ST MARY MAGDALENE, STOCKLAND BRISTOL

CONDITION REPORT
Selected Masonry, Windows and Tower Parapet
St Mary Magdalene Church, Stockland Bristol TA5 2PZ

Client: PCC of St Mary Magdalene Church, Stockland Bristol
Job No. 3401
August 2024

SALLY STRACHEY HISTORIC CONSERVATION

Revision

Date	Revision	Comments
10/10/24	1	Draft for comment

Quality Assurance Review

Prepared by: Jemma Routledge

Signature *J. Routledge*

Reviewed by: Sally Strachey ACR

Signature 

Date: 10th October 2024

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1.0 Executive Summary

The survey of selected areas of masonry, windows and the tower parapet confirms the extreme issues with structural movement within the building. This is evidenced in the opening-up of joints, and displacement and fracturing of stone generally across the building, with the most pronounced effects seen on the south and east elevations and to the tower. The damage caused by ongoing water ingress and corresponding swelling and contracting of the blue lias is outlined in the Mann Williams 2020 structural report. In addition to this, other causes of structural movement may be considered, such as historic settlement, the underlying unstable ground conditions of the church, and the design of the building, including the apparent absence of fixings and ties to the stonework of the windows and doors.

2.0 Brief

SSHC were commissioned by the PCC and architect of St Mary Magdalene Church, Stockland Bristol to undertake a condition survey of selected areas of masonry, including the windows and tower parapet, and to take mortar samples for analysis; the areas identified for inclusion in the survey are highlighted in Appendix 1. The building has significant visible signs of movement, with notable open joints and displacement of stones around the windows and doors, gables, copings and the tower parapet. Following the 2024 Quinquennial Inspection by Marcus Chantrey, a condition survey was instructed to gain further insight into the possible causes of movement prior to specifying major repairs to the building. A structural survey was carried out by John Mann in 2020 and this report was provided for reference.

The survey was carried out by Darek Malecki and Jemma Routledge of SSHC on 20th August 2024. They were met at the church by John McVerry, Marcus Chantrey and John Mann. The survey was carried out at ground level and using an aluminium tower scaffold to gain access to the heads of selected windows on the external south wall of the nave. The inside face of the tower parapet was also inspected from the tower roof. In addition to a visual and photographic survey of the tomb in its setting, a cover meter survey was carried out with a Elcometer 331 cover meter to identify the presence of metal. The weather during the survey was sunny with intermittent cloud cover.

This report does not include the tower masonry or windows and should be read in conjunction with the SSH Conservation September 2024 Rope Access Condition and Recommendation Report to the tower stonework.

3.0 Description

LOCATION
St Mary Magdalene Church is located in the village of Stockland Bristol, north west of Bridgwater in Somerset.

Figure 1 St Mary Magdalene Church. Photo: geograph.org.uk

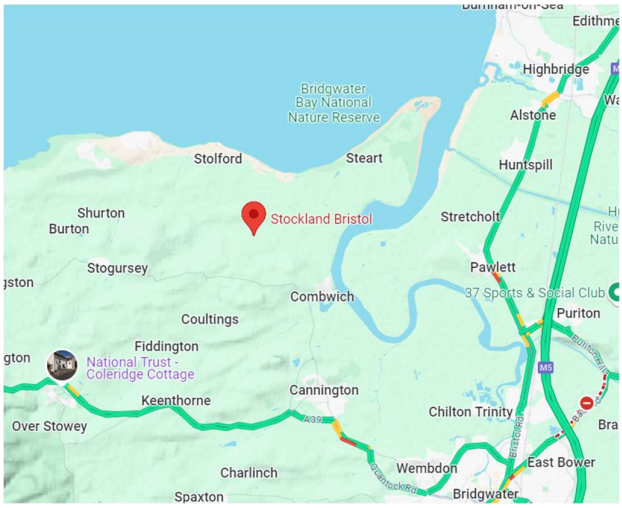

Figure 2 Location of Stockland Bristol. From Google Maps.

DATE
1865

LISTING STATUS
Heritage Category: Listed Building Grade: II List Entry Number: 1059049 Date first listed: 24 June 1985 List Entry Name: CHURCH OF ST MARY MAGDALENE, STOCKLAND BRISTOL Listing description: Parish church. 1865 from documents; on the site of an earlier parish church; for Daniel family of Stockland Manor (qv); by Arthur of Plymouth. Coursed and squared blue lias rubble, Bath Stone dressings, tile roofs with bracketted eaves, copings with cruciform finials. Decorated style with much buttressing; nave with a

north aisle and South porch, West tower, chancel with a heated north vestry and a South chapel. Three stage tower, diagonal buttresses to first and second stages, parapet pierced with quatrefoils, stair turret, 2-light bell chamber openings with louvres 3-light West window, West door, carved heads stops. Three bay nave, 2-light windows; single bay chancel, 2-light window and a lancet, 3-light West window; 3-light South window to short South chapel. Plain interior, plastered walls, tile floors wagon roofs to nave and chancel, that to nave unceiled; scissor braced roof to north aisle. Arcade on octagonal piers. Both the octagonal font and the chancel screen are C15, reused from the earlier church; the latter restored and installed by F Bligh Bond c1920 as a memorial to the fallen of the Great War. Remainder of fittings of 1865; notable the stone pulpit with 10 detached Purbeck shafts, similarly the reredos. Much C19 stained glass, that to chancel by Clayton and Bell. Two resited C17 tablets to South chapel, 2 C19 tablets. Bells of 1865. Well balanced and precise copy of a Decorated building. Thomas Daniel was the rector. (Pevsner, Buildings of England South and West Somerset, 1958).

The church is currently on the Heritage at Risk Register.

MATERIALS

Blue lias with Bath stone dressings

4.0 History and Significance

The church was built in 1865-67 on the site of an earlier church. The former church, dedicated to *All Saints* in 1316, in the 19th century comprised a chancel, a nave with south transept, south porch, and north aisle, and a west tower[1]. The 'new' church was built and paid for by Thomas Daniel of Stoodleigh, lay rector and owner of Stockland Bristol Manor. According to Pevsner, the church was designed by Mr Arthur of Plymouth.

5.0 External Environment

The church is located in an open and exposed position approximately a mile from the Bristol Channel, with Hinkley Point to the north west and Steart Marshes to the north east. The persistence of the wind blowing across to the church from the north was perceptible during the survey. The saline air will have a significant effect on the stonework of the church, with sodium chloride being the main constituent and the most damaging salt in terms of stone decay. Repeated wetting and drying cycles facilitate salt crystallisation, both on the surface of the stone and at pore level, resulting in powdering of the stone surface and potentially large-scale fragmentation.

The underlying geology of the churchyard is *Langport Member, Blue Lias Formation and Charmouth Mudstone Formation*[2]. This suggests that the location may be prone to waterlogging, ground movement and subsidence. The church is approximately 17 metres above sea level and lies just south of the high-risk flood plain running south from the Bristol Channel and west from the River Parrett.

The churchyard is raised and has a retaining wall running around its perimeter. There are a number of mature trees on the northern and western edges of the churchyard which offer some shelter from the prevailing wind but leave the upper stages of the tower exposed. The small sycamore in fairly close proximity to the east end of the chancel is potentially causing some ground disturbance to memorials in this location.

The generally damp, low-lying nature of this location must be a consideration for further investigations into ground conditions and the effect on the structure and surface condition of the masonry of the church.

[1] https://www.british-history.ac.uk/vch/som/vol6/pp129-131
[2] British Geological Survey https://www.bgs.ac.uk/map-viewers/bgs-geology-viewer/

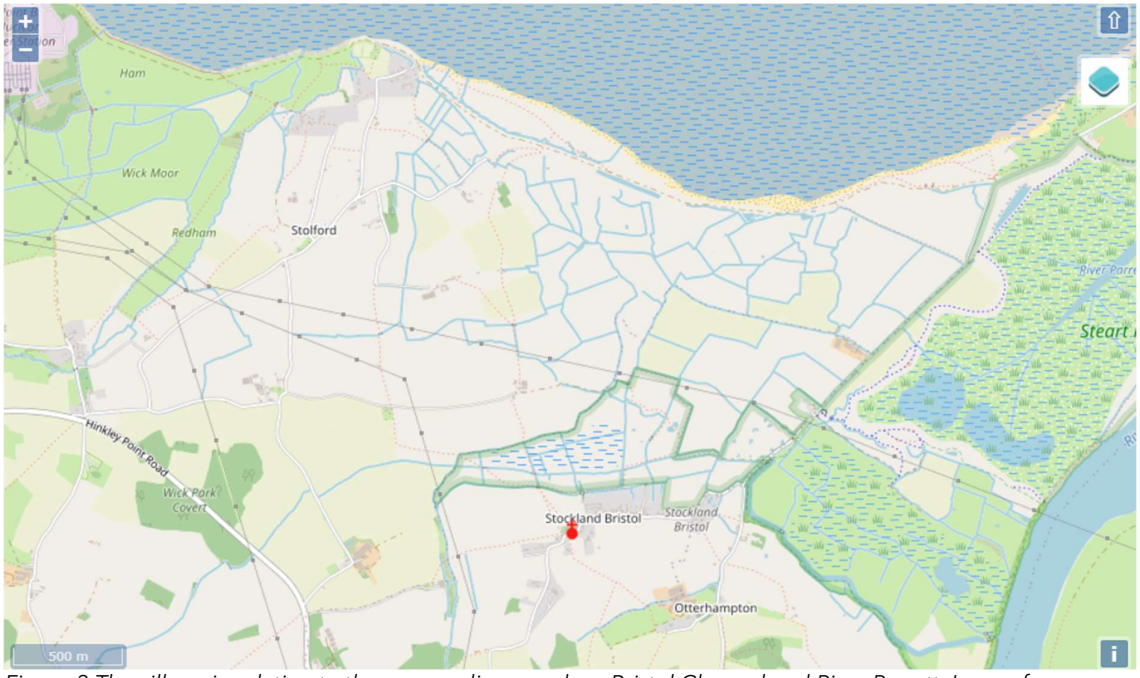

Figure 3 The village in relation to the surrounding marshes, Bristol Channel and River Parrett. Image from Church of England Faculty Online.

Figure 4 View from tower across to Steart Marshes to the north east

Figure 5 Mature trees around the north and west perimeter of the churchyard. Hinkley Point in the distance.

6.0 Internal Environment

The interior of the church did not form part of the detailed survey; general observations only have been made.

The church generally does not show any immediate signs of damp, however there are certain locations where efflorescence, damp staining and surface decay are apparent:

- The nave ceiling in the north west corner where the damp staining appears to be associated with the external buttress detail in this corner.
- The east jamb of the door between the chancel and vestry and an area of the north wall of the chancel, where salt efflorescence is present on the surface of the Bath stone and plaster, and there is some staining and loss of paint/plaster in this area more generally. Likewise, the vestry east wall above the door is showing signs of damp ingress and cracking (discussed further below). This appears to be associated with the interface between the chancel and vestry, and the external gable roof arrangement and rainwater goods which may be faulty or have insufficient drainage.

As noted in the Mann Williams February 2020 structural report, there are 'stretch marks' visible on the internal south nave wall which indicate horizontal cracking that has been patch-repaired in plaster historically. The horizontal cracking may be linked with settlement of the building over time, causing opening up along the joints of the internal face of the wall.

The composition of the inner skin of the nave could not be confirmed. A small section of missing plaster adjacent to the crack in the east wall of the south chapel revealed what appears to be a brick inner skin. Brick is also visible on the internal south gable of the south porch and in the boiler room beneath the vestry. Further investigations would be necessary to get a fuller picture the composition, thickness and condition of the internal skin and core of the wall.

The internal walls may be coated partially in the original lime plaster but there is evidence of a modern gypsum skim to the wall in the south nave. The south nave plaster was hollow in places when tapped, suggesting at least partial detachment from the masonry beneath. In the vestry where there has been substantial cracking to the internal walls, it was possible to inspect the plaster in more detail; the plaster was found to consist of one thick grey-coloured coat (possibly a course, ashy lime mortar), with a lighter top-coat.

There is a significant lateral crack at upper level along both the south nave and the north aisle walls. The north aisle wall is discussed in the structural report on p.9 and is linked with movement at the interface between the masonry walling and timber stud makeup at the eaves; it is not considered to be of structural significance. The south wall of the nave has a similar lateral crack that causes the upper section of wall to step outwards to the south.

Vertical cracking was noted on the east and west walls of the south chapel/organ chamber. There appears to have been outward/downward subsidence, with the south wall pulling in a southerly direction.

The east wall of the vestry also has evidence of severe cracking above the east door, with cracks emanating from the interface with the north chancel. The internal situation here appears to be linked with the problematic bellying vestry gable and rainwater goods.

Figure 6 Lateral crack along the north nave wall at upper level.

Figure 7 Lateral crack along the south nave wall at upper level. Stretch marks and historic plaster patching visible.

Figure 8 Vertical cracking to the east wall of the south chapel/organ chamber

Figure 9 Vertical cracking to the west wall of the south chapel/organ chamber

Figure 10 Fragment of mortar from the internal vestry wall.

8.0 Tower Parapet and Vice Turret

The internal face of the parapet (all sides) and the upper section (north and north west only) of the vice turret were inspected from the tower roof.

All elevations of the parapet are heavily lichen-covered, with open joints, displacement, fracturing and localised stone loss. There is a section of missing masonry from one of the parapet panels at the north west corner (west elevation), which has been placed on the tower roof adjacent. The north elevation has been shored-up historically with timber bracing along its length, and a stainless steel angle has been affixed at the base of the north east corner. A section of lead flashing is missing along the north elevation.

The cover meter survey revealed iron pins through the centre of each of the coping stones along the top of the west elevation only. On closer inspection, these were also visible on the surface of the stone. A corroded iron fixing was visible in the lower bed of the broken section of masonry at the north west corner of the parapet. However, detecting this iron fixing using the cover meter was unreliable, possibly

because of the level of corrosion. The visible fixing that was found in the broken section of masonry would suggest that this fixing method was used throughout the parapet, and this theory is supported by the discovery of a small 'slot' in the same position on the joint of all of the stones, indicated by a small mortar infill. It was not possible to confirm the presence of iron in all of these locations using the cover meter, however the rope access tower inspection may be able to provide further evidence. Lifting of the coping stone and opening of the joint was noted in the coping stone to the south west corner (west elevation) and ironwork was detected at a depth of 67mm (approximately) within this stone – this may have been picking up the vertical pin through the top of the stone.

The visible upper section of the vice turret is in very poor condition, both in terms of the structure and the surface of the stone. The structural stability is of concern given the level of movement and lack of overall integrity. The blue lias is heavily delaminated and decayed, with large open joints and displacement throughout. The Bath Stone quoins/dressings appear loose, are displaced and are repointed in cement mortar. There is a large, notable crack to the door head, within which a large ferrous pin is visible. The iron ring that is noted in the structural survey is just visible on the south west side of the turret below parapet level.

Figure 11 North parapet

Figure 12 East parapet

Figure 13 South parapet

Figure 14 West parapet

Figure 15 Opening up of the coping stone joint in the south west corner (west elevation), and detection of iron fixing in this location.

Figure 16 Example of an iron fixing detected at the centre of a panel on the east elevation. It is assumed that all panels contain similar central iron fixings.

Figure 17 Corroded iron fixing visible in the lower bed at the centre of the broken panel to the north west corner (west elevation).

Figure 18 Sealed slot on the inside of a panel at the north east corner (east elevation). It is assumed that the iron fixings have been installed this way throughout the parapet.

Figure 19 Example of displacement caused by embedded metal fixing at the central joints of a panel.

Figure 20 Fractured corner and displacement to the central panel on the north elevation.

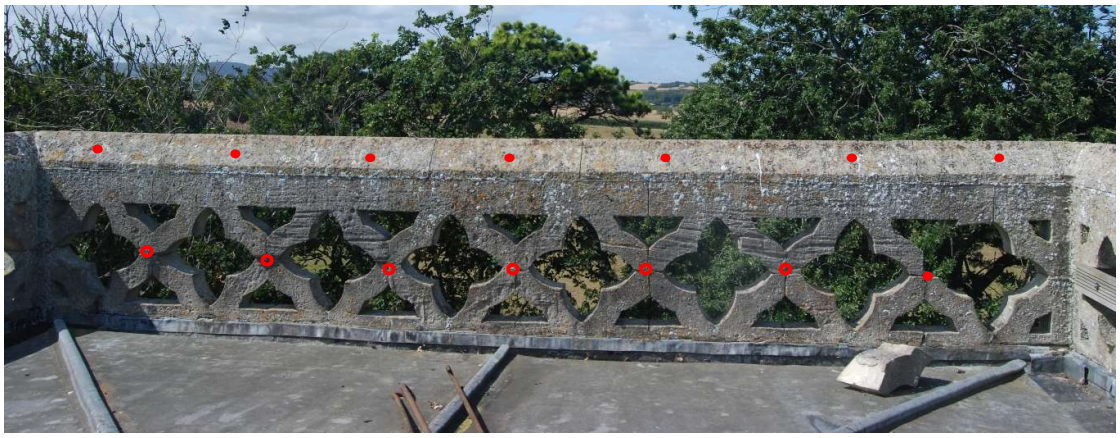

Figure 21 Locations of iron fixings on the west parapet. A solid red circle denotes an actual fixing, a hollow red circle denotes an assumed location of a fixing.

Figure 22 The vice turret viewed from the north west.

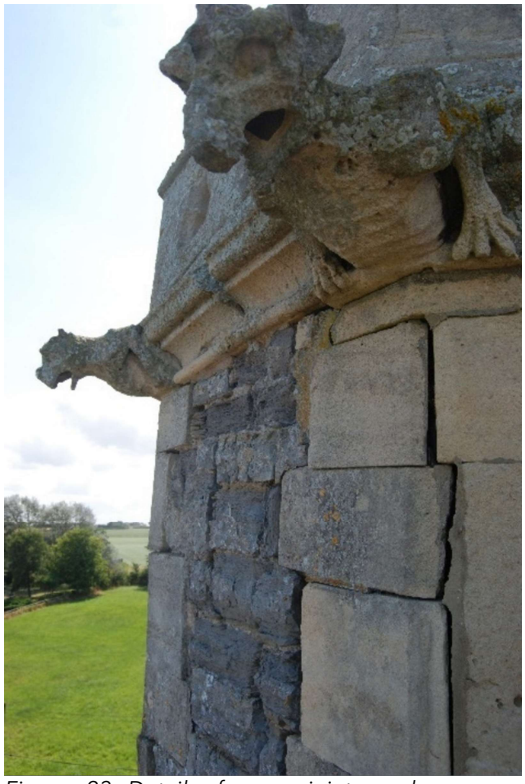

Figure 23 Detail of open joints and movement through the north west side of the vice turret.

Figure 24 Weathered blue lias surface to the vice turret on the north west side.

Figure 25 Large crack, visible pin and cement pointing to the vice turret door head.

9.0 Windows and Doors

Key to numbering:

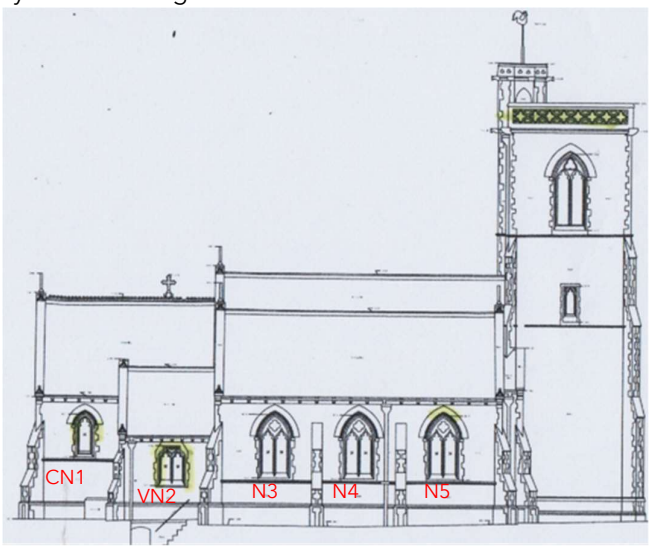

Figure 26 North (not to scale)

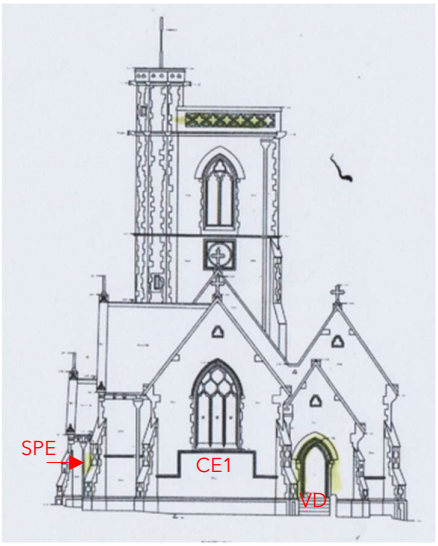

Figure 27 East (not to scale)

Figure 28 South (not to scale)

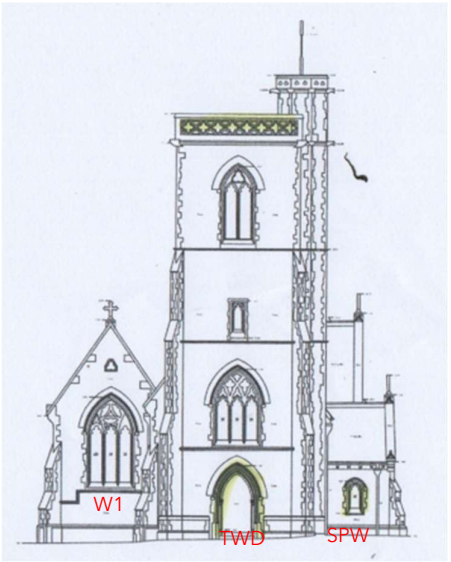

Figure 29 West (not to scale)

Key to marked-up images:

	Displaced stone (also creating open joints)
	Open joints and cracking (cracking also highlighted with yellow lines)

In the following sections, the stonework of each opening has been assessed, primarily for open joints, displacement and presence of ironwork.

9.1 South Porch

The condition of the Lias and Bath stone is generally reasonable on the external south porch, with some weathering to the faces of the Lias at the lower level either side of the south door. There has been at least one programme of repointing to the south porch, much of which is cement and some of which is failing. There are open joints to Bath stone dressings of the east buttress

There is a notable issue is with the lifting and backward leaning of the upper elements of the south porch gable. The apex cross is leaning precariously, and copings are loose and misaligned, allowing for water ingress, which is likely to be contributing to the swelling and lifting of the blue lias gable wall.

Figure 30 Lower east side of south porch door with cement pointing, weathered faces of blue lias and open joints to the buttress visible.

Figure 31 Failing cement pointing above the south porch east window.

Figure 32 South porch gable from the west

Figure 33 South porch gable from the east

9.1.1 South Porch East Window

The interior and exterior faces of the south porch east window were inspected. The window is in poor structural condition with open joints and displacement of stones. The lower corners of the external Bath stone cill have stress cracks which appear to have been caused at pinch points where structural movement is occurring; this situation is exacerbated by the adjacent comparatively hard cement pointing. No embedded iron was detected either externally or internally.

Figure 34 South porch east window internal face

Figure 35 South porch east window external face

Figure 36 Detail of cracking to the external lower south jamb/cill. Cement pointing visible.

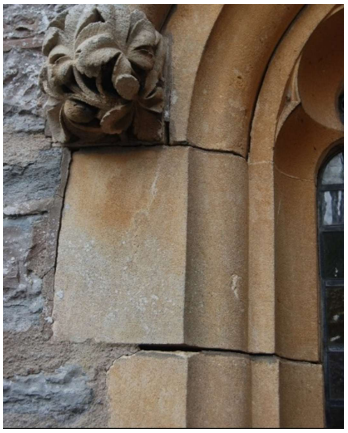

Figure 37 Opening of joints and displacement of stones to the external south jamb.

9.1.2 South Porch West Window

Similarly to the south porch east window, the west window has open joints and displacement in multiple locations. There is some cracking to south jamb. No iron was detected internally or externally.

Figure 38 South porch west window internal face

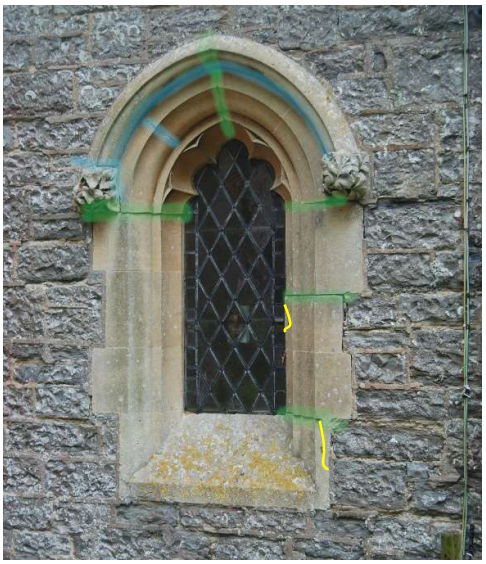

Figure 39 South porch west window external face

9.1.3 South Porch Door

There is an opening-up of the joint between the blue lias and the hood mould above the door arch, and again attempts have been made to repoint this in cement mortar; this sizeable open joint appears to be linked with the upward and backward movement of the gable above and is exacerbated by both cement pointing and loose copings and subsequent water ingress. The west voussoirs of the arch are separating from the hood mould on the upper west side of the door.

The door jambs are also showing displacement and opening-up of joints, particularly on the west side. An investigation was made using a fine saw blade to discover whether any deeply embedded fixings could be located in the bed of the west jamb at lower level; the joint was found to be completely empty of mortar or fixings.

There is surface weathering to the Bath stone of the door surround at low level. Powdering and blistering can be seen here, which is indicative of damage caused by salt crystallisation through wetting and drying cycles.

Open joints and movement to the gable copings are also indicated in the image below.

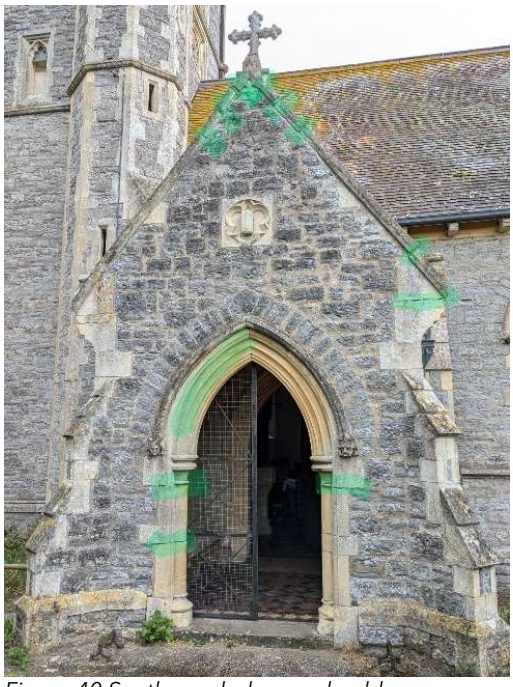

Figure 40 South porch door and gable

Figure 41 Displacement and open joints to lower west jamb

Figure 42 Surface blistering and loss to the lower east jamb

9.2 South Nave

The pointing to the south nave is variable but there is a predominance of cement, which is inhibiting moisture transfer and encouraging moisture to travel through the relatively porous and permeable blue lias and Bath Stone instead. This contributes to transfer of salts in solution, to freeze-thaw action and to general expansion and contraction caused by water ingress. Original lime mortar appears to be in place below plinth level.

This south elevation shows the most prominent evidence of structural movement to window and door heads, gables and buttresses. There are wide open joints visible above the South Windows 1, 2 and 3. The south nave wall is bulging outwards at approximately mid-window height, as indicated by the gap between the wall and the downpipe adjacent to South Window 2. Where repeated expansion and contraction of the lias is contributing to this general movement and the lifting effect, it can only be exacerbated by cement pointing and repairs.

As noted in the structural report, the plinth appears to be true, but the string course drops slightly to either side of South Windows 1, 2 and 3. This could reflect the reduced load passing down through the tracery windows in relation to the full weight of the masonry wall to either side of them.

The condition of the blue lias is considerably worse at the lower levels of the buttresses, where water run-off is concentrated; fracturing of the stone and surface loss is notable, for example to the south chapel corner buttresses.

There is a downpipe to the east of South Window 2, close to the west wall of the south chapel. The drainage arrangements here were not clear and further investigation may be required to understand where run-off is being directed.

Figure 43 South nave wall showing dipping of the string course to either side of south windows 1 and 2.

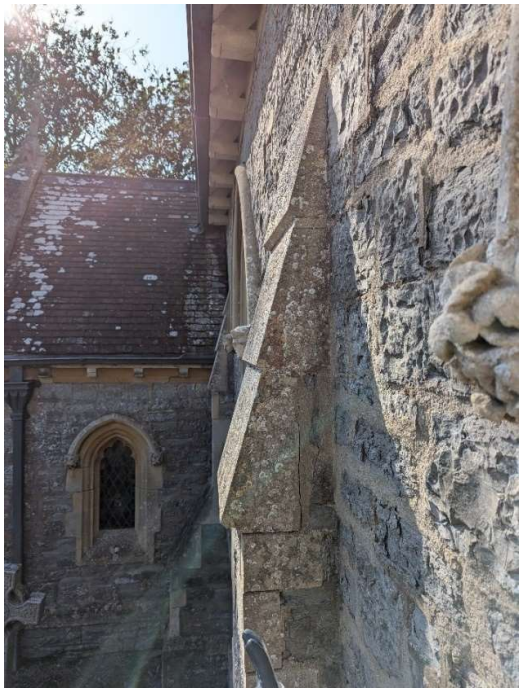

Figure 44 Movement to the buttress between south windows 1 and 2

9.2.1 South Window 1

The first window to the east of the south porch has a sizable open joint above the hoodmould, and movement through the tracery and jambs. Historically a crack monitoring device has been installed between the upper east jamb and wall, an indication of a long-standing issue with movement. There is fracturing and loss to the central mullion and to the jambs at cill level. The 'rise' of the string course is notable beneath the window. No embedded ironwork was detected during the survey.

Figure 45 South window 1

Figure 46 Displaced upper east jamb and historic crack monitoring device

9.2.2 South Window 2

The second window to the east of the south porch has a sizable open joint above the hood mould, and movement through the tracery and jambs. Cracks through the Bath stone are visible at pinch points, such as at cill level on the jambs. The undulation of the string course is visible beneath this window. The internal east jamb of the window shows corresponding displacement.

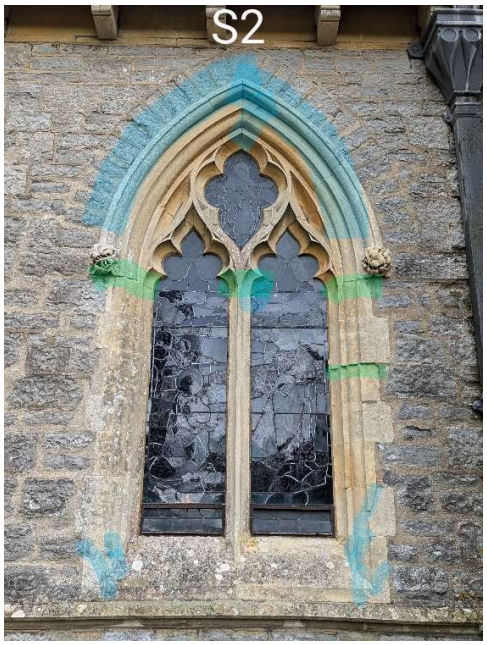

Figure 47 South window 2

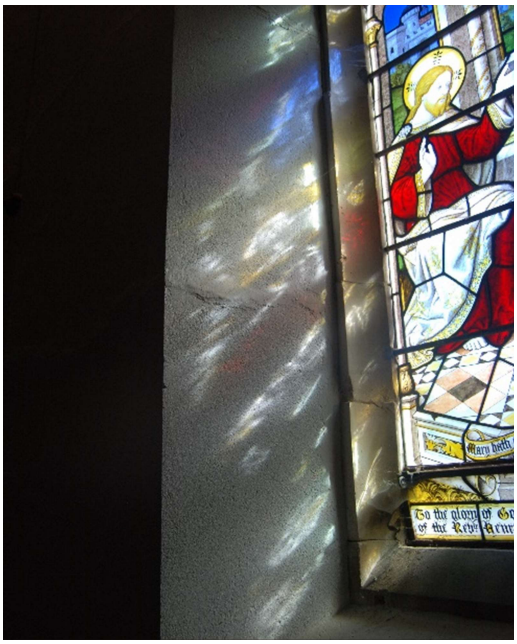

Figure 48 Displacement to internal east jamb

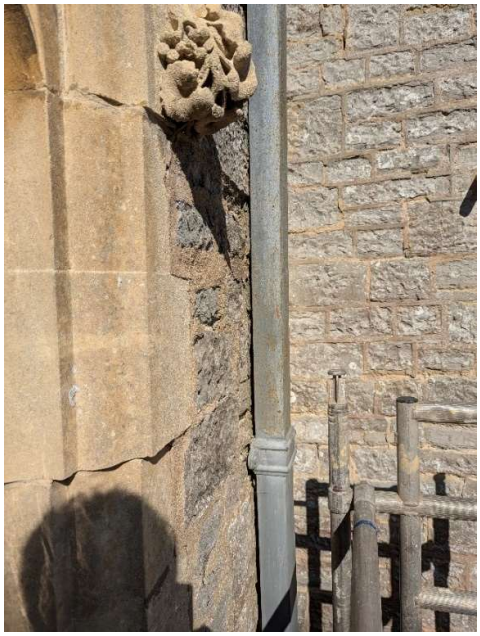

Figure 49 Displacement of east jamb at mid height

9.2.3 South Chapel Window 3

The large tracery window to the south chapel on the south elevation is opening-up above the hood mould and has significant movement through the tracery head, voussoirs, mullions and jambs. The Bath stone tracery is generally out of alignment, with open joints, fracturing and distortion of the stained glass. The gable above has misaligned copings with open joints, suggesting that water ingress, combined with cement pointing, is contributing to the overall movement in this chapel. It is also important to note that the cracks on the internal chapel wall also suggest subsidence, which may be reflected in the undulating string course. No ironwork was found in the structure of the window during the survey.

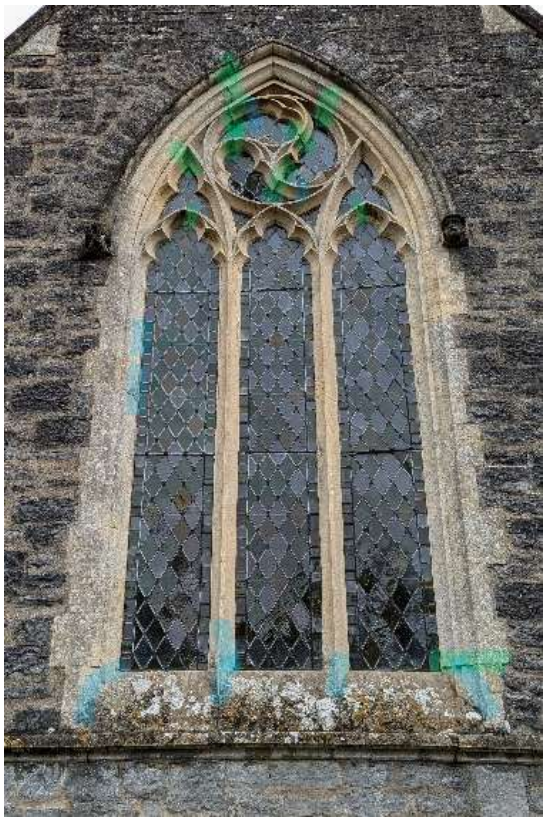

Figure 50 South chapel window 3

Figure 51 Extreme movement through the tracery head

Figure 52 Cracking to the lower east corner at cill level

Figure 53 Rising and falling of the string course beneath the window

Figure 54 Open joints and movement to the gable copings

Figure 55 Stress crack to the gable on the west elevation

9.2.4 South Window 4

The small south window of the chancel has displacement and open joints visible to the hood mould, at the apex and at the springing point of the arch.

Figure 56 Chancel south window

9.2 Chancel East Elevation

The pointing to the east elevation of the chancel is generally cement, with what appears to be original lime mortar at lower plinth level. The variation in the colour and condition of the blue lias beneath the string course suggests that stone replacement may have been undertaken historically. The string course rises beneath the window and drops to either side, as seen on the south elevation. The condition of the east gable is difficult to assess from ground level, but loose copings, misalignment and open joints were observed, as well as cracking down through the blue lias beneath the kneeler on the north side.

The chancel east gable has open joints visible from ground level, as well as opening up of the cement pointing to the upper corners beneath the kneelers.

Figure 57 Chancel east end showing variation in stone colour beneath the undulating string course. Cement pointing throughout.

Figure 58 Opening of upper south corner of the chancel east gable

Figure 59 Cracking through upper north corner of the chancel east gable

9.2.2 Chancel East Window 1

Although not as pronounced as the south chapel window, the chancel east window has movement and open joints above and beneath the voussoirs and to tracery at the head, as well as some displacement to the jambs and mullions. There is cracking to the south jamb at mid-height and at the cill. The cill to the south has lifted and moved out of alignment, shifting the string course with it. Inspection of the window was at ground level only, so a cover meter survey was not conducted, but it is assumed that there is no embedded ironwork.

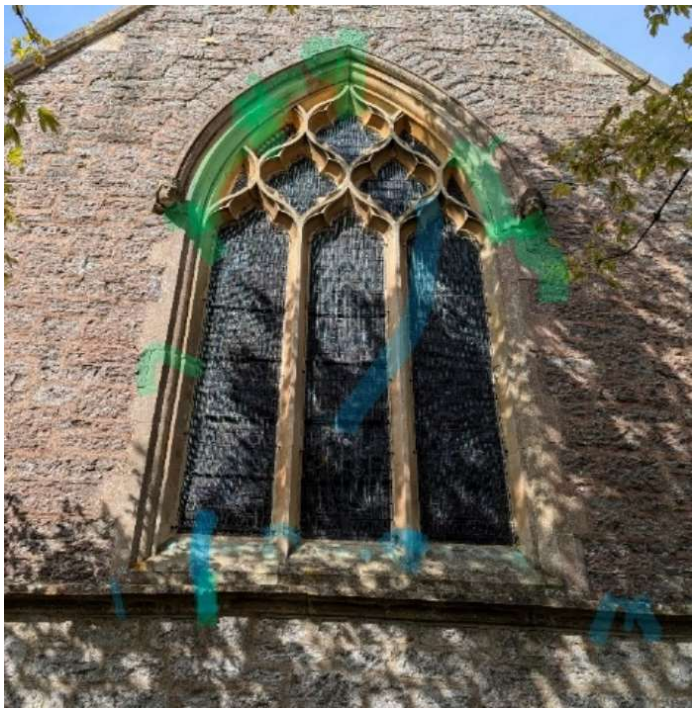

Figure 60 Chancel east window

Figure 61 Detail of smeared cement pointing to the blue lias beneath the string course of the east chancel

9.2.3 Vestry East Door

There is significant cracking and bulging of the wall above the vestry east door. This situation is reflected in the cracking and moisture ingress seen on the vestry internal east wall. The gable has open joints along the copings and directly behind the gable, where the lead flashing is loose and water ingress will be ongoing. The apex cross is leaning precariously backwards, contributing to the misalignment and open joints at coping level.

The hood mould is opening up over the door, and displacement and cracking can be seen through the voussoirs of the arch and down through the door jambs. There is tree root growth through the masonry joints at the base of the north jamb. A downpipe runs close to the door on the south side, and drainage arrangements here are unclear. This appears to be a very damp corner of the building, with heavy moss coverage to the steps to the vestry door.

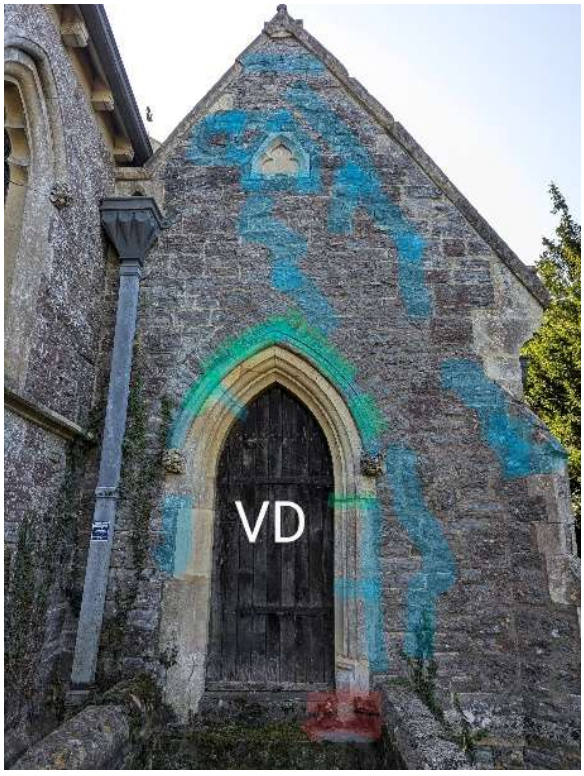

Figure 62 Vestry east door

Figure 63 Evidence of damp at the base of the vestry east door and around the base of the downpipe

Figure 64 Bulging of the vestry gable, open joints and leaning apex cross.

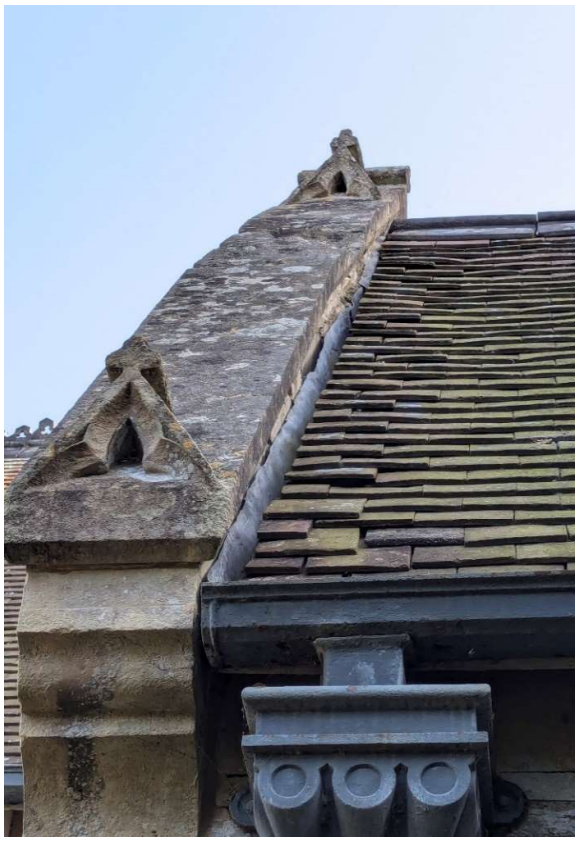

Figure 65 Point of water ingress where lead flashing is open behind the vestry gable

9.4 North Elevation

The masonry of the north elevation was found to be in generally better condition that the south, with pointing mainly intact and surfaces sound. There has been a considerable amount of repointing in cement on this, as on all, elevations.

On the day of the survey, there was evidence of a damp environment in and around the north side of the chancel and vestry, and where the steps lead down to the under croft. The downpipe at the junction between the chancel and vestry requires further investigation as the drainage arrangements are not clear. There is also evidence of history or ongoing leakage to the hopper and/or downpipe between the north aisle windows 4 and 5, however, this is one of the few locations in which the decorative cuff around the downpipe has remained intact.

Figure 66 South aisle looking west

Figure 67 Corrosion to the south aisle downpipe

9.4.1 Chancel North Window 1

The small window on the north chancel has open joint and displacement through the hood mould and jambs, with a particular shift on the east jamb at mid height.

Figure 68 Chancel north window 1

9.4.2 Vestry North Window 2

The vestry north window is opening up along a horizontal line at its head, with the wider joint at the east side of the window, where there is also evidence of failed cement pointing. The east jamb is also moving out of alignment. There is cracking to the Bath stone at cill level, where structural movement and the unforgiving cement mortar have created points of stress. This window is located over the steps to the boiler room beneath the vestry.

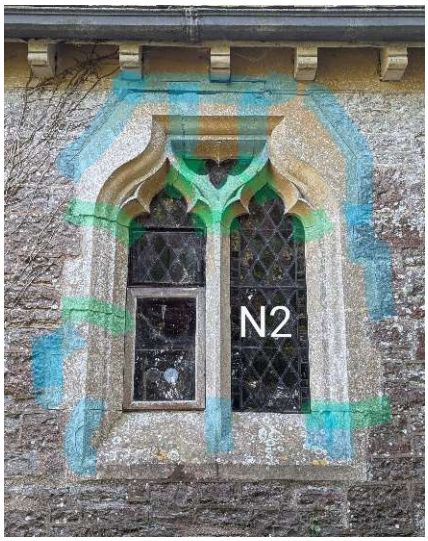

Figure 69 Vestry north window 2

9.4.3 North Aisle Window 3

The first window to the west of the vestry on the north aisle has particularly pronounced movement through the hood mould key stone and in some areas of the tracery. The jambs remain in reasonable alignment but with open joints.

Figure 70 North aisle window 3

Figure 71 Displacement of the key stone

9.4.4 North Aisle Window 4

The north aisle window 4 is in reasonable condition structurally but with a level of opening up of joints at the head and upper jambs, and at the base of the mullion. This window is in close proximity to the corroding downpipe and so water ingress (historic or ongoing) in the masonry may be expected here.

Figure 72 North aisle window 4

9.4.5 North Aisle Window 5

The opening of the central joint to the hood mould and voussoirs continues down through the upper section of the tracery. The jambs are not showing significant movement but have some open joints at the upper levels.

Figure 73 North aisle window 5


Figure 74 Displaced keystone

9.5 West Elevation

The gable at the west end of the north aisle has an usual buttress and hopper/downpipe arrangement where it abuts the tower, which corresponds with an area of water ingress in the interior of the church. There are open joints to the copings and cracking through the south side of the gable above the window head.

9.5.1 West Window 1

There are significantly fewer areas of visible movement or open joints to the south aisle west window than seen on other elevations of the building. The tracery does not appear to be opening up or moving out of alignment. The string course, however, does appear to rise and fall beneath the window, as seen on the south and east.

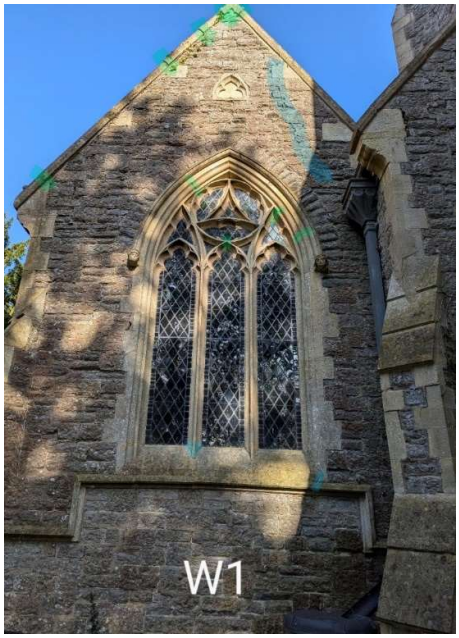

Figure 75 South aisle west window

9.5.2 Tower West Door

The voussoirs of the tower west door are both displaced and cracked at the apex. Previous attempts have been made at repair using a colour-matched mortar, but these repairs have failed at some of the joints.

Figure 76 Tower west door

Figure 77 Cracking over the tower west door

10.0 Mortar Analysis

Mortar samples were gathered during the survey and have been submitted for laboratory analysis.

An initial visual observation of what appeared to be original lime mortar to the vice turret and to the south nave plinth was that the mortar was fine and powdery, with an absence of any coarse aggregates.

11.0 Analysis of Defects

- The inherent nature of blue lias is to swell along its bedding planes in the presence of moisture. This, combined with freeze/thaw action and the harmful soluble salts within the masonry, appears to be contributing to the degradation of the lias and to subsequent structural movement over time.

- The surface condition of the blue lias is generally reasonable on the nave, south porch, south chapel, chancel and vestry. This raises the question as to whether the theory of swelling and upward heaving caused by water ingress goes far enough to explain the level of open joints, movement and displacement, for example above the windows on the south nave, south porch and south chapel. It seems that although this is a contributing factor, that other forces are also at play, such as possible ground movement and subsidence.

- In addition to potential upward movement, it is likely that there has been subsidence and downward movement of the building fabric. It is possible that settlement occurred soon after the Victorian rebuilding of the church on the medieval footings, and that this could be a longer term feature of the building. Any settlement or subsidence that has taken place could be partially responsible for the large open joints noted at the window heads, for example. Subsidence was noted in particular in the south chapel where significant cracking has occurred on the internal east and west walls, suggesting that the south end has tilted outwards and down over time. Further investigation into ground conditions would be advisable to establish whether ongoing subsidence is occurring.

- The construction of the walls requires further investigation as this is likely to have a bearing on the bulging and movement of the outer masonry skin of the building. If there is a loose rubble core and brick inner skin as suspected, there may be detachment in certain areas which contributes to the general lack of anchoring or stability.

- Cement pointing is problematic as it is inhibiting moisture transfer to the outer surface of the masonry in all areas of the building. Any salt-laden moisture within the fabric of the building, particularly where gable copings have dislodged, is choosing the path of least resistance through the face of the blue lias and Bath stone dressings.

- The instability and backward-leaning of the gables could partially be a result of the swelling and consequent upward expansion of the lias walling. This is exacerbated by the severely displaced coping stones and open joints which must be allowing water to enter the wall head. On the south porch, the weight of the apex cross and the tying-in of the roof to the south wall behind could be contributing to the 'pulling-back' effect.

- The pronounced bulging, leaning and cracking to the vestry east gable is likely to be the result of a combination of water ingress at the head causing swelling and movement (as with the south porch and south chapel gable), construction methods and possible downward movement/subsidence. The particularly poor condition of this gable could also be a result of its location, being on the north side in a damp corner where drainage arrangements are unknown and need further investigation.

- String courses are uneven along the south nave wall and east end of the chancel, rising-up beneath the windows and slightly dropping either side. The cause of this may be the difference in load bearing down from the roof, down through the masonry walls (heavier) in comparison with the weight of a tracery window (lighter). The plinth courses appear true, as noted in the structural report.

- Where there is fracturing to corners of the Bath stone dressings, for example at the base of some window jambs, it appears that this is linked with stress caused by adjacent movement ('pinching') rather than through corrosion and expansion of embedded cramps, as would usually be anticipated.

- The general absence of ironwork found during the survey in the window construction may or may not be conclusive. If the church was built without any fixings to the masonry, the usual jacking of corroding fixings is not present but the lack of any kind of anchoring may be bringing its own issues.

12.0 Recommendations

12.1 Further investigations:

- The composition and condition of the walls can be determined by opening up a window into the core. This is a vital stage in better understanding the causes of structural movement.

- Mortar design for repointing and repairs is important to ensure that there is enough flexibility to allow for inevitable ongoing movement of the masonry structure. The results of the pending mortar analysis should inform decisions on mortar design. A range of breathable lime putty mortars that create a good key with the blue lias and Bath stone will be needed for successful pointing and repairs.

- Ground conditions and the existing foundations require further investigation, as recommended in the structural report.

- Drainage channels at the base of downpipes from the nave, chancel and south aisle require investigation to determine where run-off is currently channelled to. This is particularly important in the light of the effects of climate change, where more intense and more frequent rainfall is anticipated.

- The English Heritage/David Odgers-led Blue Lias Research Group may be able to provide further case studies and information.

12.2 Suggested Works:

The following measures may form part of the programme of works moving forward.

- Urgent structural intervention and holding repairs to the tower, parapet and vice turret. This is covered more fully in the SSHC Rope Access Tower Condition Report.
- Removal of cement pointing.
- Dismantling and rebuilding of structurally unstable gables.
- The level of dismantling and rebuilding required above windows could be reassessed once the cement pointing is removed and there is a better understanding of the composition of the wall.
- A programme of repointing and surface repair to the blue lias. This has been successfully executed, for example, at Low Ham Church in Somerset for the Churches Conservation Trust and at St Michael's Church, Othery. A range of colour and texture-matched mortars were used to ensure that the watershedding qualities of the lias were reinstated. A soft putty mortar was used to reduce weathering and protect the masonry whilst still allowing for movement.
- Removal of internal plaster to the damp areas of the vestry and north chancel to allow for drying out.

Figure 78 Example of Blue Lias and Ham stone repair and repointing at Low Ham Church

Figure 79 Example of lias consolidation and repair to St Michael's Church, Othery.

Appendix 1

Areas for inspection highlighted on survey drawings.

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