone is too damaged here to determine its form. The spacing of the minims is irregular; the foot strokes of the first and third are slightly longer and more pointed than the rest. The sixth minim is different in that it does not seem to be parallel to the other minims. In addition, while its foot is missing and the slab is damaged in this location, there is no evidence to the immediate right to suggest that its foot turned right like all the other minims. There are uncertain traces in the area beneath this minim that may be damage, or could suggest a descender in this location.

The second row of text includes the upper parts of the characters only. These include two minims followed by the letter 'd' and two ascenders. The first of these seems likely to be an 'l'; the headstroke of the second is different and narrower. This may indicate it belongs to a different character, such as 'h', 't' or 'b' (there is probably not space for the first character to have additional parts).

Plate 02 – fragment of slab with blackletter inscription. Tape measure divisions = mm

Interpretation and dating:

The fragments are both part of alabaster tomb slabs. As they are of different thickness it is likely that they are parts of two separate slabs.

The first fragment has a motif of interlocking 'C' shapes. This was a common artistic technique for depicting chain mail. Under the plate armour of the time chain mail was generally only visible at the neck, groin, and sometimes armpits. The shape of the chain mail and symmetrical disposition of the lines around it suggests it belongs to the middle part of the figure. Assuming this is correct, the chain mail is therefore part of the mail skirt protruding below the breastplate; the lines beneath are parts of the cuisses (thigh armour) and the angular lines left of the chain mail represent part of the right tasset (the left was on the missing part of the slab).

The figure cannot be directly paralleled, but the semi-circular form of the skirt of mail occurs on, for example, a slab of c.1530 to Robert Vyncent in Rothley church in Leicestershire (Figure 02), and on one to Thomas Hesylryge at Noseley chapel, Leicestershire. The angular concave form of the edges of the tasset are also quite closely paralleled on the 1467 slab to Hesylryge (Greenhill 1958, Pl XIIIa),

The fragment under consideration comes from a slab that must once have commemorated a late 15th to early 16th century knight (and possibly his wife or wives) who was buried at Barrow. It is not possible to suggest whether the slab came from a chest tomb or was set in the floor. It is tempting to associate this fragment with one of the slabs to the Bothe family recorded as having been present in the north aisle and chancel until the 19th century. Of around the right period was one with the image of a man in armour with inscription identifying him as John Bothe of Arleston who died in 1484 (Cox 1879, 22). He had two sons, William and Ralph, the former who died in 1521 and had a marble and brass memorial in the north aisle, the latter who died in 1510 and had a 'stone' memorial, presumably alabaster. A 'little raised tomb of Alibaster' of a man and woman had an inscription to another John Bothe, who died in 1531 (Cox 1879, 23). The Bothe family were lords of the manor of Sinfin and Arlestone, which (together with Stenson) were townships within Barrow on Trent parish (Cox 1879, 15); the eastern end of the north aisle of St Wilfrid;s pertained to the manors of Arlestone and Sinfin and contained monuments to at least six generations of Bothes (Cox 1879, 22). The John who deceased in 1531 was the last Bothe of the parish as their manors passed to the Blount family at this time (Cox 1879, 23). While assigning this fragment to one of these documented monuments is tempting, it should be remembered that other monuments might have existed elsewhere within the church that may have been removed prior to antiquarian interest in such things. There are, for example, two tomb recesses in the south aisle but only one surviving effigy, and a range of medieval grave slabs built into the fabric of the chancel. This fragment could easily be from an unrecorded monument formerly in the church, destroyed prior to the antiquarian visits in the second half of the 17th and early 18th centuries that recorded the Bothe monuments. However, the Bothe family monuments are broadly contemporary with the fragment. Additionally, the finding if this piece when the floor was taken up suggests deposition

in a relatively recent stratigraphic position. It is known that most of the Bothe monuments were destroyed by the early 19th century for making mortar and repairing the roads of the parish (Cox 1879, 24), perhaps an ideal time for part of one of the monuments to be deposited under the floor.

The inscription on the other fragment defies translation by the present writer. This is a result of the fragmentary preservation of the surviving piece, the partial text, and the nature of blackletter script. It is clear that the inscription is only part of a longer one. There may have been further lines above and below the two lines partially preserved, and there were an unknown number of letters or words before and after the surviving section of text. The upper line of text (as surviving) is almost entirely minims. The minim was the basic stroke for many of the letters of the alphabet in blackletter. Specifically, 'i', 'n', 'm' and 'u' were made up entirely of minims (the only difference being the number of minims to each character, except 'u' and 'n', which had the same number), while letters such as 'c', 'e' and 'r' differed only in the form of the headstrokes applied to the minims; these differences were sometimes quite subtle. A damaged letter 'y' could also appear similar to two minims. In the partial inscription under consideration it is unclear what combination of 'i' 'n' 'm' and / or 'u''s are intended by the minims present, though the angle and lack of footstroke make it possible that the fifth and sixth could be part of a 'y'. The loss of the upper part of the inscription, where superscript characters such as contraction marks would have been placed had they existed, complicates things further: it is unclear whether the surviving characters are part of a single word or more than one. However, the presence of the apparent 'X' (the letter 'R' can appear similar to 'X', but there does not seem to be any evidence for the leg of an R in the present case, and the surface of the stone appears well preserved where one would be) may narrow things down.

To the writer's knowledge there are no Latin words that have 'n' or 'm' following 'x'. If the text is in Latin then it is likely that the first minim is an 'i'. Searches of online Latin dictionaries indicate that eximius, proximus and maximus all contain an 'x' followed by characters that could be made up entirely of minims. If the characters in the upper line of the inscription are all from a single word then eximius or eximium is perhaps the closest word to the number of minims present; however, a curved 's' rather than a straight 's' would be expected at the end of a word and, while damaged, the stroke present in this location for proximus and maximus could be a straight 's' but not a curved one. Additionally, the reading of the last but one character as a possible 'y' makes a Latin match difficult.

The second line of text has either 'i's, 'm' 'n' or 'u' followed by 'd'; the tall characters are most likely to be 'l's, though the second could be an 'h' 't' or 'b' as these all have similar upper sections and the rest of the character is missing. There are no Latin words known to the writer that contain these characters in this order.

At the least this indicates that the inscription from which this fragment came did not follow the standard Latin memorial formula of 'here lies [name] and [wife's name / s] wife of [name] who died [date]' with some form of prayer for the souls of the dead. This is also suggested by the use of two lines for the inscription, which is less common than a single line of text running around the outside of the slab. The difficultly of finding Latin words to match the characters present may suggest that the inscription is in English. In the late medieval period English was increasingly used on memorial slabs, with the will of Bartholomew Kyngston written in full in English on a slab at Rothley, Leicestershire, and for an inscription on an otherwise Latin slab to Ralph Wodford of c.1485 at Ashby Folville, Leicestershire, to cite two fairly local examples. Both feature multiple lines of text like the present example. Within St Wilfrid's itself, Cox recorded an English inscription dated 1446 to Henry Bothe (Cox 1879, 22). There are too many possible English words with the various combinations

of possible letters for any attempt at an English reading to be attempted. It does not fit any of the inscriptions recorded in the church in the 17th and 18th centuries reported by Cox.

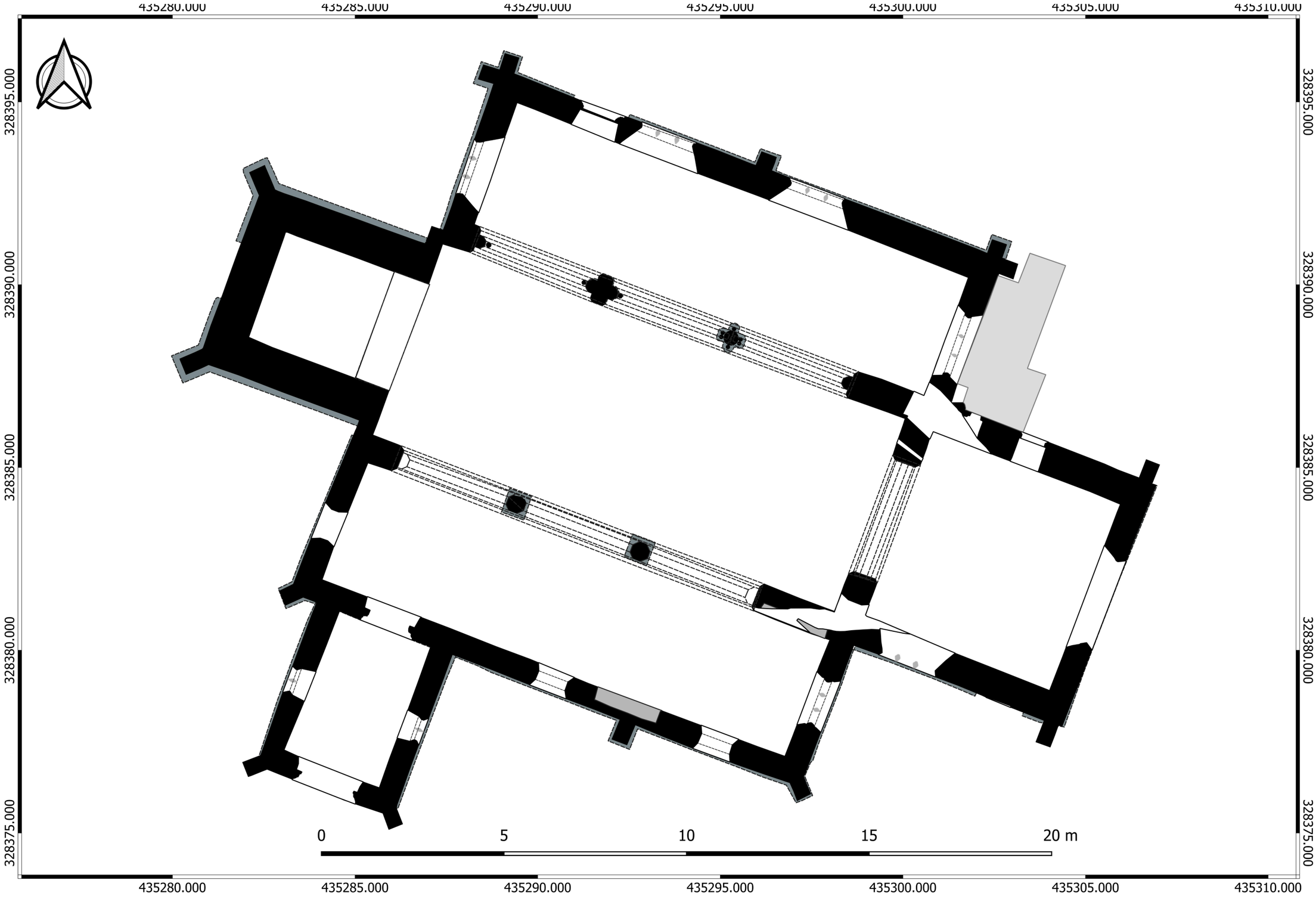
Blackletter script was used on monuments from around 1360 to about 1580 (Greenhill 1958, 5). This start date is also around the time that alabaster monuments became widespread (Greenhill 1958, 6). The very white and pure material from which this slab was manufactured might indicate it belongs to the earlier part of this date range: by the 16th century the local quarries were producing alabaster increasingly streaked and discoloured with iron oxide (Greenhill 1958, 6). There does not appear to be any published data on the thickness of alabaster slabs, but compared to the fragment with the knight this piece is very thin. This might suggest it is part of the vertical sections of a tomb chest, for example, rather than being part of a horizontal slab.

In the 19th century the Rev. Cox quoted antiquarian descriptions of a series of 'fine' alabaster slabs, both floor and chest tomb types, and some brasses, to the Bothe family. These were located in the north aisle where there was also heraldic glass in the windows. The alabaster slabs had dates ranging from the 15th to early 16th century (Cox 1879, 22 – 24). These slabs had mostly been obliterated by the early 19th century, reportedly having been 'destroyed, either by pounding them into mortar, or casting them aside in portions to repair the parish roads' (Cox 1879, 24). It is possible that this fragment may have been part of one of the monuments to the Bothe family. However, it could have come from another, unrecorded, monument in the church and one should not be too quick to link documentary evidence with archaeological finds where the archaeological evidence is ambiguous.

Figure 02 – alabaster lab to Robert Vyncent and wives at Rothley, Leicestershire

Plans and elevations

Archaeological Survey at St Wilfrid's Church,
Barrow Upon Trent



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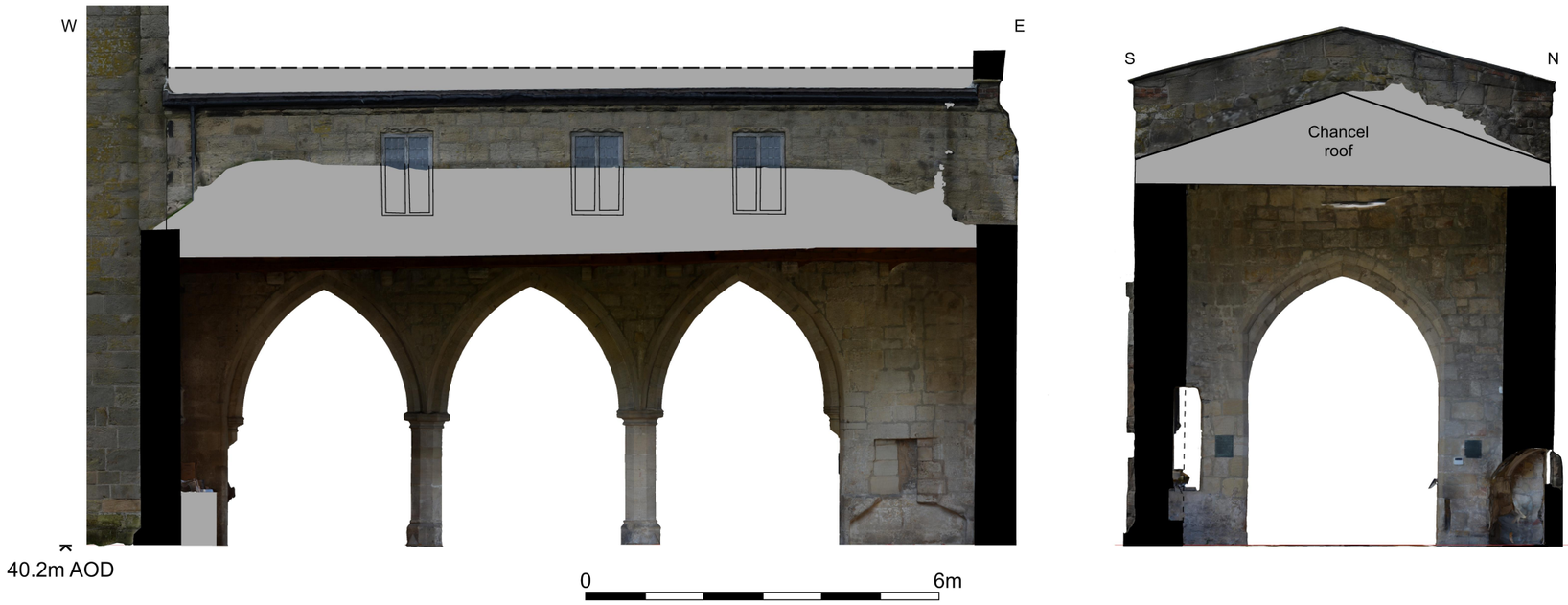
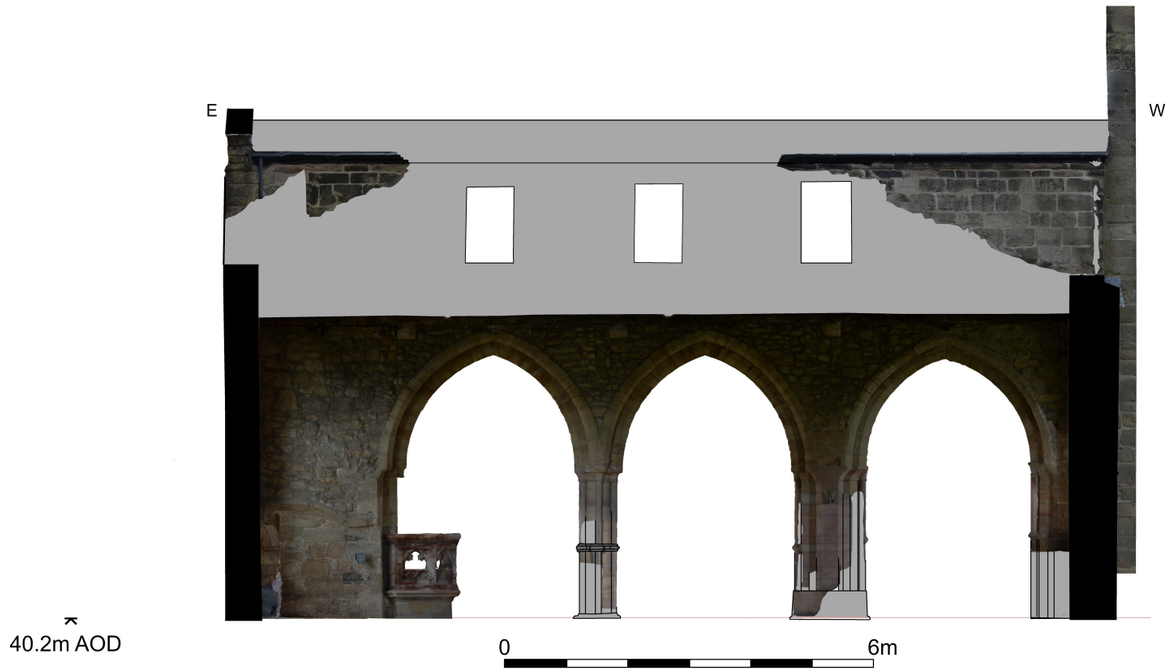


External elevations of nave. L, south face of south nave wall looking north. R, east face of east wall looking west.



Elevation of north face of north wall of the nave looking south. Most of the upper part of the wall is invisible from ground level due to the steeply pitched roof of the north aisle.

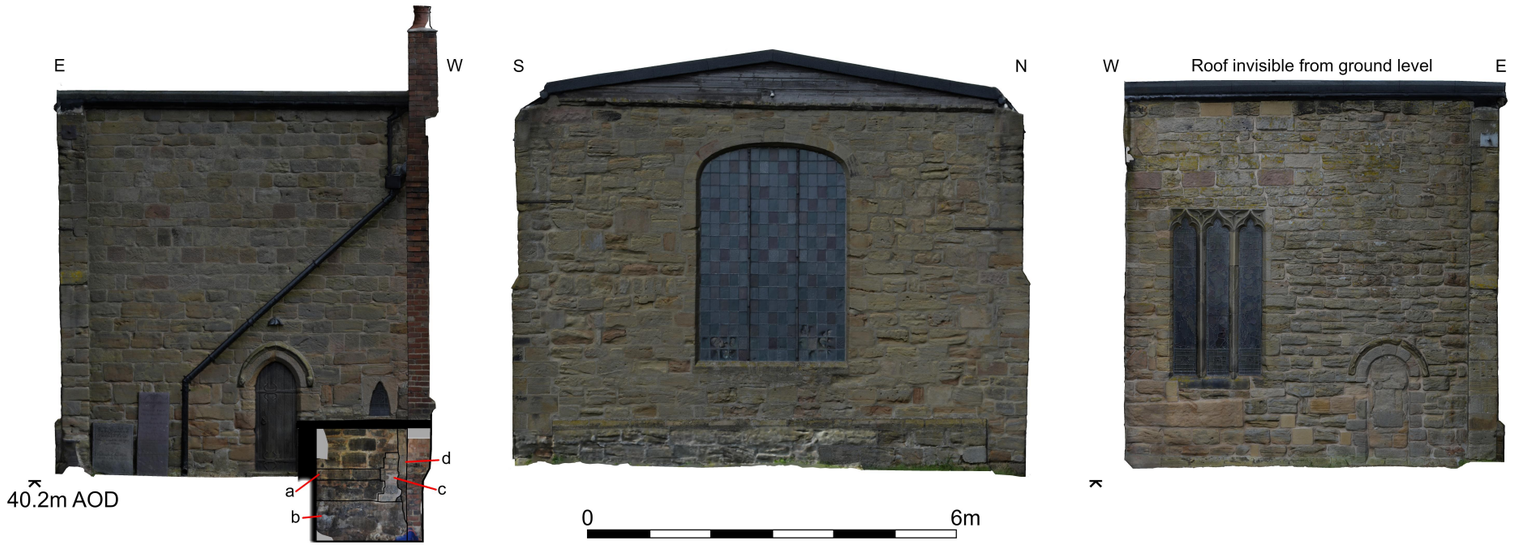
Internal elevations of nave. L:south face of north nave wall, looking north; R: north face of south nave wall, looking south.

External elevations of south aisle. L-R: west face of west wall looking east; south face of south wall looking north; east face of east wall looking west.

Internal elevations of south aisle. L-R: west face of east wall looking east, showing squint cutting through the adjacent nave wall; north face of south wall looking south; and east face of west wall looking west.

Exterior elevations of north aisle. L-R: East face of east wall looking west, with boiler room below; north face of north wall looking south; and west face of west wall looking east.

Interior elevations of north aisle, West face of east wall looking east; south face of north wall looking north; and east face of west wall looking west.



Elevations of the chancel exterior. Within the boiler house on the north wall of the chancel the following have been highlighted as they have not previously been discussed: (a) chamfered plinth; (b) stepped out rubble foundation; (c) scar indicating location of blocked opening, presumably for heating pipes; (d) foundation of N wall of passageway from N aisle to chancel

Exterior elevations of tower. L-R: east face of east wall looking west; south face of south wall looking north; north face of north wall looking south, and west face of west wall looking east.