



BRYMBO HERITAGE PROJECT



STRUCTURAL CONDITION ASSESSMENT

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Suitability S2
Revision P02

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APPENDICIES

APPENDIX A – Location Plan

APPENDIX B – Structures Location Plan

APPENDIX C – Schedules

APPENDIX D – Defect Sketches

1.0 PREFACE

1.1 Property Address

Brymbo Heritage Project,
Brymbo,
Wrexham,
LL11 5AX

1.1.1 Date 25th and 26th May 2023

1.1.2 Nature of Investigation – Structural condition assessment.

1.1.3 This report has been produced to evaluate the structural stability and condition of all the structures at Brymbo.

1.1.4 The inspection was undertaken by Ifan Rowlands BEng (Hons.) IEng FICE AaPS GMIStructE, Managing Director of Bingham Rawlings Partnership Ltd (hereby referred to as BRP within this report), Jared Humphries (Graduate Engineer) EngTech GMICE, Camilla Ramos (Engineering Technician). Copies of their individual qualifications and experience are available upon request.

1.1.5 BRP have been employed as an independent professional consultancy to investigate and report factually as part of the investigation. A copy of Cadarn's professional indemnity cover to undertake such investigation and design is also available upon request.

1.1.6 No intrusive testing or identification of hazardous material was undertaken by Cadarn, and the nature of the inspection was visual only.

1.1.7 This report has been compiled in strict accordance with BRE 251 and the IStructE guide to surveys and inspections of buildings and associated structures.

1.1.8 Structural Inspection Plan has been appended within **Appendix D** of the report.

2.0 Introduction

2.1 Site Details

- 2.1.1 Bingham Rawlings Partnership Ltd (hereby referred to as BRP within this report) have been appointed to undertake a structural condition assessment of Brymbo Heritage Project, LL11 5AX (National Grid Reference **SJ 29493 53582**). See Location Plan in **Appendix A**.
- 2.1.2 The site of Brymbo Heritage Project is the remains of the former Brymbo Iron and Steelworks.
- 2.1.3 The aim of the project is to arrest further decay of all structures and fully restore key buildings to allow them to be re-purposed and used again.
- 2.1.4 The site is approximately 0.09km² and comprises various structures which are all highlighted in the drawing attached in **Appendix B**.
- 27 retaining walls
 - 6 buildings
 - 7 rooms

3.0 Building A – Colliery Winding House and Lamp Room

3.1 Description

- 3.1.1 Building A is single storey building and of solid brick masonry construction.
- 3.1.2 The roof is a duo pitch gable roof and consists of corrugated steel sheeting supported upon regularly spaced RSA trusses and canted RSA purlins.
- 3.1.3 The ground floor is a suspended construction with a basement underneath. This was in very poor condition and had partially collapsed making internal access unsafe.

3.2 Inspection Findings

- 3.2.1 BA1 – Timber floor covering (boards) have perished. Not suitable for access due to basemen beneath.



Figure 1. Typical perished timber floor covering

- 3.2.2 BA2 – Timber floor joists exhibiting signs of wet rot due to prolonged exposure to environmental factors, particularly within their supports in the walls.



Figure 2. Typical deteriorated floor joists

- 3.2.3 BA3 – Corrugated profile steel roof has corroded throughout with significant loss of area allowing penetrative water to enter the structure.



Figure 3. Typical corrosion to corrugated profile steel roof

- 3.2.4 BA4 – Deteriorated timber lintels to front façade windows through exposure and wet rot. Refer to defect BA4 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 4. Typical deteriorated timber lintel

- 3.2.5 BA5 – The steel truss ends at their supports in the external walls penetrate to the external face and are exhibiting significant section loss through expansive corrosion. Deteriorated timber lintels to front façade windows through exposure and wet rot. Refer to defect BA5 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 5. Typical corroded steel truss end

- 3.2.6 BA6 – De-bonded brick coping along eaves at truss bearing locations. Deteriorated timber lintels to front façade windows through exposure and wet rot. Refer to defect BA6 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 6. Typical de-bonded brick coping

- 3.2.7 BA7 – Desiccated mortar pointing throughout.



Figure 7. Typical desiccated mortar pointing

- 3.2.8 BA8 – Dislodged brickwork to all four corners of the building at eaves level due to rotation of RSA canted purlins within brickwork. Refer to defect BA8 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 8. Typical dislodged brickwork on corner

- 3.2.9 BA9 – Area of vegetation growth on external wall. Refer to defect BA9 in Defect Sketch in **Appendix D – Defect Sketches**.

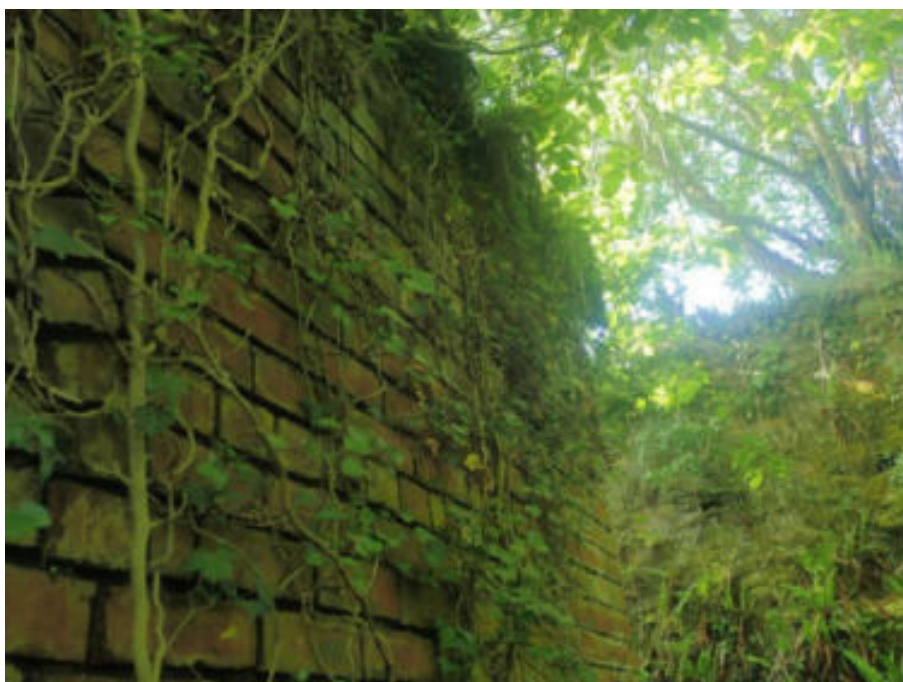


Figure 9. Vegetation growth on wall

3.2.10 BA10 – Displacement in arch keystone. Refer to defect BA10 in Defect Sketch in Appendix D – Defect Sketches.



Figure 10. Displaced arch keystone

3.2.11 BA11 – Embedded steel plate in external brick wall is exposed and has expanded through corrosion. Refer to defect BA11 in Defect Sketch in Appendix D – Defect Sketches.



Figure 11. Corroded steel plate

3.2.12 BA12 – Failed masonry arch due to displaced / dislodged keystone coupled with significant vertical and diagonal cracking (15mm width) from head of arch in masonry panel above. Refer to defect BA12 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 12. Failed masonry arch

- 3.2.13 BA13 – Failed section of roof, missing steel RSA purlins (2 No.) and significant area of disturbed masonry at the roof line of the front gable spandrel due to tree growth internally. Refer to defect BA13 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 13. Failed section of roof

3.2.14 BA14 – Loose / dislodged masonry at eaves of gable wall due to expansive corrosion of historical electricity line bracket embedded in wall. Refer to defect BA14 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 14. Loose/dislodged masonry

3.2.15 BA15 – Failed masonry arch due to displaced / dislodged keystone. Refer to defect BA15 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 15. Failed masonry arch

- 3.2.16 BA16 – Diagonal cracking emanating from the enlarged door opening in the front elevation and terminating at the base of the wall, suggestive of historical impact damage. Refer to defect BA16 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 16. Diagonal cracking

- 3.2.17 BA17 – The small addendum building to the side of the main body of Building A contains a corrugated fibre cement roof. The roof appears intact.
- 3.2.18 BA18 – Fire Damaged door and door casing.

3.3 Discussion

- 3.3.1 If access to this area is restricted there are no emergency works considered imminent. Otherwise, all items should be attended to.
- 3.3.2 Access to the internal areas of the building is restricted and as such further remedial works may be considered necessary particularly to the lower basement level of the building through further inspection.

3.4 Conclusion

- 3.4.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall building to be in a deteriorating structural condition albeit further loss of stability or collapse is not expected in the short term.
- 3.4.2 Due to the damage, the building is not considered safe for public access at present.
- 3.4.3 Remedial works are therefore recommended to ensure usability and long term structural performance of the building.
- 3.4.4 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

3.5 Emergency Works (within 12 months)

- 3.5.1 Restrict access to building and install a temporary hoarding to all external openings or repair existing.
- 3.5.2 Remove vegetation, approx. 3m².
- 3.5.3 Temporarily prop the arch and re-set. Apply a masonry crack stitching repair using heli fix or equal approved. Approx. repair area 4m²
- 3.5.4 Remove tree internally around failed roof.
- 3.5.5 Consider localised repair of roof covering.

3.6 Short Term Recommendations (1-2 years)

- 3.6.1 Remove and replace the entire roof covering.
- 3.6.2 Replace deteriorated timber lintel (1 No.) on front façade window with Precast concrete lintel.
- 3.6.3 Remove and replace all de-bonded and dislodged brickwork at corners and install pre cast padstone at bearing of RSA. Also suggest cutting RSA short to ensure they do not penetrate to the outer face of the external wall and applying

a protective zinc based coating to exposed / cut steelwork. Approx. 4m² of brick re-setting required.

- 3.6.4 Temporarily prop the remaining displaced or failed arches. Reset all arches and apply crack stitching repair including using helifix or similar approved above arches where required.
- 3.6.5 Replacement canted RSA sections between truss and gable wall. Remove dislodged brickwork at spandrel head and replace. Approx. 4m².
- 3.6.6 Remove the historical electricity line bracket and locally repair. Repair small area of loose brickwork.
- 3.6.7 Attach tell tale to diagonal crack by door opening and monitor.
- 3.6.8 Remove and replace door and door casing.

3.7 Long Term Recommendations (2-5 years)

- 3.7.1 Remove all floor coverings and replace with suitable moisture resistant board or treated timber boards.
- 3.7.2 Remove and replace all deteriorated timber floor joists. Make allowance at this stage for 50% removal.
- 3.7.3 Remove delaminated steel back to bare sound section on steel truss ends and apply protective coating. Gain access high level to assess extent of corrosion at support. Further treatment to truss bearing may then be required. Alternatively, if sufficient section of steel remaining at truss bearing cut out deteriorated sections of steel and provide protective treatment to remaining section.
- 3.7.4 Monitor all loose and de-bonded / desiccated mortar and repointing.
- 3.7.5 Remove loose or delaminated steel in the mortar joint around embedded steel plates and apply a protective coating to the exposed member. Alternatively, Remove the steel plate from the wall bed joint and repair mortar removal.
- 3.7.6 Remove and re-bed loose or de-bonded brickwork. Approx. 2m² of area.

- 3.7.7 Recommend racking out all loose and de-bonded / desiccated mortar and repointing.
- 3.7.8 If no movement to diagonal crack by door opening over a period of at least 12 months, apply cosmetic repairs to the mortar beds. Otherwise, apply crack stitching to the panel to repair the fracture using Heli fix or equal approved.
Approx area 5m²

4.0 Building B – Shunters Cabin

4.1 Description

- 4.1.1 Building B is an historic outbuilding constructed of coursed brickwork, predominantly single brick thick, where the walls at lower levels and mid-height were measured to be 450mm thick.
- 4.1.2 Originally, the roof featured a mono-pitched design sloping away from its front elevation. However, it no longer retains its roofing structure as it has been removed at some point.
- 4.1.3 The upper front elevation is composed of an unrestrained panel, measuring half a brick thick.

4.2 Inspection Findings

- 4.2.1 BB1 – Roof structure has historically failed and been removed.



Figure 17. Removed roof

4.2.2 BB2 – Vertical crack recorded in upper section of rear wall attributed by the growth of vegetation.



Figure 18. Vertical crack

- 4.2.3 BB3 – Historically, due to failure of natural stone lintel, a reinforced concrete lintel has been installed over the former fireplace. The lintel cantilevers due to localised failure of the internal wall at the bearing and as such contains vertical stress fractures due to excessive deflection.



Figure 19. Vertical stress fracture

- 4.2.4 BB4 – The front wall panel is an infill panel in part and is not adequately tied to its return walls. Inappropriate horizontal support has left to vertical hairline cracking within the panel.



Figure 20. Insufficiently tied in infill panel

- 4.2.5 BB5 – Front panel half brick thick masonry has become loose and dislodged as a result of lack of restraint.



Figure 21. Loose and dislodged panel

4.3 Conclusion

- 4.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall building to be in a deteriorating structural condition albeit, further loss of stability or collapse is not expected in the short term.
- 4.3.2 Due to the condition the building is not considered safe for public access at present.
- 4.3.3 Remedial works are therefore recommended to ensure usability and long term structural performance of the building.
- 4.3.4 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

4.4 Emergency Works (within 12 months)

- 4.4.1 Restrict access near loose brickwork panels to ensure safety or consider removal.
- 4.4.2 Monitor RC lintel on annual basis and implement remedial action as necessary.
- 4.4.3 Monitor front wall panel and implement remedial action as necessary.
- 4.4.4 Monitor loose masonry panel, implement remedial action as necessary and restrict access.

4.5 Short Term Recommendations (1-2 years)

- 4.5.1 Monitor movement of cracks over a period of 12 months.
- 4.5.2 If the RC lintel is to remain, adequately rebuild the localised area of masonry to provide a suitable bearing at both supports, covering approx. 1m².
- 4.5.3 Introduce stitching at front panel wall returns to provide adequate restraint.
- 4.5.4 Remove loose masonry units and rebuilt, covering an approximate area of 2m².

4.6 Long Term Recommendations (2-5 years)

- 4.6.1 Replacement roof to be designed and installed to provide restraint to heads of all walls.

4.6.2 Implement a crack stitching repair for the fracture locations.

5.0 Building C – Agents House

5.1 Description

- 5.1.1 Building C is a two storey building and constructed of a coursed natural stone masonry construction.
- 5.1.2 The roof is a flat roof with a slight slope towards the front elevation. The roof covering consists of corrugated steel sheeting.
- 5.1.3 Adjacent to one end of the main building, there is an additional lean-to structure which is hereby referred to as the pay office. The pay office follows the same construction method as the main building, but it features a higher pitched roof.

5.2 Inspection Findings

- 5.2.1 BC1 – Timber lintel to front elevation of pay office deteriorated due to exposure. Refer to defect BC1 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 22. Deteriorated timber lintel

- 5.2.2 BC2 – Failed external wall panel due to dislodged natural stone lintel to window at ground floor of front elevation. Refer to defect BC2 in Defect Sketch in **Appendix D – Defect Sketches.**



Figure 23. Failed wall panel

- 5.2.3 BC3 – Failed bearing at window jam to ground floor front elevation opening. Natural stone compression lintel has dropped. Refer to defect BC3 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 24. Failed lintel bearing

- 5.2.4 BC4 – Historical failure to bearing of natural stone compression lintel above door opening to ground floor front elevation. Historical repair has been undertaken, but it was not carried out in a sympathetic or appropriate manner. Refer to defect BC4 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 25. Historical failure to lintel bearing

- 5.2.5 BC5 – Natural stone eaves beam joint directly over opening and is currently propped by temporary timber props. Refer to defect BC5 in Defect Sketch in **Appendix D – Defect Sketches.**



Figure 26. *Propped stone eaves beam*

- 5.2.6 BC6 – Failed external wall panel due to dislodged natural stone lintel to window at ground floor of front elevation. Refer to defect BC6 in Defect Sketch in **Appendix D – Defect Sketches.**



Figure 27. *Failed wall panel*

- 5.2.7 BC7 – Failed bearing at window jam to ground floor front elevation opening. Natural stone compression lintel has dropped. Refer to defect BC7 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 28. *Failed lintel bearing*

- 5.2.8 BC8 – Existing steel UB forming full height opening to gable wall currently provides bearing to approximately 50% width of supported stonework above. Refer to defect BC8 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 29. *Insufficient bearing to stonework above lintel*

- 5.2.9 BC9 – Historical infill masonry panel to gable wall contains loose individual masonry at its base. Refer to defect BC9 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 30. Loose masonry

- 5.2.10 BC10 – Vertical fracture measuring 2.5mm in width at interaction of infill masonry panel and return rear elevation. Refer to defect BC10 in Defect Sketch in **Appendix D – Defect Sketches**.

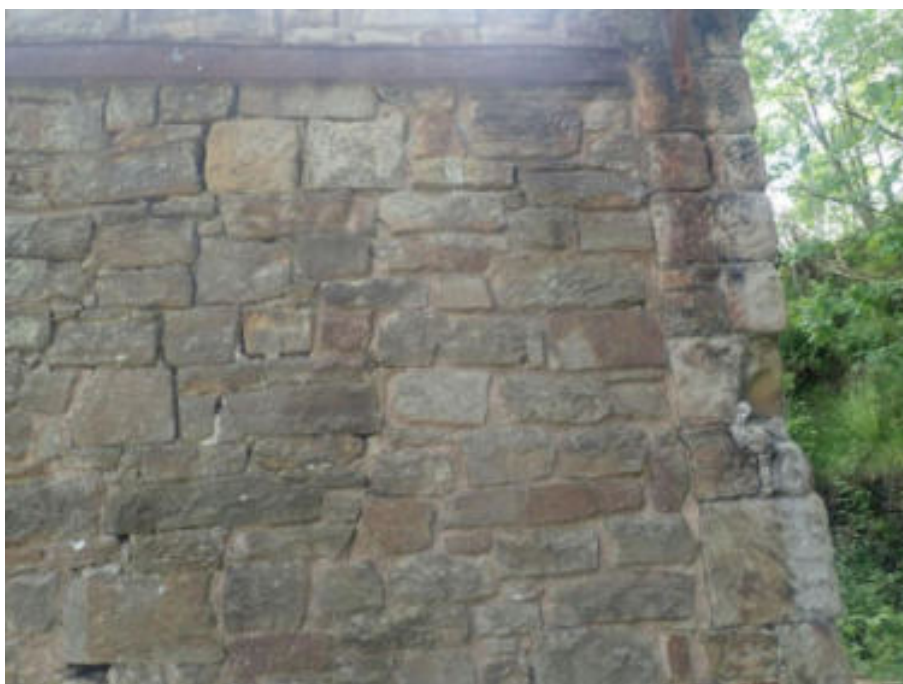


Figure 31. Vertical fracture

5.2.11 BC11 – Natural stone eaves member has been removed resulting in a void beneath the roof line. Refer to defect BC11 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 32. Removed eaves member

5.2.12 BC12 – Fire damage noted to external first floor window frame. Refer to defect BC12 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 33. Fire damaged window frame

5.2.13 BC13 – Failed external timber lintel and prying action through evasive root growth has resulted in external wall panel failure and localised collapse. Refer to defect BC13 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 34. Failed lintel and localised collapse

5.2.14 BC14 – Failed external timber lintel to rear elevation first floor opening. Refer to defect BC14 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 35. Failed timber lintel

5.2.15 BC15 – Inadequate bearing to existing lintel over rear elevation ground floor opening. Refer to defect BC15 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 36. Inadequate lintel bearing

5.2.16 BC16 – Build-up of debris amount to approximately 900mm in height for a length of approximately 4m against the rear elevation wall. Refer to defect BC16 in Defect Sketch in **Appendix D – Defect Sketches**.

5.2.17 BC17 – Rear wall panel of pay office structure contains a failed timber lintel which has resulted in significant distortion of the external wall panel. The panel has been repaired historically using brickwork, however is considered to have failed. Refer to defect BC17 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 37. Failed timber lintel



Figure 38. Failed wall panel

5.2.18 BC18 – Significant outward lean in external stack from its base resulting in various fractures between the panel and its abutting panels. Refer to defect BC18 in Defect Sketch in **Appendix D – Defect Sketches**.



Figure 39. Significant outward lean in stack

5.2.19 BC19 – The roof of the pay office structure has failed and has been historically strengthened. However, there is substantial loss of main structural elements, including rafters. Canted timber purlin has rotated significantly due to lateral thrust and there is no formal fixity between the roof and the gable of the main building.



Figure 40. Typical loss of fixity

5.2.20 BC20 – Internal timber lintels between the pay office and the main building and forming the external opening to the rear elevation are inadequate and have entered a mode of failure.



Figure 41. Inadequate timber lintel

5.3 Discussion

- 5.3.1 The internal area of this building has been completely boarded out to form a functioning office space. The condition of the internal structure could not be assessed and upon removal of the boarding further defects may be encountered.
- 5.3.2 Given that this structure is listed building, it is imperative to engage in discussions with Cadw (or the relevant heritage conservation authority) to ensure the use of appropriate materials for any preservation or repair work. These discussions are necessary to adhere to the strict guidelines and regulations in place to protect the historical significance of the site.

5.4 Conclusion

- 5.4.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall building to be in a deteriorating structural condition albeit further loss of stability or collapse is not expected in the short term.

5.4.2 Due to the damage, the building is not considered safe for public access at present.

5.4.3 Remedial works are therefore recommended to ensure usability and long term structural performance of the building.

5.4.4 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

5.5 Emergency Works (within 12 months)

5.5.1 Temporarily prop lintels with failed wall panel above (BC3 and BC7).

5.5.2 Temporarily the timber props supporting stone eaves beam can remain, and the stability monitored periodically.

5.5.3 Remove any vegetation and tree growth around collapsed wall, rebuilt external wall locally (approx. 4m²) and install designed lintel member consisting of PCC, natural stone or treated timber.

5.5.4 Restrict access within pay office until all of emergency and short term works are complete.

5.6 Short Term Recommendations (1-2 years)

5.6.1 Monitor existing steel UB on gable wall.

5.6.2 Remove and replace external failed timber lintels (BC13, BC14 and BC17) with a suitably designed member of PCC, natural stone or treated timber. Repair any loose or dislodged external wall masonry as a result of replacement.

5.6.3 Debris (BC16) may result in the progression of penetrative water ingress through the external wall. Remove debris to re-establish a level rear ground level to the building. Alternatively, assess the impact of potential water ingress internally and if not an issue do nothing.

5.6.4 Remove and reconstruct the masonry stack (BC18) from ground level. Ensure adequate tying into the remaining masonry panels either side.

- 5.6.5 Remove and replace existing internal failed or inadequate timber lintels (BC19) with a suitably designed member of PCC, natural stone or treated timber.
- 5.6.6 Remove and replace existing internal failed or inadequate timber roof members (BC20) with a suitably designed member of PCC, natural stone or treated timber. Alternatively, consider replacement of pay office roof.

5.7 Long Term Recommendations (2-5 years)

- 5.7.1 Remove and re-build failed external stone wall on front elevation (BC2 and BC). Reconstruct stone jams to opening and ensure adequate bearing to lintel prior to re-setting.
- 5.7.2 Repair natural stone jams with failed bearings to provide adequate bearing to compression lintel and re-set lintel.
- 5.7.3 Replace natural stone eaves and rebed ensuring span capability over opening. Remove props.
- 5.7.4 Remove and replace steel UB on gable wall with a suitably designed member.
- 5.7.5 Remove and re-set loose masonry on gable wall, covering an approx. area of 0.5m².
- 5.7.6 Monitor vertical fracture between infill masonry panel and rear elevation return.
- 5.7.7 Remove fire damaged frame and replace as necessary. Upon removal assess condition of window jam masonry and pointing and apply repair as necessary.
- 5.7.8 Remove the roof in its entirety and install a suitably designed roof structure similar to the existing arrangement with adequate restraint against lateral thrusting.
- 5.7.9 If monitoring of vertical fracture has not identified further movement, cosmetic repairs are recommended. Otherwise crack stitching with Heli fix or similar approved is recommended.

5.7.10 Install new windows and doors to ensure water tight finish to prevent further deterioration of structure.

6.0 Building D – Machine Shop

6.1 Description

- 6.1.1 Building D is of a steel frame construction with external brickwork extending full height on the gable ends and half height on the remaining elevations.
- 6.1.2 The roof is of a due pitch gable construction with a corrugated steel sheeting roof covering.
- 6.1.3 The covering is then supported in canted RSA purlins and regularly spaced RSA trusses.

6.2 Inspection Findings

- 6.2.1 BD1 – Corroded steel lintels to external windows have caused central mullions to buckle.



Figure 42. Corroded lintel and buckled mullion

6.2.2 BD2 – Deflected and corroded steel lintel above door opening.



Figure 43. Deflected and corroded lintel

6.2.3 BD3 – Significant corrosion noted to connection nodes at top and bottom of lattice girder and the steel plates forming the openings.



Figure 44. Typical corrosion to connections and steel plate

6.2.4 BD4 – Missing and loose brick Approx 10% of total area.

Figure 45. Typical missing and loose masonry

6.2.5 BD5 – Deterioration of brickwork. Approx 10% of total area.

Figure 46. Typical deteriorated brickwork

- 6.2.6 BD6 – Vertical fractures up to 10mm in width noted on all 4 external corners of building.



Figure 47. Typical corner fracture

- 6.2.7 BD7 – Deterioration of timber fascia and broken windows.



Figure 48. Typical deterioration to fascia

6.2.8 BD8 – Significant desiccation of mortar pointing.



Figure 49. Typical desiccated mortar

6.2.9 BD9 – Brick corbel has failed.



Figure 50. Failed corbel

6.2.10 BD10 – Significant corrosion noted on steel purlin at eaves.

Figure 51. Corrosion to purlin

6.2.11 BD11 – Angles on windows above main entrance have sheared.

Figure 52. Sheared angle

6.2.12 BD12 – Significant expansive corrosion noted on cantilevered crane beam to the front.



Figure 53. Corrosion to crane beam

6.2.13 BD14 – Roof covering requires replacing.



Figure 54. Typical deterioration of roof covering

6.2.14 BD17 – Area of vegetation growth on external wall.

Figure 55. Vegetation growth

6.2.15 BD18 – Minor surface corrosion to bottom cord of truss.

Figure 56. Typical corrosion to truss

6.2.16 BD10 – Deformed floor due to use of expansive slag.



Figure 57. Deformed floor

6.3 Discussion

6.3.1 If access to this area is restricted there are no emergency works considered imminent. Otherwise, all items should be attended to.

6.3.2 When high level works are undertaken access should be permitted to engineers to conduct further at hand investigations.

6.4 Conclusion

6.4.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall building to be in a fair structural condition for its age however it is not currently considered safe for public access do the localised defects identified.

6.4.2 Remedial works are therefore recommended to ensure usability and long term structural performance of the building.

6.4.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

6.5 Emergency Works (within 12 months)

- 6.5.1 Monitor corrosion to lintels.
- 6.5.2 Monitor sheared angle above window.
- 6.5.3 Monitor corrosion to crane beam.
- 6.5.4 Remove vegetation.
- 6.5.5 Monitor corrosion to bottom cord of truss.

6.6 Short Term Recommendations (1-2 years)

- 6.6.1 Replace steel lintels above windows and undertake repair work (support and stabilisation) on mullions. In severe cases where the buckling cannot be effectively repaired or poses a significant safety risk, it may be necessary to replace the damaged mullions entirely.
- 6.6.2 Replace steel lintel above door opening with a suitably designed member.
- 6.6.3 At hand inspection of condition of lattice girder. Remove corrosion and reapply protective coating if practical. Otherwise, replace steel lattice girder and plates locally with a suitably designed member. Alternatively, if sufficient section of steel remaining on girder cut out deteriorated sections of steel and provide protective treatment to remaining section.
- 6.6.4 Undertake masonry repair work on areas of missing or loose brick, including corbel.
- 6.6.5 Undertake crack repair stitching (helifix or similar) on all fractures >5mm in width. Cosmetic repair on any fracture <5mm in width.
- 6.6.6 An intrusive investigation is required to the corners (6.2.6) to determine the condition and extent of corrosion to steel members within. Suitable remedial works should then be undertaken.
- 6.6.7 Replace deteriorated timber fascia, approx. 66m in length.

- 6.6.8 Replace 1No. steel purlin at eaves with a suitably designed member. Alternatively, if sufficient section of steel remaining at purlin cut out deteriorated sections of steel and provide protective treatment to remaining section.
- 6.6.9 Replace sheared angle above window (BD11) with a suitably designed structural member.
- 6.6.10 Inspect cantilevered crane beam (BD12). Repair if practical otherwise remove and replace.
- 6.6.11 Replace roof covering.
- 6.6.12 Remove corrosion on all truss and lattice girder members and provide protective coating.
- 6.6.13 Replace broken windows to prevent water ingress and further corrosion to steel members.

6.7 Long Term Recommendations (2-5 years)

- 6.7.1 Undertake masonry repair work on areas of deteriorated brickwork.
- 6.7.2 Undertake repointing work throughout building.
- 6.7.3 Remove expansive slag to an appropriate depth and replace floor covering.

7.0 Building E – Pattern and Joiners Shop

7.1 Description

- 7.1.1 Building E is a three storey natural stone masonry building. The building is a historical building within the scheduled monuments area on site. Further details of the building can be found within the conservation report.
- 7.1.2 The internal structure consists of traditional timber joists and floorboards. However, it is currently in a very poor condition and has been temporarily propped in many locations and in some localised areas complete collapse has occurred.
- 7.1.3 The external of the building is in a fragile state of disrepair and is currently propped against the machine shop on its gable end and to a retaining wall on its southern wall. The steel props were designed by BRP.
- 7.1.4 The roof structure has been removed.

7.2 Inspection Findings

- 7.2.1 BE1 – Deteriorated masonry leading to the stones in the arch above the main doorway dropping. Refer to Defect Sketch in **Appendix D – Defect Sketches**.



Figure 58. Dropped arch

- 7.2.2 BE2 – Failed stone jam to 2nd floor south elevation windows. This has resulted in a slight drop to one side of the lintels. Sufficient bearing is still currently provided by the stone below. Refer to Defect Sketch in **Appendix D – Defect Sketches**.



Figure 59. Typical failed stone jam

- 7.2.3 BE3 – Propped window lintels on the 2nd floor south elevation. Refer to Defect Sketch in **Appendix D – Defect Sketches**.



Figure 60. Typical propped lintel

- 7.2.4 BE4 – Minor missing masonry and mortar loss on the north elevation. Refer to Defect Sketch in **Appendix D – Defect Sketches**.



Figure 61. Typical missing masonry



Figure 62. Typical mortar loss

7.2.5 BE5 – Failed timber lintels above the door internally on the ground floor. Refer to Defect Sketch in Appendix D – Defect Sketches.



Figure 63. Typical failed lintel

- 7.2.6 BE6 – Acrow props supporting the floor joists above. Internal first and second floor structure are generally in very poor condition with temporary props holding it up. Total collapse of section of 2nd floor noted due to failed bearing of timber joist. However, the temporary propping appears to be functioning adequately in preventing further instability or collapse of the internal structure. Refer to Defect Sketch in **Appendix D – Defect Sketches**.



Figure 64. Typical acrow prop

- 7.2.7 BE6 – Failed floor joist on 2nd floor. Refer to Defect Sketch in **Appendix D – Defect Sketches**.



Figure 65. Failed section of 2nd floor

- 7.2.8 BE7 – Failed timber lintel on exterior west elevation with temporary propping. Refer to Defect Sketch in **Appendix D – Defect Sketches**.



Figure 66. Failed lintel

- 7.2.9 BE8 – Significant deflection to steel lintel internally at the west of the building. Member is insufficient size for applied load. Refer to Defect Sketch in **Appendix D – Defect Sketches**.



Figure 67. Deflection to lintel

7.2.10 BE9 – Propped timber lintel internally on 2nd floor. Refer to Defect Sketch in **Appendix D – Defect Sketches**.



Figure 68. Propped timber lintel

7.2.11 BE10 – Localised collapse to inner leaf of stone masonry wall internally on gable end. Refer to Defect Sketch in **Appendix D – Defect Sketches**.



Figure 69. Localised collapse of inner leaf

7.2.12 BE11 – Steel prop on gable end. Refer to Defect Sketch in Appendix D – Defect Sketches.



Figure 70. Steel prop

7.2.13 BE12 – Expansive slag has been used for the ground bearing slab on the 2nd floor. This has resulted in the floor becoming uneven.

7.2.14 BE13 – Moisture penetration through lower level walls. This is most notable at the west end of the ground floor.

7.3 Discussion

7.3.1 Given that this structure is contained within the Scheduled Monument area, it is imperative to engage in discussions with Cadw (or the relevant heritage conservation authority) to ensure the use of appropriate materials for any preservation or repair work. These discussions are necessary to adhere to the strict guidelines and regulations in place to protect the historical significance of the site.

7.3.2 This building is in very poor condition and extensive works would be required to make safe. It is likely to be more effective to restrict access to this area.

7.4 Conclusion

- 7.4.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall building to be in a deteriorating structural condition albeit further loss of stability or collapse is not expected in the short term.
- 7.4.2 Due to the damage, the building is not considered safe for public access at present.
- 7.4.3 Due to the precarious nature of the structure the exact extent of deterioration is not available, estimated 25% member remediation.
- 7.4.4 Remedial works are therefore recommended to ensure usability and long term structural performance of the building.
- 7.4.5 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

7.5 Emergency Works (within 12 months)

- 7.5.1 All existing internal and external temporary propping to remain and be monitored.
- 7.5.2 A temporary roofing cap should be installed to prevent water ingress into the building which would result in further deterioration of the internal structure.
- 7.5.3 Temporarily prop the arch above the main doorway and monitor its condition on an annual basis.
- 7.5.4 Monitor lintels on south and west elevations.
- 7.5.5 Restrict access internally until all emergency and short term works are completed.
- 7.5.6 Monitor deflected and propped lintels on 2nd floor.
- 7.5.7 Unless temporary propping or remediation is undertaken to the failed area of gable spandrel further collapse will occur locally until catastrophic collapse of the spandrel will occur. As a matter of urgency the failed timber lintel below

the spandrel should be replaced with a suitably designed alternative and the inner face of masonry rebuilt to match existing. If temporary access to the area is considered to be precarious in its current fragile form it is advised that a temporary scaffold system be erected to span between side walls with a propping mechanism and protective sheeting installed.

7.6 Short Term Recommendations (1-2 years)

- 7.6.1 Demolish and rebuild arch above the main doorway.
- 7.6.2 Remove suitable depth of slag on ground bearing slab on 2nd floor and install a concrete slab. Ensure slab is tied into adjacent external walls to strengthen the external envelope of the structure.
- 7.6.3 A suitable engineering scheme should be developed for any internal access required at this stage. This should be designed by a suitably qualified engineer.

7.7 Long Term Recommendations (2-5 years)

- 7.7.1 Replace missing mortar and missing masonry on north elevation.
- 7.7.2 A permanent roof should be constructed to provide long term solution to preventing water ingress.
- 7.7.3 A suitable engineering scheme should be developed to prevent surface run off from entering the ground floor through the lower external walls.
- 7.7.4 Reconstruct stone jam and realign lintel on south elevation windows.
- 7.7.5 Replace propped lintel on south elevation with suitably designed member ensuring adequate bearing.
- 7.7.6 Replace missing mortar and missing masonry. Alternatively, do nothing and monitor on an annual basis.
- 7.7.7 Monitor missing mortar and missing masonry on north elevation.
- 7.7.8 Replace failed lintels internally with suitably designed member.

- 7.7.9 A full design for the refurbishment of the internal structure is required. Due to the sensitive nature of the building, existing members must be retained where possible. To be designed by a suitably qualified engineer ensuring stability of the external envelope is maintained.
- 7.7.10 Replace propped lintel on west elevation with suitably designed member ensuring adequate bearing.
- 7.7.11 Replace deflected lintel with suitably designed member ensuring adequate bearing.
- 7.7.12 Replace propped lintel on 2nd floor with suitably designed member ensuring adequate bearing.
- 7.7.13 Masonry repair works are recommended to the collapsed section of inner leaf on the gable end.
- 7.7.14 Monitor condition of temporary props. If functioning adequately keep in place until full remediation has been designed and implemented.
- 7.7.15 Due to lack of intrusive at hand access and based on failure through sheer at supports, allowance to be made for splicing of each joist.
- 7.7.16 Remove penetrating water and prevent surface run off from entering. Provide a method of protection or tank existing rooms.

8.0 Building F and Retaining Wall 17 – Furnace

8.1 Description

- 8.1.1 Building F is the old furnace and is of a natural stone masonry construction with regularly spaced steel stitching ties.
- 8.1.2 Retaining Wall 17 is the south elevation of Building F (Furnace).
- 8.1.3 It consists of a coursed natural stone masonry construction reinforced with steel ties.
- 8.1.4 The wall contains a brick arch formed opening which is considered likely to be an historical opening to the main furnace.
- 8.1.5 Inspection on upper section of wall conducted on foot.

8.2 Inspection Findings

- 8.2.1 BF1 – Keystone to original stone arch has dropped, and as a measure to address this, an additional arch has been constructed beneath it. The newly added arch seems to be structurally stable and secure.



Figure 71. Additional arch

8.2.2 BF2 – Vegetation growth around the exterior.



Figure 72. Typical vegetation growth

8.2.3 BF3 – Loose debris internally.



Figure 73. Loose debris

8.2.4 BF4 – Beehive halfway up in hole.



Figure 74. Beehive in hole

8.2.5 RW17A – Missing mortar 5-10% of total area.



Figure 75. Typical mortar loss

8.2.6 RW17D – Vegetation growth.



Figure 76. Vegetation growth

8.2.7 RW17E – The majority of the steel ties were noted to having missing cast iron clips which restrain the face plate to the tension rod making them redundant.

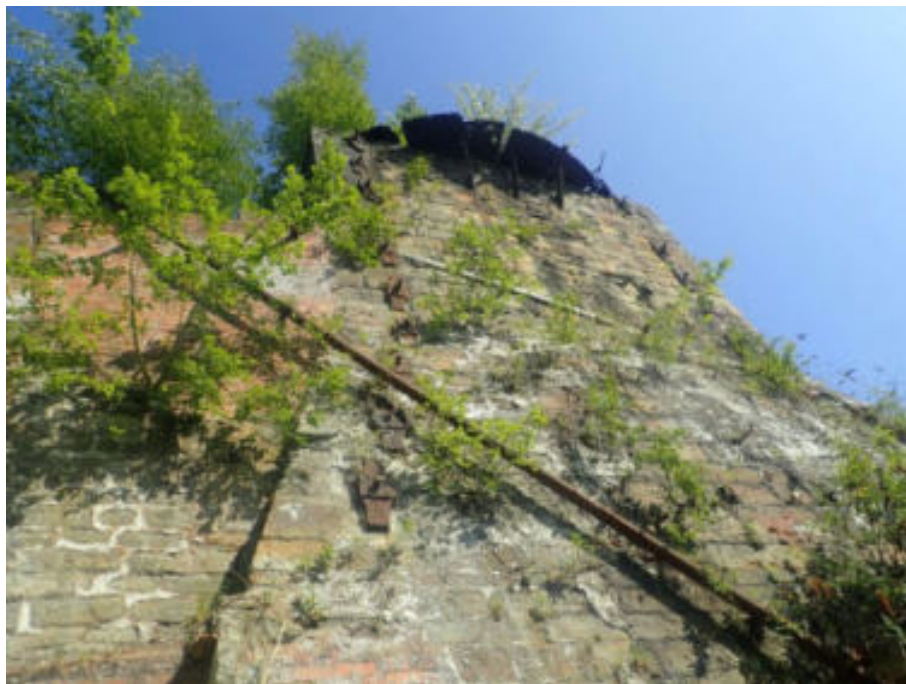


Figure 77. General view of ties

8.2.8 RW17E – Severe corrosion to the steel capping plates at the top of the furnace. Section loss and signs of fallen sections was noted creating a serious fall hazard.

8.2.9 BF5 – The point cloud survey and on foot inspection highlighted areas of corrosion and brittle fractures to the steel capping plates at the top of the furnace. Signs of historic dislodged and fallen pieces were also noted.

8.3 Discussion

8.3.1 Given that this structure is contained within the Scheduled Monument area, it is imperative to engage in discussions with Cadw (or the relevant heritage conservation authority) to ensure the use of appropriate materials for any preservation or repair work. These discussions are necessary to adhere to the strict guidelines and regulations in place to protect the historical significance of the site.

8.4 Conclusion

8.4.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall building to be in a fair structural condition.

8.4.2 Remedial works are however recommended to ensure long term structural performance of the building.

8.4.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

8.5 Emergency Works (within 12 months)

8.5.1 Remove vegetation to enable full inspection. Once the vegetation is cleared, it is crucial to address any voids or gaps that become visible. These voids should be promptly filled with appropriate materials to restore structural integrity.

8.5.2 Restrict access to furnace.

8.6 Short Term Recommendations (1-2 years)

8.6.1 Monitor arch on an annual basis.

8.6.2 Although there is no evidence of long term movement as a result of redundant ties and expansion of masonry due to the operation of the furnace is no longer a critical factor. At hand inspection of all plates and ties is recommended. If any defects are found, ultrasound scanning is recommended to determine the extent of corrosion. If plates are considered not at risk of falling then no further works are required. If plates are considered to be at risk of falling then they should be removed and replaced to match existing.

8.6.3 The steel capping plates at the top of the furnace should be removed and replaced suitable alternative, or made safe.

8.7 Long Term Recommendations (2-5 years)

8.7.1 Remove debris internally.

8.7.2 Remove beehive, it's essential to contact a professional beekeeper or a licensed pest control expert who specialises in bee removal.

8.7.3 Undertake repointing work on wall. Alternatively, undertake a programme of long term monitoring.

8.7.4 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

9.0 Steel Coke Chute

9.1 Description

- 9.1.1 This structure was outside the scope of the original inspection area therefore no structural condition assessment was undertaken.

9.2 Short Term Recommendations (1-2 years)

- 9.2.1 Restrict access to this area using pedestrian fencing as necessary.
- 9.2.2 Clear vegetation if required and undertake structural condition assessment.

10.0 Upshaft and Downshaft

10.1 Description

10.1.1 Access was not possible at the time of inspection therefore no structural condition assessment was undertaken.

10.2 Short Term Recommendations (1-2 years)

10.2.1 Restrict access to this area using pedestrian fencing as necessary. Ensure existing fencing is secure.

10.2.2 Clear vegetation and undertake structural condition assessment.

11.0 Railway Maintenance Pit

11.1 Description

11.1.1 The railway maintenance pit is a 920mm deep pit with a combination of stone and concrete retaining walls.

11.2 Inspection Findings

11.2.1 No signs of movement were noted and the retaining walls are considered to be in a fair condition.

11.2.2 Vegetation growth was noted.



Figure 78. Vegetation growth

11.2.3 A drainage inlet was noted. It was not clear if the inlet is functioning correctly at present.

11.3 Conclusion

11.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a fair structural condition.

11.3.2 Remedial works are however recommended to ensure long term structural performance of the building.

11.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

11.4 Emergency Works (within 12 months)

11.4.1 Remove vegetation to prevent damage to structure.

11.5 Short Term Recommendations (1-2 years)

11.5.1 None.

11.6 Long Term Recommendations (2-5 years)

11.6.1 Investigate the condition of the noted drainage inlet to determine if it is functioning correctly.

12.0 Retaining Wall A

12.1 Description

12.1.1 Retaining wall which is situated to the rear of Building A and is set back approximately 1.45m from the rear elevation of the building.

12.1.2 The wall is constructed for the first 1.70m from ground level in an inclined coursed natural masonry.

12.1.3 Although with localised variations in general an 850mm vertical coursed natural masonry wall sits above the inclined section with an approximate 1.40m coursed clay brick wall above this.

12.1.4 In total the maximum retained height is approximately 3.95m.

12.1.5 The wall retains a grassed flat area above which is overgrown with general vegetation, saplings, and the occasional mature tree.

12.2 Inspection Findings

12.2.1 RWA1 – Significant vegetation growth and moss growth on face of wall and at base.



Figure 79. Typical vegetation growth

12.2.2 RWA2 – Sapling and mature tree growth in retained areas above retaining wall.



Figure 80. Typical sapling and mature tree growth

12.2.3 RWA3 – Stability of wall is considered satisfactory.

12.3 Conclusion

12.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a fair structural condition.

12.3.2 Remedial works are however recommended to ensure long term structural performance of the wall.

12.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

12.4 Emergency Works (within 12 months)

12.4.1 Remove all vegetation and expose external face of all areas including stone and brick retaining elements.

12.4.2 Where possible remove all saplings and check status of mature trees for felling.

12.5 Short Term Recommendations (1-2 years)

12.5.1 Undertake regular inspection of the mortar pointing, renew as required.

12.5.2 Inspect wall for any mortar loss. Repointing works to be undertaken to any areas of mortar loss noted.

12.6 Long Term Recommendations (2-5 years)

12.6.1 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

13.0 Retaining Wall B

13.1 Description

- 13.1.1 Retaining wall B is situated to the side of Building A abutting Retaining Wall A.
- 13.1.2 The wall is constructed in coursed clay brick inclined at approximately 5 degrees.
- 13.1.3 The wall retained height reduces as it moves away from Retaining Wall A from a maximum of 3.95m to a minimum of 1.10m where it abuts Retaining Wall C.
- 13.1.4 The wall retains a grassed sloped area above which is overgrown with general vegetation, saplings and the occasional mature tree.
- 13.1.5 The general condition of the wall is good.

13.2 Inspection Findings

- 13.2.1 RWB1 – Significant vegetation growth and moss growth on face of wall and at base.



Figure 81. Typical moss and vegetation growth

13.2.2 RWB2 – Sapling and mature tree growth in retained areas above retaining wall.



Figure 82. Sapling and mature tree growth

13.2.3 RWB3 – Deterioration and desiccation of the mortar pointing.



Figure 83. Typical deterioration and desiccation to pointing

13.2.4 RWB4 – Localised area of dislodged brickwork due to vegetation growth.



Figure 84. Area of dislodged brickwork

13.2.5 RWB5 – Stability of wall is considered satisfactory.

13.3 Conclusion

13.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a fair structural condition.

13.3.2 Remedial works are however recommended to ensure long term structural performance of the wall.

13.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

13.4 Emergency Works (within 12 months)

13.4.1 Remove all vegetation and expose external face of all areas including stone and brick retaining elements.

13.4.2 Where possible remove all saplings and check status of mature trees for felling.

13.5 Short Term Recommendations (1-2 years)

13.5.1 Monitor loose mortar and implement remedial action as necessary.

13.5.2 Remove and replace loose / dislodged brickwork to face of wall. Approx. repair area 1.5m².

13.6 Long Term Recommendations (2-4 years)

13.6.1 Recommend long term racking out of loose mortar and replacement pointing throughout.

13.6.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

14.0 Retaining Wall C

14.1 Description

14.1.1 Retaining wall C is a continuation of Retaining Wall B.

14.1.2 The wall is constructed in coursed dry jointed natural masonry with significant areas of historical pointing loss.

14.1.3 The wall retained height is relatively consistent at approximately 1.10m.

14.1.4 The coping to the wall is formed of a natural stone cock and hen arrangement.

14.1.5 Due to significant vegetation growth in the immediate vicinity the entire extent of the wall could not be confirmed.

14.1.6 The wall retains a grassed sloped area above which is overgrown with general vegetation, saplings and the occasional mature tree.

14.2 Inspection Findings

14.2.1 RWC1 – Significant vegetation growth and moss growth on face of wall and at base.



Figure 85. Vegetation growth

14.2.2 RWC2 – Sapling and mature tree growth in retained areas above retaining wall.



Figure 86. Tree and sapling growth

14.2.3 RWC3 – Deterioration and desiccation of the mortar pointing.



Figure 87. Deteriorated mortar

14.2.4 RWC4 – Stability of wall is considered satisfactory.

14.3 Conclusion

14.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a fair structural condition.

14.3.2 Remedial works are however recommended to ensure long term structural performance of the wall.

14.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

14.4 Emergency Works (within 12 months)

14.4.1 Remove all vegetation and expose external face of all areas including stone and brick retaining element to ensure a full inspection of the wall.

14.4.2 Where possible remove all saplings and check status of mature trees for felling.

14.5 Short Term Recommendations (1-2 years)

14.5.1 Monitor loose mortar and implement remedial action as necessary.

14.6 Long Term Recommendations (2-5 years)

14.6.1 Recommend long term racking out of loose mortar and replacement pointing throughout.

14.6.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

15.0 Retaining Wall 1

15.1 Description

15.1.1 Coursed natural stone wall approx. retained height 1.5 - 1.8m.

15.1.2 At the top of the wall, there is a sloped embankment with a 1:1 incline.

15.1.3 Formed access path in front of wall.

15.2 Inspection Findings

15.2.1 RW1A – Displaced and loose masonry.



Figure 88. Typical displaced and loose masonry

15.2.2 RW1B – Mortar loss noted along the wall, approx. 10-20% of total area.

Figure 89. Typical mortar loss

15.2.3 RW1C – 300m lateral displacement resulting the wall entering a mode of failure.

Figure 90. Lateral displacement

15.2.4 RW1D – Vegetation growth.



Figure 91. Typical vegetation growth

15.2.5 RW1E – Remains of tree.



Figure 92. Remains of tree

15.2.6 RW1F – Section of wall has failed.



Figure 93. Failed section of wall

15.2.7 RW1G – Stability of wall is considered precarious.

15.3 Conclusion

15.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a deteriorating structural condition albeit further loss of stability or collapse is not expected in the short term.

15.3.2 Remedial works are therefore recommended to ensure long term structural performance of the wall.

15.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

15.4 Emergency Works (within 12 months)

15.4.1 Monitor area of displaced wall and relocate path to ensure safety of pedestrians.

15.4.2 Remove vegetation to enable full inspection.

15.4.3 Monitor failed section of wall and relocate path to ensure safety of pedestrians.

15.5 Short Term Recommendations (1-2 years)

- 15.5.1 Remove and replace loose or dislodged masonry and undertake masonry repair on wall.
- 15.5.2 Remove the affected area of displaced wall and locally rebuild.
- 15.5.3 Remove remains of tree and void to be repaired.
- 15.5.4 Undertake masonry repair work on wall on failed section of wall.

15.6 Long Term Recommendations (2-5 years)

- 15.6.1 Undertake repointing work on wall.
- 15.6.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

16.0 Retaining Wall 2

16.1 Description

16.1.1 Coursed natural stone wall with sections of brick infill.

16.1.2 The total height of wall ranges from 1.5 – 5.0m.

16.1.3 Standard steel handrail safety parapet noted on the top of wall.

16.2 Inspection Findings

16.2.1 RW2A – Loose and missing masonry.



Figure 94. Typical loose and missing masonry

16.2.2 RW2B – Mortar loss.



Figure 95. Typical mortar loss

16.2.3 RW2C – Lateral displacement.



Figure 96. Lateral displacement

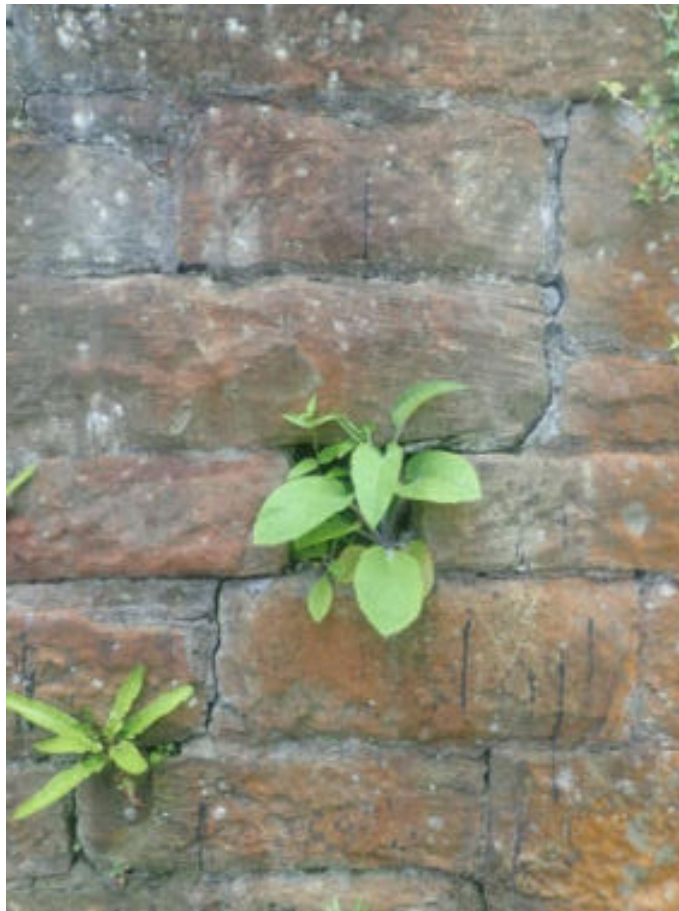
16.2.4 RW2D – Diagonal fracture 5-10mm in width.

Figure 97. Diagonal fracture

16.2.5 RW2E – Vegetation growth.



Figure 98. Typical vegetation growth

16.2.6 RW2F – Remains of tree.



Figure 99. Tree

16.3 Conclusion

16.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a fair structural condition and stability of wall is considered satisfactory.

16.3.2 Remedial works are however recommended to ensure long term structural performance of the wall.

16.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

16.4 Emergency Works (within 12 months)

16.4.1 None

16.5 Short Term Recommendations (1-2 years)

16.5.1 Undertake masonry repairs on loose and missing masonry.

16.5.2 Monitor displacement on an annual basis.

16.5.3 Install a tell-tale crack monitor on diagonal fracture and monitor annually.

16.5.4 Remove vegetation to enable full inspection.

16.5.5 Remove remains of tree and void to be repaired.

16.6 Long Term Recommendations (2-5 years)

16.6.1 Undertake repointing work on wall.

16.6.2 Undertake masonry repair on displaced section of wall.

16.6.3 Undertake masonry repair such as stitching to diagonal fracture. Alternatively, install a tell-tale crack monitor on fracture and monitor annually.

16.6.4 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

17.0 Retaining Wall 3

17.1 Description

- 17.1.1 Retaining Wall 3 is constructed of coursed clay brickwork and historically was used as part of a platform associated with the adjacent rail line.
- 17.1.2 The wall generally retains the unmade platform above and is approximately ranging from 1.35m and 1.80m in total retained height.
- 17.1.3 The rail line is located immediately fronting the wall at lower level.
- 17.1.4 The brick wall measures approximately 360mm thick, although it is expected to be a stepped rear gravity retaining wall.
- 17.1.5 The coping is formed using a soldier course arrangement.

17.2 Inspection Findings

- 17.2.1 RW3-1 – There is a consistent lean of approximately 3 degrees from the vertical towards the rail track. The lean is visibly noticeable but the wall's centre of gravity is still contained within its middle third.



Figure 100. Leaning wall

17.2.2 RW3-2 – Dislodged coping in localised areas due to vegetation growth both on the wall, in front of the wall and within the retained platform above.



Figure 101. Typical dislodged coping

17.2.3 RW3-3 – Evidence of effervescent at lower level of the exposed wall face indicative of sulphate leaching as a result of a lack of weep holes.



Figure 102. Typical effervescent

17.2.4 RW3-4 – Vertical crack measuring between 15mm - 25mm at wall return location as a result of the leaning action of the wall.



Figure 103. Vertical crack

17.2.5 RW3-5 – Full height diagonal crack in mortar joints as a direct result of a mature tree directly behind the wall at high level and as a result of no formal movement joints being constructed within the wall to counter thermal movement.



Figure 104. Diagonal crack

17.3 Conclusion

- 17.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a fair structural condition.
- 17.3.2 Remedial works are however recommended to ensure long term structural performance of the wall.
- 17.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

17.4 Emergency Works (within 12 months)

- 17.4.1 None

17.5 Short Term Recommendations (1-2 years)

- 17.5.1 No remedial action at present but further movement would result in the centre of gravity leaving its middle third and the wall entering a mode of failure.
- 17.5.2 Remove vegetation and remove and replace loose coping bricks. Approx. 4m².
- 17.5.3 Clean and monitor effervescent.
- 17.5.4 Monitor vertical crack and implement remedial action as necessary.
- 17.5.5 Remove tree and introduce a crack stitching repair using heli fix or equal approved at every other mortar course.

17.6 Long Term Recommendations (2-5 years)

- 17.6.1 Consider introducing additional weep holes through percussive drilling 50mm weep vents through the lower level weep holes at 2.5m centres.
- 17.6.2 Introduce stitching at the return at max. 200mm vertical centres using Heli fix or equal approved to provide adequate restraint. Alternatively, do nothing, monitor and implement remedial action as necessary.

18.0 Retaining Wall 4

18.1 Description

18.1.1 Retaining wall 4 forms an historical platform which houses two brick towers that is assumed to have housed apparatus associated with lifting or watering engines or goods to the previous adjoining track.

18.1.2 Although removed, the rail track historically was sited in front of the wall at the lower level.

18.1.3 The wall in its majority retains a height of 1.80m of unmade platform with a cast in-situ ground bearing concrete slab placed centrally between the two brick towers.

18.1.4 The wall demonstrates no leaning or fractures.

18.2 Inspection Findings

18.2.1 RW4A – Displaced and loose masonry to localised areas as a result of vegetation growth.



Figure 105. Typical displaced and loose masonry

18.2.2 RW4B – Loose coping at corner of wall.

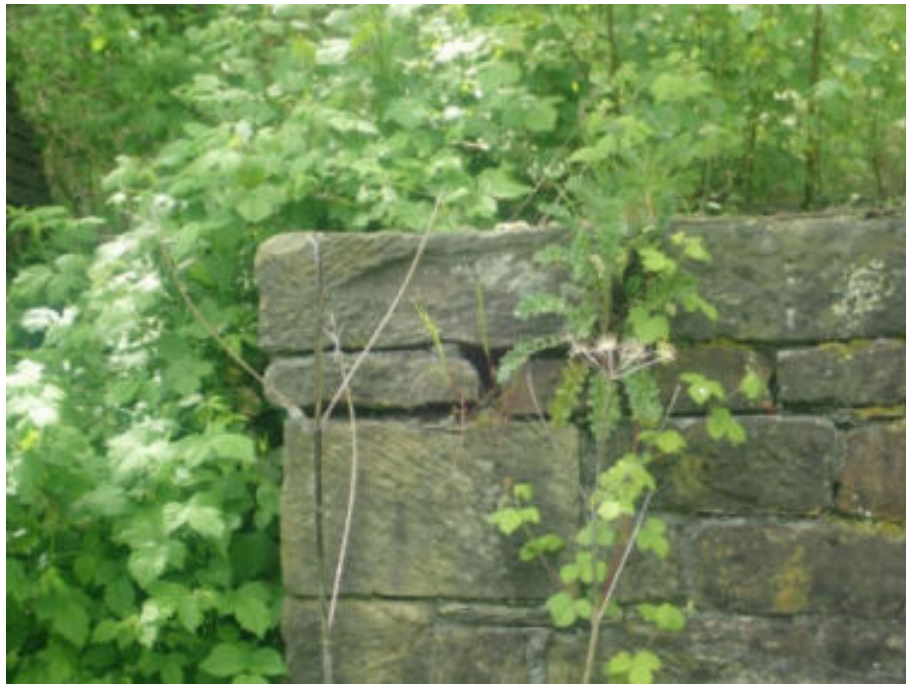


Figure 106. Loose coping

18.2.3 RW4C – Vegetation growth.



Figure 107. Typical vegetation growth

18.3 Conclusion

18.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a fair structural condition and stability of wall is considered satisfactory.

18.3.2 Remedial works are however recommended to ensure long term structural performance of the wall.

18.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

18.4 Emergency Works (within 12 months)

18.4.1 Remove vegetation to enable full inspection.

18.5 Short Term Recommendations (1-2 years)

18.5.1 Undertake masonry repair on wall and copings.

18.6 Long Term Recommendations (2-5 years)

18.6.1 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

19.0 Retaining Wall 5

19.1 Description

19.1.1 Coursed brickwork retaining wall adjacent to the rail inspection pit.

19.1.2 The wall retains approximately 750mm and as a result of vegetation growth, impact and unsuitable construction method, the wall has failed.

19.2 Inspection Findings

19.2.1 RW5A – Failed brick retaining wall.



Figure 108. Failed wall

19.3 Conclusion

19.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a poor structural condition.

19.3.2 Remedial works are recommended to ensure long term structural performance of the wall.

19.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

19.4 Emergency Works (within 12 months)

19.4.1 None.

19.5 Short Term Recommendations (1-2 years)

19.5.1 Dismantle and rebuild wall. Alternatively, remove the wall in its entirety and grade the area back.

19.6 Long Term Recommendations (2-5 years)

19.6.1 None.

20.0 Retaining Wall 6

20.1 Description

20.1.1 Retaining Wall 6 is constructed with a combination of coursed natural stone and coursed brickwork.

20.1.2 The brickwork section is common bond with full headers every 4th or 2nd course.

20.1.3 The wall originates behind the Agents House at the southeast corner where a combination of natural bedrock and placed excavated bedrock is located.

20.1.4 The wall extends easterly then northerly until approximately parallel with the north elevation of the Agents House where it changed from coursed natural stone to brickwork. It then extends easterly again until butting up against Retaining Wall 7.

20.2 Inspection Findings

20.2.1 RW6A – Historic brick repair.



Figure 109. Historic brick repair

20.2.2 RW6B – Vegetation growth.



Figure 110. Typical vegetation growth

20.2.3 RW6C – Misaligned and partially collapsed area of natural stone retaining wall to rear of the Agent's House due to vegetation growth.



Figure 111. Partially collapsed wall

20.2.4 RW6D – Debonded and dislodged brickwork due to vegetation growth on face of wall and at head of wall.



Figure 112. Debonded and dislodged brickwork

20.2.5 RW6E – Section of brick retaining wall which abuts Retaining Wall 7 vertically leans outward by approximately 7 degrees. This lean is attributed to the growth of a mature tree located behind the wall.



Figure 113. Leaning section of wall

20.2.6 RW6F – Stability of wall is considered satisfactory.

20.3 Conclusion

20.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a fair structural condition.

20.3.2 Remedial works are however recommended to ensure long term structural performance of the wall.

20.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

20.4 Emergency Works (withing 12 months)

20.4.1 Remove vegetation and tree to enable full structure review of wall and repair top of wall following the removal of the vegetation.

20.5 Short Term Recommendations (1-2 years)

20.5.1 Repair or rebuild approximately 3.5m² of natural stone wall, note that the area is very constrained in working space due to proximity to rear of Agent's house.

20.5.2 Repair or rebuild the upper 500mm of the brick retaining wall where it has debonded and dislodged brickwork. Approximate are of repair 1.5m².

20.5.3 Monitoring of the leaning section of wall is recommended on an annual basis.

20.6 Long Term Recommendations (2-5 years)

20.6.1 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

21.0 Retaining Wall 7

21.1 Description

21.1.1 Retaining Wall 7 continues adjacent to the path downslope from the Agent's house.

21.1.2 It is formed of coursed natural stone and indicative of the historical stone wall construction found elsewhere on site.

21.1.3 The wall retains, in the majority, approximately 1.75m and contains a cock and hen coping arrangement.

21.1.4 Other than localised areas of repair, the wall is considered to be in a sound structural condition.

21.2 Inspection Findings

21.2.1 RW7A – Diagonal fracture within mortar joints.



Figure 114. Diagonal fracture

21.2.2 RW7B – Vegetation growth.



Figure 115. Typical vegetation growth

21.2.3 RW7C – Mature tree.



Figure 116. Mature tree

21.2.4 RW7D – Missing mortar 5-10% of total area.

Figure 117. Typical mortar loss

21.2.5 RW7E – Loose copings.

Figure 118. Typical loose copings

21.3 Conclusion

21.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a fair structural condition.

21.3.2 Remedial works are however recommended to ensure long term structural performance of the wall.

21.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

21.4 Emergency Works (within 12 months)

21.4.1 Remove vegetation to enable full structure review of wall.

21.4.2 Remove tree. Once the vegetation is cleared, it is crucial to address any voids or gaps that become visible. These voids should be promptly filled with appropriate materials to restore structural integrity.

21.5 Short Term Recommendations (1-2 years)

21.5.1 Undertake repointing work on wall approximately 5m².

21.5.2 Monitor movement of wall around removed wall on an annual basis.

21.5.3 Undertake repair work on copings.

21.6 Long Term Recommendations (2-5 years)

21.6.1 None.

22.0 Retaining Wall 8

22.1 Description

22.1.1 Retaining Wall 8 continues adjacent to the path downslope from the Agent's house.

22.1.2 It is formed of coursed natural stone and indicative of the historical stone wall construction found elsewhere on site. However, at a distance of 13 meters, the wall has experienced failure, necessitating the addition of inclined brickwork in front of it.

22.1.3 This wall serves to retain an elevation ranging from 0 to 3 meters. Part of the wall has failed and is currently in a state of disrepair.

22.1.4 For reference purposes, Chainage 0m is established at the top of the track, which corresponds to the easternmost point of the wall

22.2 Inspection Findings

22.2.1 RW8A – The first 6m has displaced horizontally at mid height by approx. 60mm. This section of wall is considered to have failed.



Figure 119. Displaced wall

22.2.2 RW8B – Vegetation growth. Mature tree at approx. Ch.15m at risk of causing further movement or localised collapse to wall.



Figure 120. Typical vegetation growth

22.2.3 RW8C – Missing masonry at base of access steps.



Figure 121. Missing masonry

22.3 Conclusion

22.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a deteriorating structural condition, where localised area of the wall has failed and is currently in a state of disrepair.

22.3.2 Remedial works are however recommended to ensure long term structural performance of the wall.

22.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

22.4 Emergency Works (withing 12 months)

22.4.1 Tree at approx. Ch. 15m to be removed.

22.5 Short Term Recommendations (1-2 years)

22.5.1 Demolish and replace wall. Alternatively, remove wall and grade back on retaining soil.

22.5.2 Localised repair to brickwork corner approx. 1.5m².

22.6 Long Term Recommendations (2-5 years)

22.6.1 None.

23.0 Retaining Wall 9

23.1 Description

23.1.1 Retaining Wall 9 continues from retaining wall 8.

23.1.2 It is formed of coursed natural stone and indicative of the historical stone wall construction found elsewhere on site.

23.1.3 This wall serves to retain an elevation ranging up to 3 meters.

23.1.4 The wall demonstrates no leaning or fractures and is considered to be in a good structural condition.

23.2 Inspection Findings

23.2.1 RW9A – Mature Tree noted on top of wall.



Figure 122. Mature tree

23.2.2 RW9B – Vegetation growth.



Figure 123. Vegetation growth

23.2.3 RW9C – Stability of wall is considered satisfactory.

23.3 Conclusion

23.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a fair structural condition.

23.3.2 Remedial works are however recommended to ensure long term structural performance of the wall.

23.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

23.4 Emergency Works (withing 12 months)

23.4.1 None.

23.5 Short Term Recommendations (1-2 years)

23.5.1 Remove tree and undertake masonry repair on void s created. Approx. 1.5m² repair.

23.5.2 Remove vegetation.

23.6 Long Term Recommendations (2-5 years)

23.6.1 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

24.0 Retaining Wall 10 – Foundry Charging Wall

24.1 Description

24.1.1 Retaining Wall 10 ties into the side of Retaining Wall 11.

24.1.2 It is formed of coursed brickwork and it approximately 1.9m high and retains the top section of the embankment.

24.1.3 There is a sloped embankment below the base of the wall.

24.2 Inspection Findings

24.2.1 RW10A – Mortar loss 10-20% of total area.

24.2.2 RW10B and RW10C – Vegetation growth and remains of tree noted on wall



Figure 124. General view of wall showing mortar loss, vegetation growth and tree

24.2.3 RW10D – Stability of wall is considered satisfactory.

24.3 Discussion

24.3.1 Given that this structure is contained within the Scheduled Monument area, it is imperative to engage in discussions with Cadw (or the relevant heritage conservation authority) to ensure the use of appropriate materials for any preservation or repair work. These discussions are necessary to adhere to the strict guidelines and regulations in place to protect the historical significance of the site.

24.4 Conclusion

24.4.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a fair structural condition.

24.4.2 Remedial works are however recommended to ensure long term structural performance of the wall.

24.4.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

24.5 Emergency Works (within 12 months)

24.5.1 Remove vegetation to enable full inspection.

24.5.2 Remove remains of tree and repair wall.

24.6 Short Term Recommendations (1-2 years)

24.6.1 None.

24.7 Long Term Recommendations (2-5 years)

24.7.1 Undertake repointing work on wall.

24.7.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

25.0 Retaining Wall 11 – Foundry Charging Wall

25.1 Description

25.1.1 Retaining Wall 11 retains approx. 5m and is a continuation of Retaining Wall 10.

25.1.2 It is of a coursed dry jointed natural stone construction and features an approx. 5 degree incline to the face.

25.1.3 Evidence of historical pointing with sand and cement mortar was noted.

25.1.4 Inspection on upper section of wall conducted on foot. From visual inspection stability of wall is considered satisfactory.

25.2 Inspection Findings

25.2.1 RW11A – Mortar loss 10-20% of total area.



Figure 125. Typical mortar loss

25.2.2 RW11B – Vegetation growth.



Figure 126. Typical vegetation growth

25.2.3 RW11C – Missing masonry noted on upper section.



Figure 127. Missing masonry

25.2.4 RW11E – Stability of wall is considered satisfactory.

25.3 Discussion

25.3.1 Given that this structure is contained within the Scheduled Monument area, it is imperative to engage in discussions with Cadw (or the relevant heritage conservation authority) to ensure the use of appropriate materials for any preservation or repair work. These discussions are necessary to adhere to the strict guidelines and regulations in place to protect the historical significance of the site.

25.4 Conclusion

25.4.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a fair structural condition.

25.4.2 Remedial works are however recommended to ensure long term structural performance of the wall.

25.4.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

25.5 Emergency Works (within 12 months)

25.5.1 None.

25.6 Short Term Recommendations (1-2 years)

25.6.1 Remove vegetation to enable full inspection.

25.6.2 Undertake masonry repair work on upper section of wall, approx. 2m².

25.7 Long Term Recommendations (2-5 years)

25.7.1 Undertake repointing work on wall.

25.7.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

26.0 Retaining Wall 12 – Foundry Charging Wall

26.1 Description

26.1.1 Retaining Wall 12 is a continuation of Retaining Wall 11 with additional historical strengthening on the front elevation. This consists of RSJs with a mass concrete fill between.

26.2 Inspection Findings

26.2.1 RW12A – Isolated areas of minor pitting were noted to the steel.



Figure 128. Typical minor pitting to steel

26.2.2 RW12B – Deterioration in the form of scaling was noted to the concrete with up to 100mm depth loss.



Figure 129. Typical concrete scaling

26.2.3 RW12D – Vegetation growth.



Figure 130. Typical vegetation growth

26.2.4 RW12E – Stability of wall is considered satisfactory.

26.3 Discussion

26.3.1 Given that this structure is contained within the Scheduled Monument area, it is imperative to engage in discussions with Cadw (or the relevant heritage conservation authority) to ensure the use of appropriate materials for any preservation or repair work. These discussions are necessary to adhere to the strict guidelines and regulations in place to protect the historical significance of the site.

26.4 Conclusion

26.4.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a fair structural condition.

26.4.2 Remedial works are however recommended to ensure long term structural performance of the wall.

26.4.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

26.4.4 Given that this structure is contained within the Scheduled Monument area, it is imperative to engage in discussions with Cadw (or the relevant heritage conservation authority) to ensure the use of appropriate materials for any preservation or repair work. These discussions are necessary to adhere to the strict guidelines and regulations in place to protect the historical significance of the site.

26.5 Emergency Works (within 12 months)

26.5.1 None.

26.6 Short Term Recommendations (1-2 years)

26.6.1 Apply protective coating to exposed areas of steel beams.

26.6.2 Undertake concrete repair work by resurfacing or overlaying the affected areas. Alternatively, an appropriate protective coating, such as a Parex or Sika product, can be applied to safeguard the exposed concrete surfaces. This protective

coating will shield the concrete from exposure, prevent carbonation, and inhibit the corrosion of embedded steelwork within the concrete.

26.6.3 Remove vegetation.

26.7 Long Term Recommendations (2-5 years)

26.7.1 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

27.0 Retaining Wall 13 – Foundry Charging Wall

27.1 Description

27.1.1 Retaining Wall 13 is a continuation of Retaining Walls 11 and 12, and it is constructed using the same method as Retaining Wall 11. The wall features coursed dry jointed natural stone construction with an approximate 5 degree incline on its face.

27.1.2 Retained height is approx. 8m.

27.1.3 Inspection on upper section of wall conducted on foot.

27.2 Inspection Findings

27.2.1 RW13A – Mortar loss 10-20%.



Figure 131. Typical mortar loss

27.2.2 RW13 – Vegetation growth.



Figure 132. Typical vegetation growth

27.2.3 RW13C – Dislodged and missing masonry noted on upper parapet section of the wall due to historical vegetation growth and instability within the parapet.



Figure 133. Dislodged and missing masonry

27.2.4 RW13D – The parapet section of the wall which measures approximately 500mm in height is noticeably leaning forward due to historic increase of retained levels behind.

27.2.5 RW13F – Stability and condition of wall is considered satisfactory.

27.3 Discussion

27.3.1 Given that this structure is contained within the Scheduled Monument area, it is imperative to engage in discussions with Cadw (or the relevant heritage conservation authority) to ensure the use of appropriate materials for any preservation or repair work. These discussions are necessary to adhere to the strict guidelines and regulations in place to protect the historical significance of the site.

27.4 Conclusion

27.4.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a fair structural condition.

27.4.2 Remedial works are however recommended to ensure long term structural performance of the wall.

27.4.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

27.5 Emergency Works (within 12 months)

27.5.1 Remove vegetation to enable full inspection.

27.6 Short Term Recommendations (1-2 years)

27.6.1 Restrict access to top of wall via temporary fencing.

27.7 Long Term Recommendations (2-5 years)

27.7.1 Undertake repointing work on wall.

27.7.2 Undertake masonry repair work on upper parapet section of wall, approximately 5m².

- 27.7.3 Reduce levels of the ground behind the parapet and undertake localised repairs and consolidation of loose masonry. Alternatively, demolish and rebuild top section of wall.
- 27.7.4 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

28.0 Retaining Wall 14

28.1 Description

28.1.1 Retaining Wall 14 runs parallel with the Pattern Shop.

28.1.2 The first 4m is of a reinforced concrete construction with a thickness of approx. 350mm. The remainder of the wall is then constructed of historic dry jointed coursed masonry wall.

28.1.3 At Ch 16m as the retained height increases, historical brick inclined buttressing has been included for an approximate length of 30m to consolidate and stabilise the wall.

28.2 Inspection Findings

28.2.1 RW14A – In the vicinity of the drainage channel at Ch10m, there is an area with slight bulging and leaning observed. Additionally, loose masonry units and masonry unit fractures have been noted. The movement in this area is assessed as historical and not considered to be currently progressing.



Figure 134. Bulging and leaning wall



Figure 135. Typical masonry fracture

28.2.2 RW14B – Vegetation growth. Vegetation causing movement in the wall.



Figure 136. Typical vegetation growth

28.2.3 RW14C – Missing and loose masonry.



Figure 137. Dislodged and missing masonry

28.2.4 RW14D – Fractures units at corner of wall, approx. 1m above G.L. Units have also displaced.

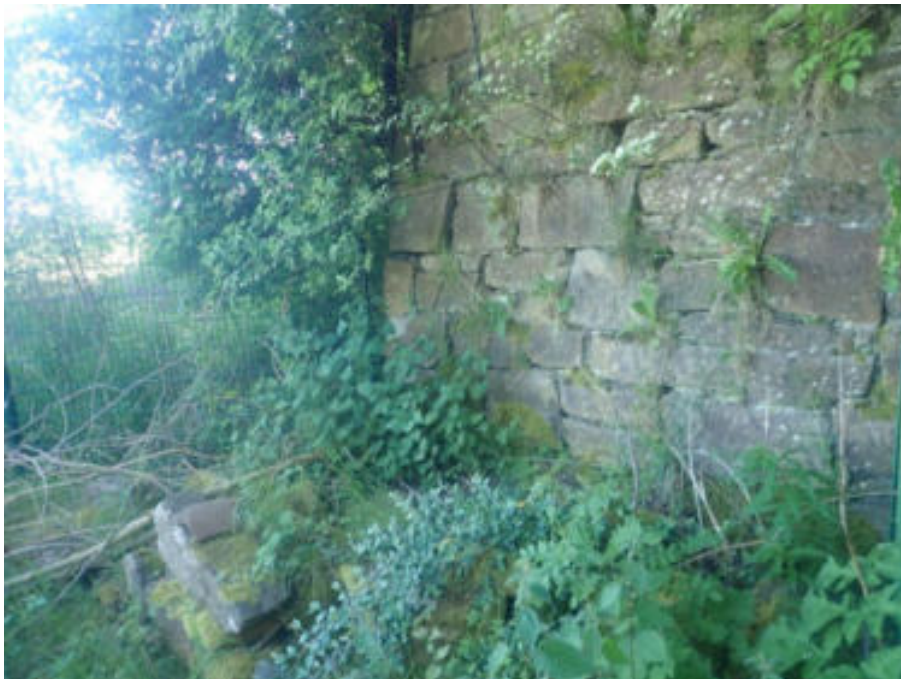


Figure 138. Fractured and displaced units

28.2.5 RW14E – Stability of wall is considered satisfactory.

28.3 Conclusion

- 28.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a fair structural condition.
- 28.3.2 Remedial works are however recommended to ensure long term structural performance of the wall.
- 28.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

28.4 Emergency Works (withing 12 months)

- 28.4.1 Monitor bulging and movement on an annual basis.
- 28.4.2 Remove vegetation to enable full inspection. Once the vegetation is cleared, it is crucial to address any voids or gaps that become visible. These voids should be promptly filled with appropriate materials to restore structural integrity. A discussion should be undertaken with the design team ecologist as significant mature trees are present in the retained graded bank above the wall. Their removal may increase stability of the wall or halt further deterioration, however, may lead to instability of the retained graded bank above.
- 28.4.3 Monitor fracture at corner on an annual basis.

28.5 Short Term Recommendations (1-2 years)

- 28.5.1 Undertake masonry repair work locally around area of bulging and leaning, approximately 5m².
- 28.5.2 Undertake masonry repair work approximately 10m² in entire length.
- 28.5.3 Undertake masonry repair work to fracture at corner, approximately 2m².

28.6 Long Term Recommendations (2-4 years)

- 28.6.1 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

29.0 Retaining Wall 15 – Foundry

29.1 Description

29.1.1 Retaining Wall 15 runs parallel to Room 6 and is constructed of coursed natural stone construction.

29.1.2 Retaining Wall 15 does not function as a retaining wall, it forms the southern elevation of Room 6 and stands at an approximate total height of 7m.

29.1.3 The wall forms the physical boundary between Room 6 and the former foundry building which is now removed.

29.1.4 Inspection on upper section of wall conducted on foot. From visual inspection stability of wall is considered satisfactory.

29.2 Inspection Findings

29.2.1 RW15A – Missing mortar 50%.



Figure 139. Typical mortar loss

29.2.2 RW15B – Corrosion noted on steel structure members.



Figure 140. Typical corrosion to steel

29.2.3 RW15C – Missing and loose masonry.



Figure 141. Missing and loose masonry

29.2.4 RW15D – Spalling noted on brick work.

Figure 142. Spalling to brickwork

29.2.5 RW15F – Perished render 90%.

Figure 143. Perished render

29.2.6 RW15G – Stability of wall is considered satisfactory.

29.3 Conclusion

29.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a fair structural condition.

29.3.2 Remedial works are however recommended to ensure long term structural performance of the wall.

29.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

29.4 Emergency Works (within 12 months)

29.4.1 None.

29.5 Short Term Recommendations (1-2 years)

29.5.1 Undertake repointing work on wall.

29.5.2 Apply protective coating on steel members removing any loose or de-laminated steel.

29.5.3 Undertake masonry repair work approx. 3.5m² total.

29.6 Long Term Recommendations (2-5 years)

29.6.1 Re-render elevation. Alternatively, remove loose and de-bonded render and if required re-point perished areas.

29.6.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

30.0 Retaining Wall 16 – Foundry

30.1 Description

30.1.1 Retaining Wall 16 is a continuation of Retaining Wall 15 and back of Room 7.

30.1.2 The wall does not function as a retaining wall historically it formed the front elevation of the former foundry building and is currently free standing.

30.1.3 It is constructed the same as Retaining Wall 15 with a coursed natural stone masonry construction.

30.1.4 It has a total height of approx. 5.5m.

30.1.5 Inspection on upper section of wall conducted on foot.

30.2 Inspection Findings

30.2.1 RW16A – Missing mortar 5-10% of total area.



Figure 144. Typical mortar loss

30.2.2 RW16B – Various corroded historical steel members embedded in wall associated with previous building including structural steel members, service ducts etc.



Figure 145. Typical corrosion to steel

30.2.3 RW16C – Localised areas of spalling noted on brick work infill panels and high level parapet.



Figure 146. Typical spalling to brickwork



Figure 147. Spalling to brickwork

30.2.4 RW16F – Temporary timber propping.



Figure 148. Temporary timber propping

30.2.5 RW16G – Localised areas of missing masonry units, expected with a historic wall of this nature.



Figure 149. Typical missing masonry

30.2.6 RW16H – Fragile timber temporary mezzanine. Deteriorated timber joists and posts which form part of a temporary mezzanine abutting the furnace.



Figure 150. General view of temporary mezzanine

30.2.7 RW16J – The opening in the northern section of Retaining Wall 16, adjacent to the furnace, has been constructed using a back-to-back arrangement of steel PFC (Parallel Flange Channel) for the majority of the wall width. However, the precast concrete blockwork on the inner face is unsupported. Unfortunately, the steel PFCs have suffered significant deterioration due to corrosion and are displaying excessive deflection, leading to associated cracking in the masonry wall above. It appears that the previous lintel forming the inner face has deteriorated, leaving approximately 40% of the wall width unsupported. Immediate attention and remedial action are required to address this structural issue.



Figure 151. Corroded PFCs and unsupported blockwork

30.2.8 RW16K – Perished render 90% of total area.



Figure 152. Perished render

30.3 Conclusion

30.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a fair structural condition.

30.3.2 Remedial works are however recommended to ensure long term structural performance of the wall.

30.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

30.4 Emergency Works (within 12 months)

30.4.1 None.

30.5 Short Term Recommendations (1-2 years)

30.5.1 Apply protective coating on steel members following removal of any delaminated steel. Alternatively, cut or remove the previous steel members which are not acting in any structural capacity repairing the masonry wall voids left following their removal.

- 30.5.2 Install a tell-tale crack monitor on fracture and monitor annually.
- 30.5.3 Undertake replacement or repair of timber members of mezzanine. Alternatively, remove the temporary mezzanine in its entirety.
- 30.5.4 Replace structural members above opening with suitably designed members. Install a new member to support the inner face of masonry. Undertake a masonry repair to the fractured wall above, approx. 2m². Alternatively, remove the opening by blocking it up.

30.6 Long Term Recommendations (2-5 years)

- 30.6.1 Undertake repointing work on wall. Alternatively, undertake a programme of long term monitoring.
- 30.6.2 Undertake masonry repair work on fracture by stitching and re-pointing.
- 30.6.3 Timber propping considered to be in a satisfactory condition. It is recommended that a long term maintenance and inspection regime is implemented.
- 30.6.4 Undertake masonry repair work to areas of missing masonry. Approx. 1m².
- 30.6.5 Re-render external elevation. Alternatively, carefully remove loose or debonded render and if required apply re-pointing to stone substrate.
- 30.6.6 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

31.0 Retaining Wall 18 – Foundry

31.1 Description

31.1.1 Retaining Wall 18 is a continuation of Retaining Wall 17 and consists of a combination of coursed natural stone masonry and coursed brick masonry.

31.1.2 This wall contains mass masonry buttresses similar to the remainder of the other blast walls on the site.

31.1.3 Inspection on upper section of wall conducted on foot

31.2 Inspection Findings

31.2.1 RW18A – Missing mortar 5-10% of total area.



Figure 153. Typical mortar loss

31.2.2 RW18C – Vegetation growth.



Figure 154. Vegetation growth

31.2.3 RW18E – Stability of wall considered to be satisfactory.

31.3 Conclusion

31.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a fair structural condition.

31.3.2 Remedial works are however recommended to ensure long term structural performance of the wall.

31.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

31.4 Emergency Works (within 12 months)

31.4.1 None.

31.5 Short Term Recommendations (1-2 years)

31.5.1 Remove vegetation to enable full inspection. Once the vegetation is cleared, it is crucial to address any voids or gaps that become visible. These voids should be promptly filled with appropriate materials to restore structural integrity.

31.6 Long Term Recommendations (2-5 years)

31.6.1 Undertake repointing work on wall. Alternatively, undertake a programme of long term monitoring.

31.6.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

32.0 Retaining Wall 19 – Foundry

32.1 Description

32.1.1 Retaining Wall 19 is a continuation of Retaining Wall 18 and consists of a coursed natural stone masonry construction.

32.1.2 The wall also forms the front elevation of Room 1.

32.1.3 The total height is approx. 5.5m.

32.1.4 There is an additional room of which previous access was gained through Retaining Wall 19, however the room brick arch access has been blocked and no access is available.

32.2 Inspection Findings

32.2.1 RW19A – Localised areas of missing masonry units, which is expected from wall of this type and age.



Figure 155. Typical missing masonry

32.2.2 RW19B – Mortar loss. Less significant in pointing of natural stone units however much more prominent in the brickwork infill, approximately 60% of total area.



Figure 156. Typical mortar loss

32.2.3 RW19C – General weathering of external render.



Figure 157. Typical weathered render

32.2.4 RW19D – Vegetation growth.



Figure 158. Typical vegetation growth

32.2.5 RW19E – Access should be made available for the inspection of the non accessible room behind Retaining Wall 19.

32.2.6 RW19F – Stability of wall is considered satisfactory.

32.3 Conclusion

32.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a deteriorating structural condition. However, there are no indications of sudden failure at this time.

32.3.2 Remedial works are however recommended to ensure long term structural performance of the wall.

32.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

32.4 Emergency Works (within 12 months)

32.4.1 None.

32.5 Short Term Recommendations (1-2 years)

- 32.5.1 Undertake masonry repair work approximately 1m².
- 32.5.2 Undertake repointing work on wall.
- 32.5.3 Remove vegetation to enable full inspection.
- 32.5.4 Access should be made available for the inspection of the non accessible room behind RW19.

32.6 Long Term Recommendations (2-5 years)

- 32.6.1 Re-render the external elevation. Alternatively, carefully remove loose or debonded render and if required apply re-pointing to stone substrate.
- 32.6.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

33.0 Retaining Wall 20 – Foundry

33.1 Description

33.1.1 Retaining Wall 20 is a continuation of Retaining Wall 19 and forms the front elevation of Room 2, Room 3 and the stairs within Room 3.

33.1.2 It consists of a combination of coursed natural stone masonry and coursed brick masonry.

33.1.3 All openings are formed with brick arches with the arch to Room 1 having been blocked up with brickwork leaving a standard door opening centrally.

33.1.4 A mass masonry buttress is located between the two arch openings into Room 3 and between the arch opening to Room 3 and the Stairs.

33.1.5 Inspection on upper section of wall conducted on foot.

33.2 Inspection Findings

33.2.1 RW20A – Missing mortar 5-10% of total area.



Figure 159. Typical mortar loss

33.2.2 RW20B – Localised areas of missing masonry units, expected with a historic wall of this nature. Approx. 5 - 10% of total area.



Figure 160. Typical missing masonry

33.2.3 RW20D – Vegetation growth.



Figure 161. Typical vegetation growth

33.2.4 RW20E – Stability of wall and ties are considered to be satisfactory.

33.3 Conclusion

33.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a fair structural condition.

33.3.2 Remedial works are however recommended to ensure long term structural performance of the wall.

33.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

33.4 Emergency Works (within 12 months)

33.4.1 None.

33.5 Short Term Recommendations (1-2 years)

33.5.1 Undertake masonry repairs works on areas of missing masonry.

33.5.2 Remove vegetation to enable full inspection. Once the vegetation is cleared, it is crucial to address any voids or gaps that become visible. These voids should be promptly filled with appropriate materials to restore structural integrity.

33.6 Long Term Recommendations (2-5 years)

33.6.1 Undertake repointing work on wall. Alternatively, undertake a programme of long term monitoring.

33.6.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

34.0 Retaining Wall 21 – Foundry

34.1 Description

34.1.1 Retaining Wall 21 is a continuation of Retaining Wall 20 and forms the front elevation of Room 4 and Room 5 and the remainder of the Pattern Shop.

34.1.2 The wall consists of a combination of coursed natural stone masonry and coursed brick construction.

34.1.3 Further in detail comments are made within the Pattern Shop schedules.

34.1.4 Inspection on upper section of wall conducted on foot.

34.2 Inspection Findings

34.2.1 RW21A – Missing mortar 5-10%.



Figure 162. Typical mortar loss

34.2.2 RW21C – Vegetation growth.



Figure 163. Typical vegetation growth

34.3 Discussion

34.3.1 Refer to Room 4 and Room 5 schedules for further detailed particularly at the entrance to these specific rooms.

34.4 Conclusion

34.4.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a fair structural condition.

34.4.2 Remedial works are however recommended to ensure long term structural performance of the wall.

34.4.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

34.5 Emergency Works (within 12 months)

34.5.1 None.

34.6 Short Term Recommendations (1-2 years)

34.6.1 Remove vegetation to enable full inspection. Once the vegetation is cleared, it is crucial to address any voids or gaps that become visible. These voids should be promptly filled with appropriate materials to restore structural integrity.

34.7 Long Term Recommendations (2-5 years)

34.7.1 Undertake repointing work on wall. Alternatively, undertake a programme of long term monitoring.

34.7.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

35.0 Retaining Wall 22

35.1 Description

35.1.1 Retaining Wall 22 consists of a reinforced concrete construction with intermediate reinforced concrete buttresses that are considered to have historically supported the steel frame of a former shed.

35.1.2 The wall retains a flat area of ground varying between 5 and 10m in width with the upper level of a historical mass masonry blast wall being present above this.

35.1.3 The total height of the wall is approx. 5m.

35.2 Inspection Findings

35.2.1 RW22A – Deterioration and spalling of concrete as a result corrosive expansion of reinforced steel bars. Exposed bars vary in terms of section loss between 40% and 100%.



Figure 164. Exposed and corroded bars

35.2.2 RW22B – Localised areas of wall failure at high level due to a combination of impact, vegetation intrusive growth and expansive corrosion due to exposure of steel reinforcement.



Figure 165. Failed area of wall

35.2.3 RW22C – Vegetation growth in the south corner of the wall is significant.



Figure 166. Vegetation growth

35.2.4 RW22D – The wall does not contain any form of allowance to allow the passage of ground water build up to release hydrostatic pressure. Evidence of seepage and oxide staining in various areas of the wall are noted along its entire length.



Figure 167. Typical staining on wall

35.3 Conclusion

35.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a deteriorated structural condition. However, the stability of the wall appears to be satisfactory at the moment.

35.3.2 Remedial works are however recommended to ensure long term structural performance of the wall.

35.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

35.4 Emergency Works (within 12 months)

- 35.4.1 Halt the current onset of corrosion of exposed reinforcement by applying a protective coating and include the wall in a programme of long term monitoring.
- 35.4.2 Remove all loose debris due to wall failure to make the area safe and monitor.

35.5 Short Term Recommendations (1-2 months)

- 35.5.1 Undertake reinforced concrete repair work splicing new steel if required. Approximately 10m².
- 35.5.2 Undertake reinforced concrete repair work to 2No. localised areas. This repair work may involve cutting out the damaged concrete and recasting the affected areas, covering approximately 4m² in total.
- 35.5.3 Remove vegetation to enable full inspection.
- 35.5.4 Monitor the deterioration of the wall due to water penetration and any impact seepage may have on its performance.

35.6 Long Term Recommendations (2-5 months)

- 35.6.1 If necessary, retrofit 50mm diameter weep holes within the wall at intervals of 2.5m and provide a scheme of surface water / land drainage fronting the wall to remove any seepage from the area.
- 35.6.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

36.0 Retaining Wall 23

36.1 Description

36.1.1 Retaining Wall 23 is a continuation of Retaining Wall 24, the Blast Wall which separates the site and the Enterprise Centre.

36.1.2 The wall construction consists of a coursed natural stone masonry construction with mass masonry buttresses.

36.2 Inspection Findings

36.2.1 RW23A – Exposed and corroded steel beams.



Figure 168. Corroded steel beam

36.2.2 RW23B – Mortar loss noted. Approx 10-20% of total area.

Figure 169. Typical mortar loss

36.2.3 RW23C – Loose masonry noted at localised sections.

Figure 170. Loose masonry

36.2.4 RW23D – Vegetation growth.

Figure 171. Vegetation growth

36.2.5 RW23E – Corroded safety fence.

Figure 172. Corroded fence

36.3 Conclusion

36.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a deteriorating structural condition. However, the stability of the wall appears to be satisfactory.

36.3.2 Remedial works are however recommended to ensure long term structural performance of the wall.

36.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

36.4 Emergency Works (within 12 months)

36.4.1 Remove vegetation to enable full inspection.

36.4.2 Restrict access beneath corroded fence.

36.5 Short Term Recommendations (1-2 years)

36.5.1 Remove exposed and corroded beam with a suitably designed member.

36.5.2 Undertake masonry repair on wall on areas of loose masonry.

36.5.3 Dismantle the steel safety fence to prevent any further corrosion and minimise the potential hazard of the fence falling onto pedestrians.

36.6 Long Term Recommendations (2-5 years)

36.6.1 Undertake repointing work on wall.

36.6.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

37.0 Retaining Wall 24 – Blast Furnace Charging Wall

37.1 Description

37.1.1 Retaining Wall 24 consists of a coursed natural stone construction with reinforcing buttresses constructed from a combination of coursed natural stone and coursed brickwork.

37.1.2 The total height of wall is approx. 17m.

37.1.3 Upper section of wall was inspected on foot.

37.2 Inspection Findings

37.2.1 RW24A – Spalled brickwork < 5% of total area



Figure 173. Typical spalled brickwork

37.2.2 RW24B – Vertical-diagonal fractures noted on wall (Dimensions not attained).

Figure 174. Typical fracture

37.2.3 RW24C – Missing and loose masonry < 5% of total area.

Figure 175. Typical missing and loose masonry

37.2.4 RW24D – Vegetation growth.



Figure 176. Typical vegetation growth

37.2.5 RW24F – Missing mortar 5-10% of section.



Figure 177. Typical mortar loss

37.2.6 RW24G – Corroded safety fence at top of wall.

Figure 178. Corroded fence

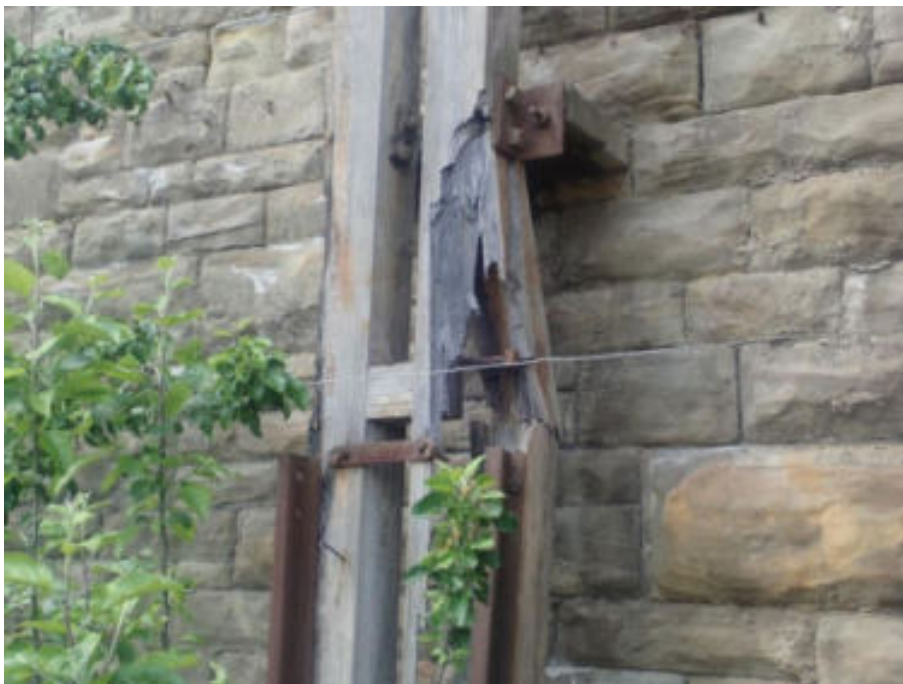
37.2.7 RW24H – Deteriorated timber.

Figure 179. Deteriorated timber

37.2.8 RW24J – Corroded lighting on buttresses.



Figure 180. Corroded lighting

37.2.9 RW24K – Delaminated cementitious capping render on top of buttresses. 10% of total area.



Figure 181. Delaminated render

37.3 Conclusion

37.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall wall to be in a fair structural condition. The diagonal fractures observed are assumed to be historical and may not indicate active movement at present. The construction of the buttresses appears to have been done to prevent further movement of the wall and stabilise it. However, it is crucial to continue monitoring the wall's condition and take appropriate measures if any changes or developments are observed over time.

37.3.2 Remedial works are however recommended to ensure long term structural performance of the wall.

37.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

37.4 Emergency Works (within 12 months)

37.4.1 Monitor vertical-diagonal crack.

37.4.2 Remove vegetation to enable full inspection.

37.5 Short Term Recommendations (1-2 years)

37.5.1 Dismantle the steel safety fence to prevent any further corrosion and minimise the potential hazard of the fence falling onto pedestrians. Restrict access to top of wall via temporary fencing.

37.6 Long Term Recommendations (2-5 years)

37.6.1 Undertake masonry repair on wall, ensuring that any fractures wider than 5mm are addressed through stitching (helibar or similar). Additionally, it is recommended to conduct annual monitoring of the wall for maintenance purpose.

37.6.2 Undertake repointing work on wall.

37.6.3 Replace timber propping with a suitably designed member.

37.6.4 Remove lighting units.

37.6.5 Re-render top of buttresses.

37.6.6 Install new parapet at top of wall.

37.6.7 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

38.0 Room 1

38.1 Description

38.1.1 Room 1 is constructed from a combination of coursed natural stone masonry and coursed brickwork.

38.1.2 The front elevation forms part of Retaining Wall 19 and the rear elevation acts as retaining wall supporting the higher-level ground above.

38.1.3 The arched roof also supports the ground above.

38.2 Inspection Findings

38.2.1 R1A – Severe corrosion noted on iron/steel lintel. Lintel supported by brick pier. Deterioration also noted on brick pier.



Figure 182. Corroded lintel

38.2.2 R1B – Brick support at mid span is in a poor state of repair.

Figure 183. Brick pier

38.2.3 R2C – Outer brick spandrel has failed.

Figure 184. Failed spandrel

38.2.4 R1E – Verticality of stone wall is out of plumb with significant bulging.

Figure 185. General view of wall

38.2.5 R1F – Dislodged bricks noted on barrel roof.

Figure 186. Dislodged bricks

38.2.6 R1G – Vegetation growth.



Figure 187. Vegetation growth

38.2.7 R1D - Standing Water.

38.3 Discussion

38.3.1 If access to this area is restricted there are no emergency works considered imminent. Otherwise, all items should be attended to.

38.3.2 Temporary measures will be taken into consideration for the remedial work.

38.3.3 Given that this structure is contained within the Scheduled Monument area, it is imperative to engage in discussions with Cadw (or the relevant heritage conservation authority) to ensure the use of appropriate materials for any preservation or repair work. These discussions are necessary to adhere to the strict guidelines and regulations in place to protect the historical significance of the site.

38.4 Conclusion

- 38.4.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall room to be in a poor structural condition.
- 38.4.2 Remedial works are recommended to ensure long term structural performance of the room.
- 38.4.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

38.5 Emergency Works (within 12 months)

- 38.5.1 Restrict access to room.
- 38.5.2 Remove vegetation and implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
- 38.5.3 Overpump standing water to prevent moisture affecting the base of surrounding structures.

38.6 Short Term Recommendations (1-2 years)

- 38.6.1 Remove and replace corroded lintel with a suitably designed structural member. Alternatively, restrict access to room.
- 38.6.2 Dismantle and rebuild pier supports. This task will necessitate the use of temporary support structures during the reconstruction process to ensure stability and safety. Alternatively, by designing a suitably designed lintel, the necessity for rebuilding the support can be eliminated.
- 38.6.3 Undertake masonry repair work on the failed spandrel. To prevent future failures and enhance the strength of the spandrel, strengthening measures such as reinforcing bars may be required.
- 38.6.4 Monitor vertically of walls on an annual basis.
- 38.6.5 Undertake masonry repair on barrel roof.

38.7 Long Term Recommendations (2-5 years)

- 38.7.1 Any section of the wall that exhibits a deviation from verticality exceeding 1/3 of the total height, that specific portion of the wall will require rebuilding.

39.0 Room 2

39.1 Description

39.1.1 Room 2 is constructed from a combination of coursed natural stone masonry and coursed brickwork.

39.1.2 The front elevation forms part of Retaining Wall 20 and the remaining three walls act as retaining wall supporting the higher level ground above.

39.1.3 The arched roof also supports the ground above.

39.2 Inspection Findings

39.2.1 R2A – Debris noted in drainage gully by door.



Figure 188. Debris in gully

39.2.2 R2B – Standing Water.

39.3 Conclusion

39.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall room to be in a fair structural condition.

39.3.2 Remedial works are however recommended to ensure long term structural performance of the room.

39.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

39.4 Emergency Works (within 12 months)

39.4.1 Overpump standing water to prevent moisture affecting the base of surrounding structures.

39.5 Short Term Recommendations (1-2years)

39.5.1 Clear debris from drainage. Implement a routine maintenance plan to ensure drainage gully is cleared on a regular basis.

39.6 Long Term Recommendations (2-5 years)

39.6.1 None

40.0 Room 3 – Cupolas

40.1 Description

40.1.1 Room 3 is constructed from a combination of coursed natural stone masonry and coursed brickwork.

40.1.2 The front elevation forms part of Retaining Wall 20 and the rear elevation acts as retaining wall supporting the higher level ground above.

40.1.3 Room 3 contains the base of the two cupolas.

40.1.4 The roof also supports the ground above.

40.2 Inspection Findings

40.2.1 R3A – Significant delamination noted to cupola bases, but is currently in a structurally sound condition.



Figure 189. Typical delamination to cupola bases

40.2.2 R3B – Vegetation growth.



Figure 190. Typical vegetation growth

40.2.3 R3C – Heavily corroded steel roof members.



Figure 191. Steel Members

40.2.4 R3D – Severe corrosion was noted to the columns supporting the reinforced concrete deck.



Figure 192. Corrosion to column

40.2.5 R3E – Standing ground water.

40.3 Discussion

40.3.1 If access to this area is restricted there are no emergency works considered imminent. Otherwise all items should be attended to.

40.3.2 Temporary measures will be taken into consideration for the remedial work.

40.3.3 Given that this structure is contained within the Scheduled Monument area, it is imperative to engage in discussions with Cadw (or the relevant heritage conservation authority) to ensure the use of appropriate materials for any preservation or repair work. These discussions are necessary to adhere to the strict guidelines and regulations in place to protect the historical significance of the site.

40.4 Conclusion

40.4.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall room to be in a deteriorated structural condition.

40.4.2 Remedial works are however recommended to ensure long term structural performance of the room.

40.4.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

40.5 Emergency Works (within 12 months)

40.5.1 Restrict access to room.

40.5.2 Remove vegetation and implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

40.5.3 Overpump standing water to prevent moisture affecting the base of surrounding structures.

40.6 Short Term Recommendations (1-2 years)

40.6.1 Remove cupola ancillaries which are at risk of collapse.

40.6.2 Remove and replace steel columns.

40.6.3 Remove areas of corrosion and apply protective coating.

40.6.4 Prevent water ingress and reduce corrosion by water proofing existing deck

40.6.5 Replace corroded columns.

40.7 Long Term Recommendations (2-5 years)

40.7.1 None

41.0 Stairs (Room 3)

41.1 Description

41.1.1 The staircase, situated within room 3, serves as the primary access point to the upper levels.

41.1.2 The staircase is constructed using in-situ concrete, while its walls are built with dry coarse masonry.

41.2 Inspection Findings

41.2.1 ST1 – Debris build up noted on stairs.



Figure 193. Debris on stairs

41.2.2 ST2 – Frame for corrugated steel corroded and deteriorated.

Figure 194. Deteriorated frame

41.2.3 ST3 – Rain water pipe discharging surface water at bottom of stairs straight onto ground,

Figure 195. Pipe discharging onto ground

41.3 Conclusion

41.3.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall stairs to be in a fair structural condition.

41.3.2 Remedial works are however recommended to ensure long term structural performance of the stairs.

41.3.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

41.4 Emergency Works (within 12 months)

41.4.1 Prevent access up stairs.

41.5 Short Term Recommendations (1-2 years)

41.5.1 Remove debris build up.

41.5.2 Replace the steel frame with a suitable member to support the corrugated steel or whichever material that will be used to segregate room 3 and the stairs. Alternatively, if it is deemed unnecessary to have a replacement member, the frame and corrugated steel can be removed altogether. In such cases, it is crucial to ensure the safety of individuals using the area by providing suitable handrails that comply with relevant safety standards.

41.5.3 Construct a drainage system that directs surface water away from the building, ensuring a proper and appropriate discharge at a recommended distance of 5 meters from the structure.

41.6 Long Term Recommendations (2-5 years)

41.6.1 None.

42.0 Room 4 – Brymbo Adit No. 12

42.1 Description

42.1.1 Room 4 serves as the entrance to the mine with its walls constructed of coarse masonry.

42.1.2 A channel is situated in the centre of the room, serving as method to direct water out of the mine.

42.2 Inspection Findings

42.2.1 R4A – Minor mortar loss, approx. 5% of total area.



Figure 196. Typical mortar loss

42.2.2 R4B – Algae and moss growth.



Figure 197. Typical algae and moss growth

42.2.3 R4C – The condition of the floor in Room 4 is highly unsuitable for walking due to corroded grates, a wet base, and noticeable voids present on the ground.



Figure 198. General view of floor

42.2.4 R4D – There are visible signs of water presence in the room. The pipe within the channel is damaged and the drainage system is blocked up.

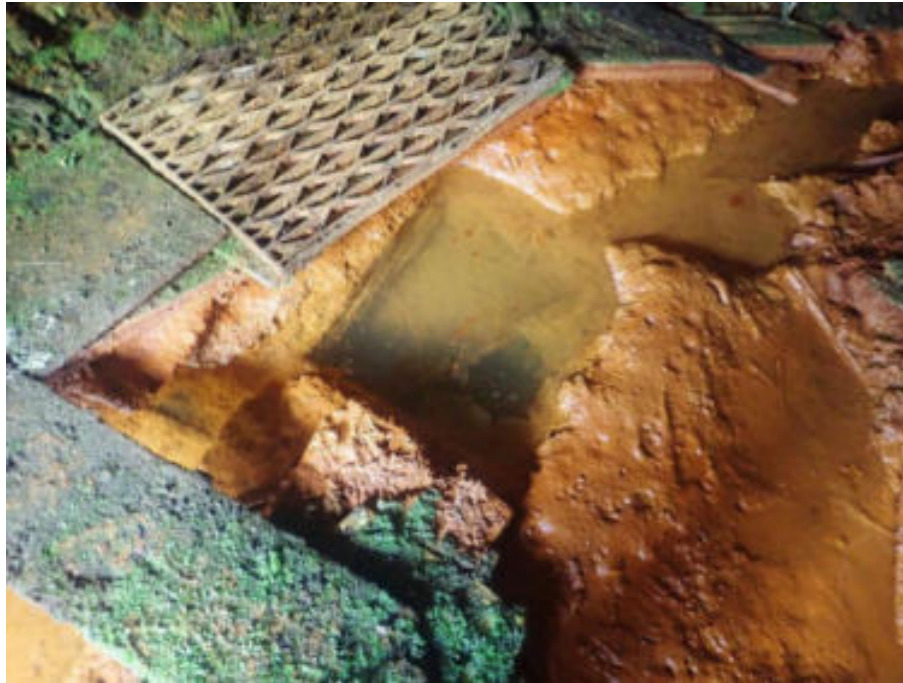


Figure 199. Water presence

42.2.5 R4E - Standing Water.

42.3 Discussion

42.3.1 If access to this area is restricted there are no emergency works considered imminent. Otherwise all items should be attended to.

42.3.2 Given that this structure is contained within the Scheduled Monument area, it is imperative to engage in discussions with Cadw (or the relevant heritage conservation authority) to ensure the use of appropriate materials for any preservation or repair work. These discussions are necessary to adhere to the strict guidelines and regulations in place to protect the historical significance of the site.

42.4 Conclusion

42.4.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall room to be in a fair structural condition. However, the condition of the floor in Room 4 is highly unsuitable for pedestrian access.

42.4.2 Remedial works are however recommended to ensure long term structural performance of the room.

42.4.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

42.5 Emergency Works (within 12 months)

42.5.1 Restrict access to room.

42.5.2 Overpump standing water to prevent moisture affecting the base of surrounding structures.

42.6 Short Term Recommendations (1-2 years)

42.6.1 Clear moss and algae growth.

42.6.2 Undertake remedial works to ensure the flooring is adequate to walk on.

42.6.3 Pump the excessive water out of the room. Conduct a CCTV footage within the existing system to ascertain the blockage.

42.7 Long Term Recommendations (2-5 years)

42.7.1 Undertake repointing work on masonry joints.

43.0 Room 5 – Annealing Furnace

43.1 Description

43.1.1 Room 5 is split into 2 rooms,

43.1.2 The walls are built of coarse masonry with an arch barrel roof.

43.1.3 Two arches were observed, with the second arch retrofitted in front of the original arch and covered with a layer of render.

43.1.4 Room 1 within Room 5 is referred to as R5A, while Room 2 is designated as R5B.

43.1.5 Access was restricted to room R5B.

43.2 Inspection Findings

43.2.1 R5Ai/R5Bi – Minor mortar loss noted on brickwork, approx. 10% of total area.



Figure 200. Typical mortar loss

43.2.2 R5Aii/R5Biii – Algae and moss growth.

Figure 201. Typical algae and moss growth

43.2.3 R5Aiii/R5Biii – The room exhibits evident signs of water accumulation, which can be directly attributed to the obstructed drainage system in room 4.

Figure 202. Typical water ingress

- 43.2.4 R5Aiv – Expansive corrosion noted on steel beam at top right corner of opening. Beam is thought of a historic lintel and is no longer bearing any loading.



Figure 203. Corroded beam

- 43.2.5 R5v – General weathering and deterioration noted on plasterboard.



Figure 204. Deterioration to plasterboard

43.2.6 R5vi – Expansive corrosion noted on door frame.

Figure 205. Corroded door frame

43.2.7 R5Avii – Access door is significantly deteriorated.

Figure 206. Deteriorated door

43.2.8 R5Aviii – Deteriorated brickwork and beam



Figure 207. Deteriorated brickwork and beam

43.2.9 R5Biv – Void noted between arch barrels.



Figure 208. Void

43.2.10R5Bv – Deteriorated masonry noted above access.

Figure 209. Deteriorated masonry

43.3 Discussion

43.3.1 If access to this area is restricted there are no emergency works considered imminent. Otherwise all items should be attended to.

43.3.2 Given that this structure is contained within the Scheduled Monument area, it is imperative to engage in discussions with Cadw (or the relevant heritage conservation authority) to ensure the use of appropriate materials for any preservation or repair work. These discussions are necessary to adhere to the strict guidelines and regulations in place to protect the historical significance of the site.

43.4 Conclusion

43.4.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall room to be in a deteriorated structural condition.

43.4.2 Remedial works are however recommended to ensure long term structural performance of the room.

43.4.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

43.5 Emergency Works (within 12 months)

43.5.1 Restrict access to room.

43.5.2 Apply protective coating on exposed and corroded steel beam.

43.6 Short Term Recommendations (1-2 years)

43.6.1 Clear moss and algae growth.

43.6.2 Address the drainage issue in room 4.

43.6.3 To prevent corrosion and mitigate potential damage to the surrounding masonry, it is recommended to remove the corroded steel beam, as it is no longer serving a structural purpose.

43.6.4 Remove plasterboard to maintain natural appearance of the arch brick. Apply protective coating on brickwork to ensure the structure's durability.

43.6.5 Replace door frame with a suitable frame.

43.6.6 Replace door with a suitable door.

43.6.7 Undertake masonry repair work on brickwork.

43.6.8 Undertake masonry repair work to arch barrels by forming a mechanical tie between the two arches and address any cosmetic concerns by patching up the voids.

43.7 Long Term Recommendations (2-5 years)

43.7.1 Undertake repointing work on masonry joints.

44.0 Room 6 – Switch Gear Room

44.1 Description

44.1.1 The room backs up against Retaining Wall 16. The wall consists of a single layer of bricks and is approximately one brick thick.

44.1.2 On top of the wall, there is a 100mm cast-in-situ concrete roof where the structural steel member resting up against wall 16 supports the roof.

44.1.3 No access provided for internal inspection.

44.2 Inspection Findings

44.2.1 R6A – Visual deflection noted on lintel, but has not entered a mode of failure.



Figure 210. Deflection to lintel

44.2.2 R6B – Missing mortar Approx 10% of total area.

Figure 211. Typical mortar loss

44.2.3 R6C – Spalling noted on brickwork <5% of total area.

Figure 212. Typical spalled brickwork

44.3 Discussion

44.3.1 If access to this area is restricted there are no emergency works considered imminent. Otherwise, all items should be attended to.

44.3.2 Temporary measures will be taken into consideration for the remedial work.

44.3.3 Given that this structure is contained within the Scheduled Monument area, it is imperative to engage in discussions with Cadw (or the relevant heritage conservation authority) to ensure the use of appropriate materials for any preservation or repair work. These discussions are necessary to adhere to the strict guidelines and regulations in place to protect the historical significance of the site.

44.4 Conclusion

44.4.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall room to be in a deteriorating structural condition.

44.4.2 Remedial works are however recommended to ensure long term structural performance of the room.

44.4.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

44.5 Emergency Works (within 12 months)

44.5.1 Monitor deflected lintel on annual basis.

44.6 Short Term Recommendations (1-2 years)

44.6.1 Remove and replace deflected lintel with a suitably designed structural member.

44.7 Long Term Recommendations (2-5 years)

44.7.1 Undertake repointing work.

44.7.2 Undertake masonry repair work.

45.0 Room 7 – Transformer and Switch Gear Room

45.1 Description

45.1.1 Room 7 is of the same construction as Room 6 consisting of a single brick construction and a cast in-situ concrete roof.

45.2 Inspection Findings

45.2.1 R7A – Missing and loose masonry noted 5-10%.



Figure 213. Typical loose and missing masonry

45.2.2 R7B – Horizontal fracture noted on plinth.



Figure 214. Horizontal fracture

45.2.3 R7C – Missing mortar joints 10-20% of total area.



Figure 215. Typical missing mortar

45.2.4 R7D – Vegetation growth.



Figure 216. Typical vegetation growth

45.3 Discussion

45.3.1 If access to this area is restricted there are no emergency works considered imminent. Otherwise, all items should be attended to.

45.3.2 Given that this structure is contained within the Scheduled Monument area, it is imperative to engage in discussions with Cadw (or the relevant heritage conservation authority) to ensure the use of appropriate materials for any preservation or repair work. These discussions are necessary to adhere to the strict guidelines and regulations in place to protect the historical significance of the site.

45.4 Conclusion

45.4.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall room to be in a deteriorating structural condition.

45.4.2 Remedial works are however recommended to ensure long term structural performance of the room.

45.4.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

45.5 Emergency Works (within 12 months)

45.5.1 None.

45.6 Short Term Recommendations (1-2 years)

45.6.1 Undertake masonry repair work on wall.

45.6.2 Remove vegetation and implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

45.7 Long Term Recommendations (2-5 years)

45.7.1 Undertake cosmetic concrete repair work.

45.7.2 Undertake repointing work on wall.

46.0 Room 8 – Glass Store

46.1 Description

46.1.1 Room 8 consists of cavity brickwork outer walls with corrugated steel sheeting as a roof covering.

46.1.2 All of the openings consist of reinforced concrete lintels.

46.2 Inspection Findings

46.2.1 R8A – Deflection and hairline fracture noted above 2 No. internal precast concrete lintel.



Figure 217. Typical cracking above lintel

46.2.2 R8B – Hairline diagonal fracture noted at base of window protruding to floor.

Figure 218. Diagonal fracture

46.2.3 R8C – Diagonal fracture noted from eaves and terminating 7 courses down.

Figure 219. Diagonal fracture

46.3 Discussion

46.3.1 Given that this structure is contained within the Scheduled Monument area, it is imperative to engage in discussions with Cadw (or the relevant heritage conservation authority) to ensure the use of appropriate materials for any preservation or repair work. These discussions are necessary to adhere to the strict guidelines and regulations in place to protect the historical significance of the site.

46.4 Conclusion

46.4.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall room to be in a fair structural condition.

46.4.2 Remedial works are however recommended to ensure long term structural performance of the room.

46.4.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

46.5 Long Term Recommendations (2-5 years)

46.5.1 None

46.6 Short Term Recommendations (1-2 years)

46.6.1 None

46.7 Long Term Recommendations (2-5 years)

46.7.1 Undertake cosmetic repair on lintel.

46.7.2 Undertake cosmetic repairs on brickwork.

47.0 Room 9

47.1 Description

47.1.1 Room 9 consists of cavity brickwork outer walls with a flat roof structure.

47.1.2 All of the openings consist of reinforced concrete lintels.

47.2 Inspection Findings

47.2.1 R9A – Deflection and hairline fracture noted on precast lintel above door.



Figure 220. Deflected and cracked lintel

47.3 Discussion

47.3.1 Given that this structure is contained within the Scheduled Monument area, it is imperative to engage in discussions with Cadw (or the relevant heritage conservation authority) to ensure the use of appropriate materials for any preservation or repair work. These discussions are necessary to adhere to the strict guidelines and regulations in place to protect the historical significance of the site.

47.4 Conclusion

47.4.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall room to be in a fair structural condition.

47.4.2 Remedial works are however recommended to ensure long term structural performance of the room.

47.4.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

47.5 Emergency Works (within 12 months)

47.5.1 None

47.6 Short Term Recommendations (1-2 years)

47.6.1 None

47.7 Long Term Recommendations (2-5 years)

47.7.1 Undertake cosmetic repair on lintel.

48.0 Room 10 – Winch Room

48.1 Description

48.1.1 Room 10 is constructed from a reinforced concrete frame with brickwork and steel cladding infill.

48.2 Inspection Findings

48.2.1 R10A – Corrosion was noted to the beams under the roof.



Figure 221. Typical corrosion to beam

48.3 Discussion

48.3.1 Given that this structure is contained within the Scheduled Monument area, it is imperative to engage in discussions with Cadw (or the relevant heritage conservation authority) to ensure the use of appropriate materials for any preservation or repair work. These discussions are necessary to adhere to the strict guidelines and regulations in place to protect the historical significance of the site.

48.4 Conclusion

48.4.1 Based upon the findings of the visual inspection detail within this report, BRP consider the overall room to be in a fair structural condition.

48.4.2 Remedial works are however recommended to ensure long term structural performance of the room.

48.4.3 To provide further understanding and remedials for the issues, recommendations are highlighted and listed below in recommendations.

48.5 Emergency Works (within 12 months)

48.5.1 Monitor corrosion on corroded beams.

48.6 Short Term recommendations (1-2 years)

48.6.1 Remove corrosion and reapply protective coating on corroded beams.

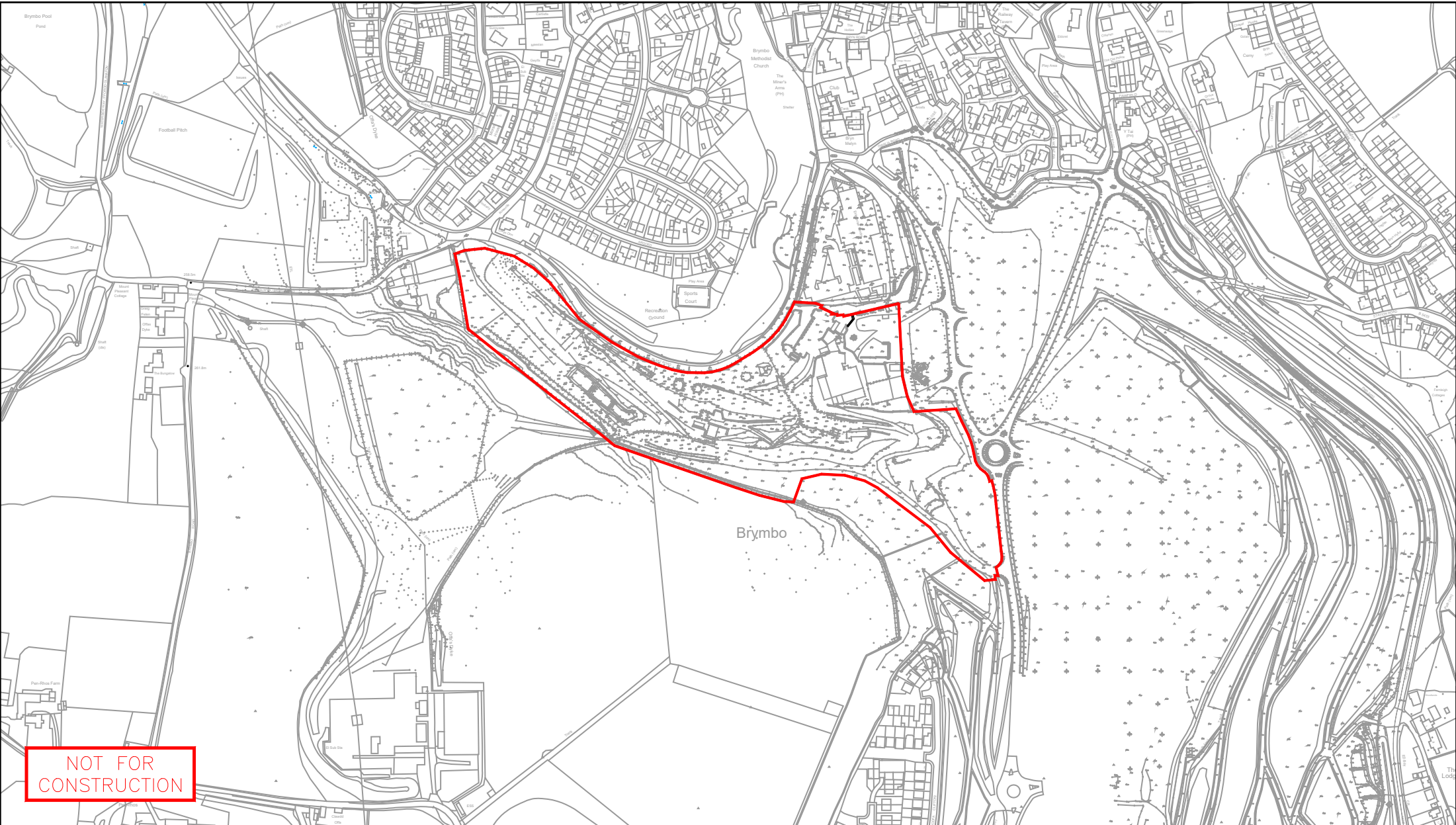
48.7 Long Term recommendations (2-5 years)

48.7.1 None

APPENDICIES

APPENDIX A

Location Plan



This drawing is to be read in conjunction with all relevant architects drawings and specifications.

Do not scale – use written dimensions only !

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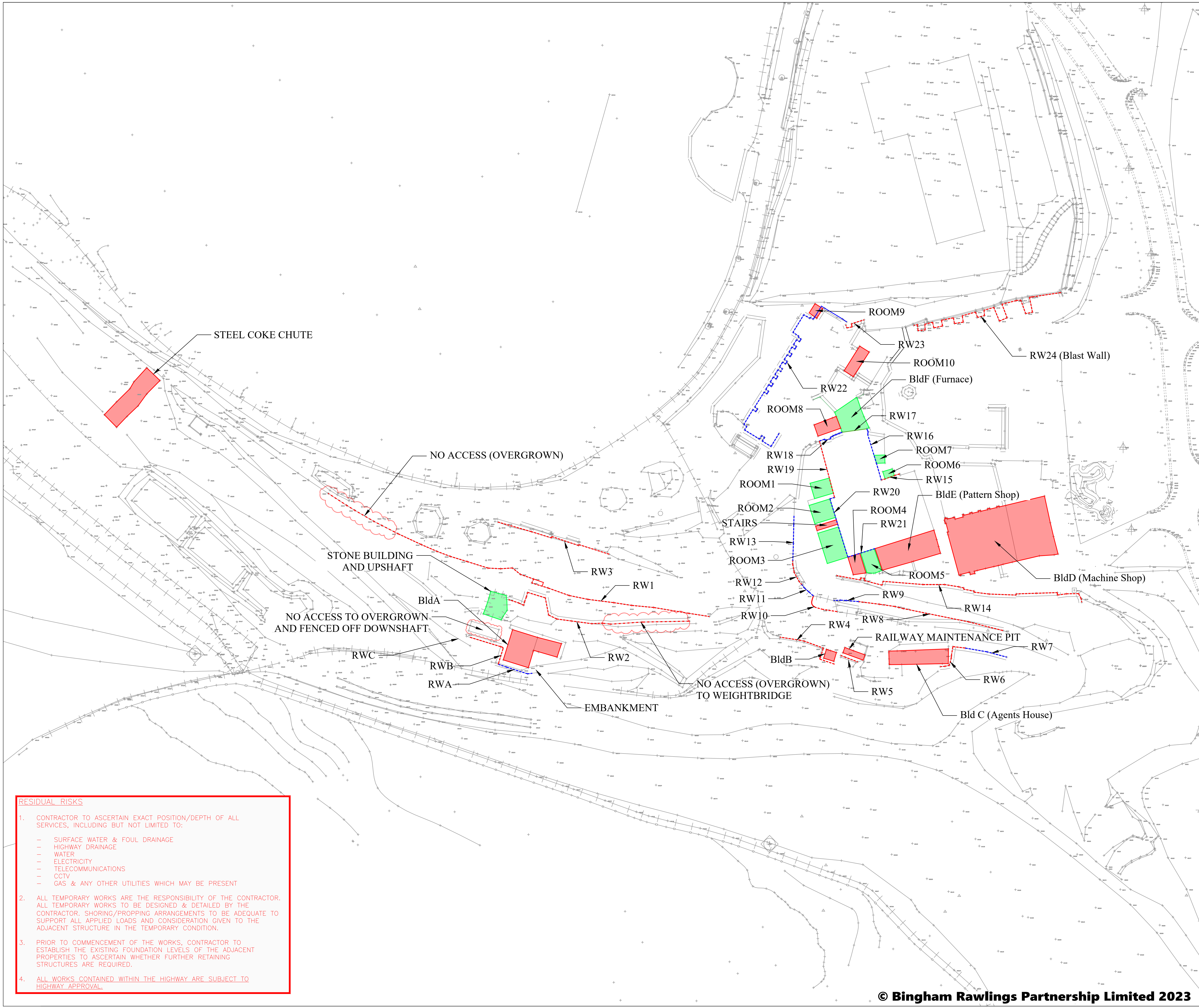
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Project: BRYMBO HERITAGE PROJECT				
Detail: LOCATION PLAN				
Project No.	Drawing No.	Scale	By	Rev.
4866	0001	1:5000	M.J	P01

APPENDIX B

Structures Location Plan



NOTES

1. DO NOT SCALE FROM THIS DRAWING.

2. ALL LEVELS IN METERS UNLESS NOTED OTHERWISE ON DRAWING.

3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEER'S AND ARCHITECT'S DRAWINGS AND RELEVANT SPECIFICATION CLAUSES.

4. PLEASE REFER TO ARCHITECTS DRAWINGS FOR FINAL BUILDING LOCATION.

KEY

Revisions.

Revision	Made by	Date	Checked	Description

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Project

BYRMO HERITAGE PROJECT

Drawing Title

STRUCTURAL INSPECTION PLAN

Architect

TACP ARCHITECTURE

Client

BRYMBO HERITAGE TRUST

Scale

NTS

Drawn

B.Thorne

Date

21.06.23

Checked

I.Rowlands

Revision

4866

EW08

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- RESIDUAL RISKS
1. CONTRACTOR TO ASCERTAIN EXACT POSITION/DEPTH OF ALL SERVICES, INCLUDING BUT NOT LIMITED TO:
 - SURFACE WATER & FOUL DRAINAGE
 - HIGHWAY DRAINAGE
 - WATER
 - ELECTRICITY
 - TELECOMMUNICATIONS
 - CCTV
 - GAS & ANY OTHER UTILITIES WHICH MAY BE PRESENT

2. ALL TEMPORARY WORKS ARE THE RESPONSIBILITY OF THE CONTRACTOR. ALL TEMPORARY WORKS TO BE DESIGNED & DETAILED BY THE CONTRACTOR. SHORING/PROPPING ARRANGEMENTS TO BE ADEQUATE TO SUPPORT ALL APPLIED LOADS AND CONSIDERATION GIVEN TO THE ADJACENT STRUCTURE IN THE TEMPORARY CONDITION.

3. PRIOR TO COMMENCEMENT OF THE WORKS, CONTRACTOR TO ESTABLISH THE EXISTING FOUNDATION LEVELS OF THE ADJACENT PROPERTIES TO ASCERTAIN WHETHER FURTHER RETAINING STRUCTURES ARE REQUIRED.

4. ALL WORKS CONTAINED WITHIN THE HIGHWAY ARE SUBJECT TO HIGHWAY APPROVAL.

APPENDIX C

Schedules

Structure	Emergency Works (within 12 months)	Short Term Recommendations (1-2 years)	Long Term Recommendations (2-5 years)
Building A - Colliery/Winding House and Lamp Room	3.5.1 Restrict access to building and install a temporary hoarding to all external openings or repair existing.	3.6.1 Remove and replace the entire roof covering.	3.7.1 Remove all floor coverings and replace with suitable moisture resistant board or treated timber boards.
	3.5.2 Remove vegetation, approx. 3m2.	3.6.2 Replace deteriorated timber lintel (1 No.) on front façade window with Precast concrete lintel.	3.7.2 Remove and replace all deteriorated timber floor joists. Make allowance at this stage for 50% removal.
	3.5.3 Temporarily prop the arch and re-set. Apply a masonry crack stitching repair using heli fix or equal approved. Approx. repair area 4m2	3.6. 3 Remove and replace all de-bonded and dislodged brickwork at corners and install pre cast padstone at bearing of RSA. Also suggest cutting RSA short to ensure they do not penetrate to the outer face of the external wall and applying . a protective zinc based coating to exposed / cut steelwork. Approx. 4m2 of brick re-setting required.	3.7.3 Remove delaminated steel back to bare sound section on steel truss ends and apply protective coating. Gain access high level to assess extent of corrosion at support. Further treatment to truss bearing may then be required. Alternatively, if sufficient section of steel remaining at truss bearing cut out deteriorated sections of steel and provide protective treatment to remaining section.
	3.5.4 Remove tree internally around failed roof.	3.6.4 Temporarily prop the remaining displaced or failed arches. Reset all arches and apply crack stitching repair including using helifix or similar approved above arches where required.	3.7.4 Monitor all loose and de-bonded / desiccated mortar and repointing.
	3.5.5 Consider localised repair of roof covering.	3.6.5 Replacement canted RSA sections between truss and gable wall. Remove dislodged brickwork at spandrel head and replace. Approx. 4m2.	3.7.5 Remove loose or delaminated steel in the mortar joint around embedded steel plates and apply a protective coating to the exposed member. Alternatively, Remove the steel plate from the wall bed joint and repair mortar removal.
		3.6.6 Remove the historical electricity line bracket and locally repair. Repair small area of loose brickwork.	3.7.6 Remove and re-bed loose or de-bonded brickwork. Approx. 2m2 of area.
		3.6.7 Attach tell tale to diagonal crack by door opening and monitor.	3.7.7 Recommend racking out all loose and de-bonded / desiccated mortar and repointing.
		3.6.8 Remove and replace door and door casing.	3.7.8 If no movement to diagonal crack by door opening over a period of at least 12 months, apply cosmetic repairs to the mortar beds. Otherwise, apply crack stitching to the panel to repair the fracture using Heli fix or equal approved. Approx area 5m2
Building B - Surters Cabin	4.4.1 Restrict access near loose brickwork panels to ensure safety or consider removal.	4.5.1 Monitor movement of cracks over a period of 12 months.	4.6.1 Replacement roof to be designed and installed to provide restraint to heads of all walls.
	4.4.2 Monitor RC lintel on annual basis and implement remedial action as necessary.	4.5.2 If the RC lintel is to remain, adequately rebuild the localised area of masonry to provide a suitable bearing at both supports, covering approx. 1m2.	
	4.4.3 Monitor front wall panel and implement remedial action as necessary.	4.5.3 Introduce stitching at front panel wall returns to provide adequate restraint.	
	4.4.4 Monitor loose masonry panel, implement remedial action as necessary and restrict access.	4.5.4 Remove loose masonry units and rebuilt, covering an approximate area of 2m2.	
Building C - Agents House	5.5.1 Temporarily prop lintels with failed wall panel above (BC3 and BC7).	5.6.1 Monitor existing steel UB on gable wall.	5.7.1 Remove and re-build failed external stone wall on front elevation (BC2 and BC). Reconstruct stone jams to opening and ensure adequate bearing to lintel prior to re-setting.
	5.5.2 Temporarily the timber props supporting stone eaves beam can remain, and the stability monitored periodically.	5.6.2 Remove and replace external failed timber lintels (BC13, BC14 and BC17) with a suitably designed member of PCC, natural stone or treated timber. Repair any loose or dislodged external wall masonry as a result of replacement.	5.7.2 Repair natural stone jams with failed bearings to provide adequate bearing to compression lintel and re-set lintel.
	5.5.3 Remove any vegetation and tree growth around collapsed wall, rebuilt external wall locally (approx. 4m2) and install designed lintel member consisting of PCC, natural stone or treated timber.	5.6.3 Debris (BC16) may result in the progression of penetrative water ingress through the external wall. Remove debris to re-establish a level rear ground level to the building. Alternatively, assess the impact of potential water ingress internally and if not an issue do nothing.	5.7.3 Replace natural stone eaves and rebed ensuring span capability over opening. Remove props.
	5.5.4 Restrict access within pay office until all of emergency and short term works are complete.	5.6.4 Remove and reconstruct the masonry stack (BC18) from ground level. Ensure adequate tying into the remaining masonry panels either side.	5.7.4 Remove and replace steel UB on gable wall with a suitably designed member.
		5.6.5 Remove and replace existing internal failed or inadequate timber lintels (5.2.19) with a suitably designed member of PCC, natural stone or treated timber.	5.7.5 Remove and re-set loose masonry on gable wall, covering an approx. area of 0.5m2.
		5.6.6 Remove and replace existing internal failed or inadequate timber roof members (5.2.20) with a suitably designed member of PCC, natural stone or treated timber. Alternatively, consider replacement of pay office roof.	5.7.6 Monitor vertical fracture between infill masonry panel and rear elevation return.
			5.7.7 Remove fire damaged frame and replace as necessary. Upon removal assess condition of window jam masonry and pointing and apply repair as necessary.
			5.7.8 Remove the roof in its entirety and install a suitably designed roof structure similar to the existing arrangement with adequate restraint against lateral thrusting.
			5.7.9 If monitoring of vertical fracture has not identified further movement, cosmetic repairs are recommended. Otherwise crack stitch
			5.7.10 Install new windows and doors to ensure water tight finish to prevent further deterioration of structure.
Building D - Machine Shop	6.5.1 Monitor corrosion to lintels.	6.6.1 Replace steel lintels above windows and undertake repair work (support and stabilisation) on mullions. In severe cases where the buckling cannot be effectively repaired or poses a significant safety risk, it may be necessary to replace the damaged mullions entirely.	6.7.1 Undertake masonry repair work on areas of deteriorated brickwork.
	6.5.2 Monitor sheared angle above window.	6.6.2 Replace steel lintel above door opening with a suitably designed member.	6.7.2 Undertake repointing work throughout building.

	6.5.3 Monitor corrosion to crane beam.	6.6.3 At hand inspection of condition of lattice girder. Remove corrosion and reapply protective coating if practical. Otherwise, replace steel lattice girder and plates locally with a suitably designed member. Alternatively, if sufficient section of steel remaining on girder cut out deteriorated sections of steel and provide protective treatment to remaining section.	6.7.3 Remove expansive slag to an appropriate depth and replace floor covering.
	6.5.4 Remove vegetation.	6.6.4 Undertake masonry repair work on areas of missing or loose brick, including corbel.	
	6.5.5 Monitor corrosion to bottom cord of truss.	6.6.5 Undertake crack repair stitching (helifix or similar) on all fractures >5mm in width. Cosmetic repair on any fracture <5mm in width.	
		6.6.6 An intrusive investigation is required to the corners (6.2.6) to determine the condition and extent of corrosion to steel members within. Suitable remedial works should then be undertaken.	
		6.6.7 Replace deteriorated timber fascia, approx. 66m in length.	
		6.6.8 Replace 1No. steel purlin at eaves with a suitably designed member. Alternatively, if sufficient section of steel remaining at purlin cut out deteriorated sections of steel and provide protective treatment to remaining section.	
		6.6.9 Replace sheared angle above window (6.2.11) with a suitably designed structural member.	
		6.6.10 Inspect cantilevered crane beam (6.2.12). Repair if practical otherwise remove and replace.	
		6.6.11 Replace roof covering.	
		6.6.12 Remove corrosion on all truss and lattice girder members and provide protective coating.	
		6.6.13 Replace broken windows to prevent water ingress and further corrosion to steel members.	
Building E - Pattern and Joiners Shop	7.5.1 All existing internal and external temporary propping to remain and be monitored.	7.6.1 Demolish and rebuild arch above the main doorway.	7.7.1 Replace missing mortar and missing masonry on north elevation.
	7.5.2 A temporary roofing cap should be installed to prevent water ingress into the building which would result in further deterioration of the internal structure.	7.6.2 Remove suitable depth of slag on ground bearing slab on 2nd floor and install a concrete slab. Ensure slab is ties into adjacent external walls to strengthen the external envelope of the structure.	7.7.2 A permanent roof should be constructed to provide long term solution to preventing water ingress.
	7.5.3 Temporarily prop the arch above the main doorway and monitor its condition on an annual basis.	7.6.3 A suitable engineering scheme should be developed for any internal access required at this stage. This should be designed by a suitability qualified engineer.	7.7.3 A suitable engineering scheme should be developed to prevent surface run off from entering the ground floor through the lower external walls.
	7.5.4 Monitor lintels on south and west elevations.		7.7.4 Reconstruct stone jam and realign lintel on south elevation windows.
	7.5.5 Restrict access internally until all emergency and short term works are completed.		7.7.5 Replace propped lintel on south elevation with suitably designed member ensuring adequate bearing.
	7.5.6 Monitor deflected and propped lintels on 2nd floor.		7.7.6 Replace missing mortar and missing masonry. Alternatively, do nothing and monitor on an annual basis.
	7.5.7 Unless temporary propping or remediation is undertaken to the failed area of gable spandrel further collapse will occur locally until catastrophic collapse of the spandrel will occur. As a matter of urgency the failed timber lintel below the spandrel should be replaced with a suitably designed alternative and the inner face of masonry rebuilt to match existing. If temporary access to the area is considered to be precarious in its current fragile form it is advised that a temporary scaffold system be erected to span between side walls with a propping mechanism and protective sheeting installed.		7.7.7 Monitor missing mortar and missing masonry on north elevation.
			7.7.8 Replace failed lintels internally with suitably designed member.
			7.7.9 A full design for the refurbishment of the internal structure is required. Due to the sensitive nature of the building, existing members must be retained where possible. To be designed by a suitably qualified engineer ensuring stability of the external envelope is maintained.
			7.7.10 Replace propped lintel on west elevation with suitably designed member ensuring adequate bearing.
			7.7.11 Replace deflected lintel with suitably designed member ensuring adequate bearing.
			7.7.12 Replace propped lintel on 2nd floor with suitably designed member ensuring adequate bearing.
			7.7.13 Masonry repair works are recommended to the collapsed section of inner leaf on the gable end.
			7.7.14 Monitor condition of temporary props. If functioning adequately keep in place until full remediation has been designed and implemented.
			7.7.15 Due to lack of intrusive at hand access and based on failure through sheer at supports, allowance to be made for splicing of each joist.
			7.7.16 Remove penetrating water and prevent surface run off from entering. Provide a method of protection or tank existing rooms.
Building F - Furnace	8.5.1 Remove vegetation to enable full inspection. Once the vegetation is cleared, it is crucial to address any voids or gaps that become visible. These voids should be promptly filled with appropriate materials to restore structural integrity.	8.6.1 Monitor arch on an annual basis.	8.7.1 Remove debris internally.

	8.5.2 Restrict access to furnace.	8.6.2 Although there is no evidence of long term movement as a result of redundant ties and expansion of masonry due to the operation of the furnace is no longer a critical factor. At hand inspection of all plates and ties is recommended. If any defects are found, ultrasound scanning is recommended to determine the extent of corrosion. If plates are considered not at risk of falling then no further works are required. If plates are considered to be at risk of falling then they should be removed and replaced to match existing.	8.7.2 Remove beehive, it's essential to contact a professional beekeeper or a licensed pest control expert who specialises in bee removal.
		8.6.3 The steel capping plates at the top of the furnace should be removed and replaced suitable alternative. or made safe.	8.7.3 Undertake repointing work on wall. Alternatively, undertake a programme of long term monitoring.
			8.7.4 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
Steel Coke Chute		9.2.1 Restrict access to this area using pedestrian fencing as necessary.	
		9.2.2 Clear vegetation if required and undertake structural condition assessment.	
Upshaft and Downshaft		10.2.1 Restrict access to this area using pedestrian fencing as necessary. Ensure existing fencing is secure	
		10.2.2 Clear vegetation and undertake structural condition assessment.	
Railway Maintenance Pit	11.4.1 Remove vegetation to prevent damage to structure.		11.6.1 Investigate the condition of the noted drainage inlet to determine if it is functioning correctly.

Structure	Emergency Works (within 12 months)	Short Term Recommendations (1-2 years)	Long Term Recommendations (2-5 years)
Retaining Wall A	12.4.1 Remove all vegetation and expose external face of all areas including stone and brick retaining elements.	12.5.1 Undertake regular inspection of the mortar pointing, renew as required.	12.6.1 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
	12.4.2 Where possible remove all saplings and check status of mature trees for felling.	12.5.2 Inspect wall for any mortar loss. Repointing works to be undertaken to any areas of mortar loss noted.	
Retaining Wall B	13.4.1 Remove all vegetation and expose external face of all areas including stone and brick retaining elements.	13.5.1 Monitor loose mortar and implement remedial action as necessary.	13.6.1 Recommend long term racking out of loose mortar and replacement pointing throughout.
	13.4.2 Where possible remove all saplings and check status of mature trees for felling.	13.5.2 Remove and replace loose / dislodged brickwork to face of wall. Approx. repair area 1.5m2.	13.6.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
Retaining Wall C	14.4.1 Remove all vegetation and expose external face of all areas including stone and brick retaining element to ensure a full inspection of the wall.	14.5.1 Monitor loose mortar and implement remedial action as necessary.	14.6.1 Recommend long term racking out of loose mortar and replacement pointing throughout.
	14.4.2 Where possible remove all saplings and check status of mature trees for felling.		14.6.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
Retaining Wall 1	15.4.1 Monitor area of displaced wall and relocate path to ensure safety of pedestrians.	15.5.1 Remove and replace loose or dislodged masonry and undertake masonry repair on wall.	15.6.1 Undertake repointing work on wall.
		15.5.2 Remove the affected area of displaced wall and locally rebuild.	15.6.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
	15.4.2 Remove vegetation to enable full inspection.		
	15.4.3 Monitor failed section of wall and relocate path to ensure safety of pedestrians.	15.5.3 Remove remains of tree and void to be repaired.	
Retaining Wall 2		15.5.4 Undertake masonry repair work on wall on failed section of wall.	
		16.5.1 Undertake masonry repairs on loose and missing masonry.	16.6.1 Undertake repointing work on wall.
		16.5.2 Monitor displacement on an annual basis.	16.6.2 Undertake masonry repair on displaced section of wall.
		16.5.3 Install a tell-tale crack monitor on diagonal fracture and monitor annually.	16.6.3 Undertake masonry repair such as stitching to diagonal fracture. Alternatively, install a tell-tale crack monitor on fracture and monitor annually.
		16.5.4 Remove vegetation to enable full inspection.	16.6.4 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
Retaining Wall 3		16.5.5 Remove remains of tree and void to be repaired.	
		17.5.1 No remedial action at present but further movement would result in the centre of gravity leaving its middle third and the wall entering a mode of failure.	17.6.1 Consider introducing additional weep holes through percussive drilling 50mm weep vents through the lower level weep holes at 2.5m centres.
		17.5.2 Remove vegetation and remove and replace loose coping bricks. Approx. 4m2.	17.6.2 Introduce stitching at the return at max. 200mm vertical centres using Heli fix or equal approved to provide adequate restraint. Alternatively, do nothing, monitor and implement remedial action as necessary.
		17.5.3 Clean and monitor effervescent.	
		17.5.4 Monitor vertical crack and implement remedial action as necessary.	
Retaining Wall 4		17.5.5 Remove tree and introduce a crack stitching repair using heli fix or equal approved at every other mortar course.	
	18.4.1 Remove vegetation to enable full inspection.	18.5.1 Undertake masonry repair on wall and copings.	18.6.1 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
Retaining Wall 5		19.5.1 Dismantle and rebuild wall. Alternatively, remove the wall in its entirety and grade the area back.	
Retaining Wall 6	20.4.1 Remove vegetation and tree to enable full structure review of wall and repair top of wall following the removal of the vegetation.	20.5.1 Repair or rebuild approximately 3.5m2 of natural stone wall, note that the area is very constrained in working space due to proximity to rear of Agent's house.	20.6.1 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
		20.5.2 Repair or rebuild the upper 500mm of the brick retaining wall where it has debonded and dislodged brickwork. Approximate are of repair 1.5m2.	
		20.5.3 Monitoring of the leaning section of wall is recommended on an annual basis.	
Retaining Wall 7	21.4.1 Remove vegetation to enable full structure review of wall.	21.5.1 Undertake repointing work on wall approximately 5m2.	
	21.4.2 Remove tree. Once the vegetation is cleared, it is crucial to address any voids or gaps that become visible. These voids should be promptly filled with appropriate materials to restore structural integrity.	21.5.2 Monitor movement of wall around removed wall on an annual basis.	
		21.5.3 Undertake repair work on copings.	
Retaining Wall 8	22.4.1 Tree at approx. Ch. 15m to be removed.	22.5.1 Demolish and replace wall. Alternatively, remove wall and grade back on retaining soil.	
		22.5.2 Localised repair to brickwork corner approx. 1.5m2.	
Retaining Wall 9		23.5.1 Remove tree and undertake masonry repair on void s created. Approx. 1.5m2 repair.	23.6.1 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
		23.5.2 Remove vegetation.	
Retaining Wall 10 - Foundary Charging Wall	24.5.1 Remove vegetation to enable full inspection.		24.7.1 Undertake repointing work on wall.

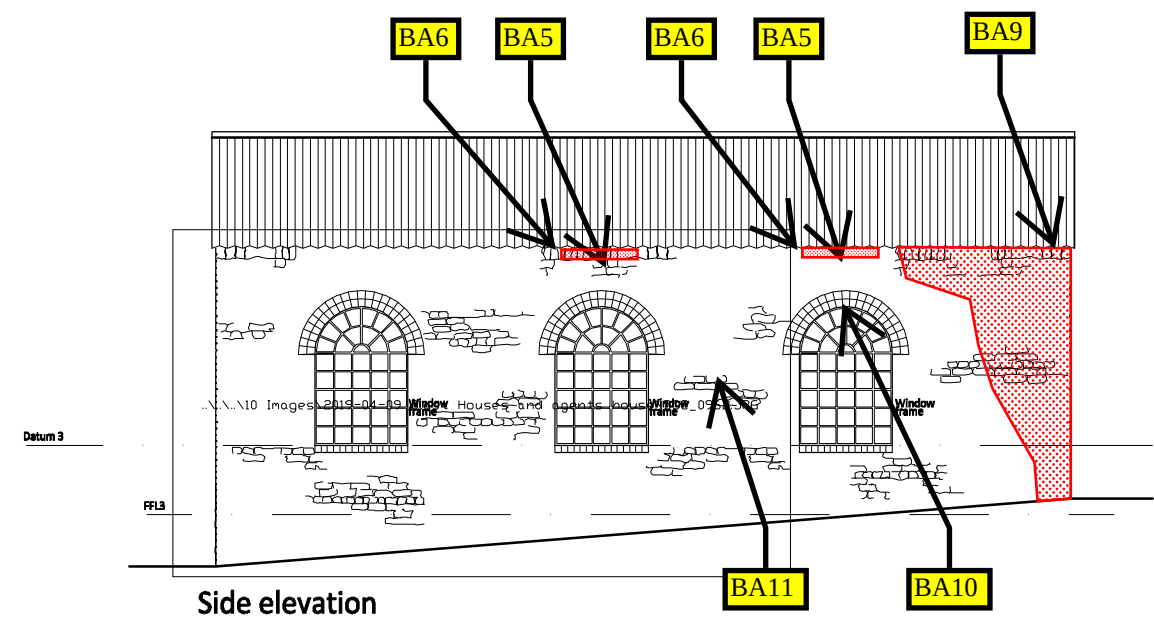
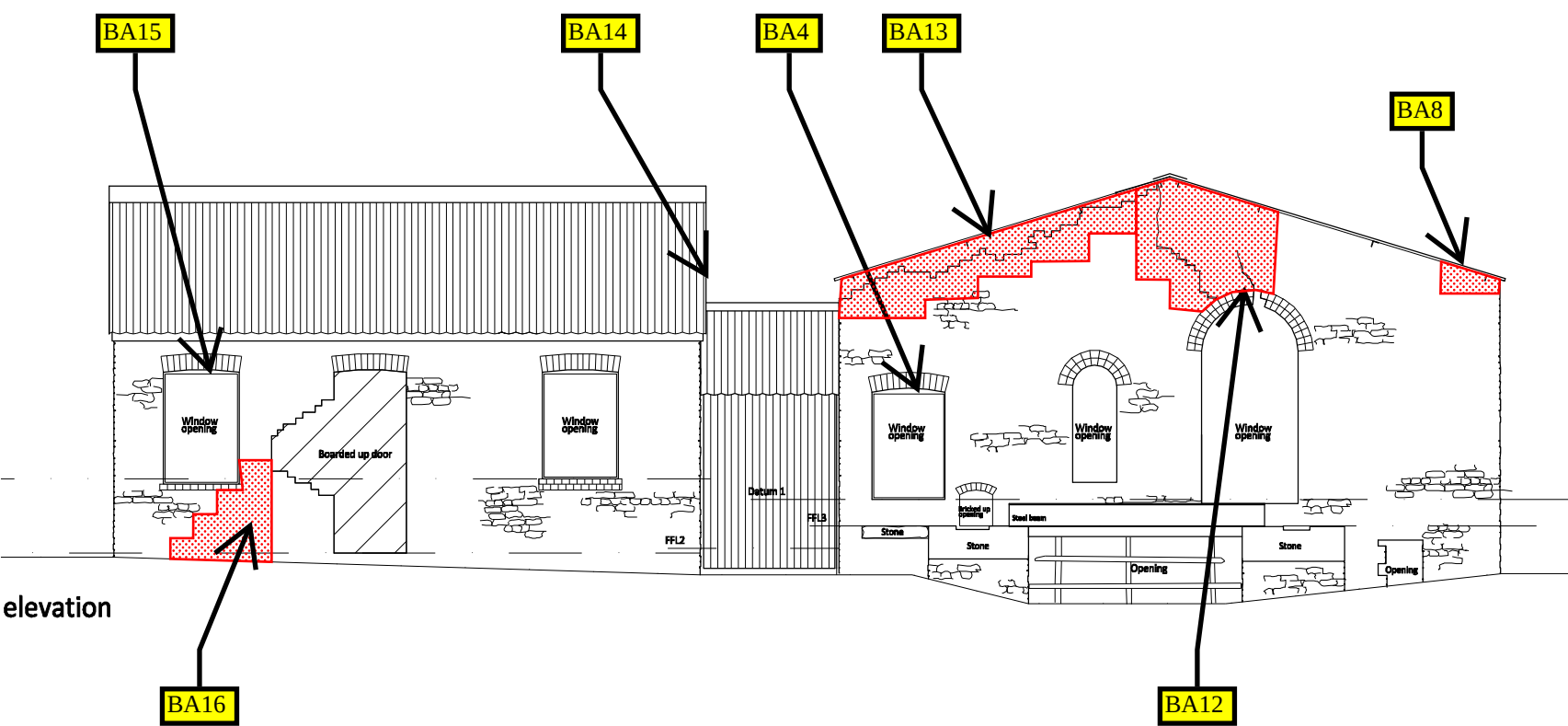
	24.5.2 Remove remains of tree and repair wall.		24.7.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
Retaining Wall 11 - Foundary Charging Wall		25.6.1 Remove vegetation to enable full inspection.	25.7.1 Undertake repointing work on wall.
		25.6.2 Undertake masonry repair work on upper section of wall, approx. 2m2.	25.7.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
Retaining Wall 12 - Foundary Charging Wall		26.6.1 Apply protective coating to exposed areas of steel beams.	26.7.1 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
		26.6.2 Undertake concrete repair work by resurfacing or overlaying the affected areas. Alternatively, an appropriate protective coating, such as a Parex or Sika product, can be applied to safeguard the exposed concrete surfaces. This protective coating will shield the concrete from exposure, prevent carbonation, and inhibit the corrosion of embedded steelwork within the concrete.	
		26.6.3 Remove vegetation.	
Retaining Wall 13 - Foundary Charging Wall	27.5.1 Remove vegetation to enable full inspection.	27.6.1 Restrict access to top of wall via temporary fencing.	27.7.1 Undertake repointing work on wall.
			27.7.2 Undertake masonry repair work on upper parapet section of wall, approximately 5m2.
			27.7.3 Reduce levels of the ground behind the parapet and undertake localised repairs and consolidation of loose masonry. Alternatively, demolish and rebuild top section of wall.
			27.7.4 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
Retaining Wall 14	28.4.1 Monitor bulging and movement on an annual basis.	28.5.1 Undertake masonry repair work locally around area of bulging and leaning, approximately 5m2.	28.6.1 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
	28.4.2 Remove vegetation to enable full inspection. Once the vegetation is cleared, it is crucial to address any voids or gaps that become visible. These voids should be promptly filled with appropriate materials to restore structural integrity. A discussion should be undertaken with the design team ecologist as significant mature trees are present in the retained graded bank above the wall. Their removal may increase stability of the wall or halt further deterioration, however, may lead to instability of the retained graded bank above.	28.5.2 Undertake masonry repair work approximately 10m2 in entire length.	
	28.4.3 Monitor fracture at corner on an annual basis.	28.5.3 Undertake masonry repair work to fracture at corner, approximately 2m2.	
Retaining Wall 15 - Foundary		29.5.1 Undertake repointing work on wall.	29.6.1 Re-render elevation. Alternatively, remove loose and de-bonded render and if required re-point perished areas.
		29.5.2 Apply protective coating on steel members removing any loose or de-laminated steel.	29.6.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
		29.5.3 Undertake masonry repair work approx. 3.5m2 total.	
Retaining Wall 16 - Foundary		30.5.1 Apply protective coating on steel members following removal of any delaminated steel. Alternatively, cut or remove the previous steel members which are not acting in any structural capacity repairing the masonry wall voids left following their removal.	30.6.1 Undertake repointing work on wall. Alternatively, undertake a programme of long term monitoring.
		30.5.2 Install a tell-tale crack monitor on fracture and monitor annually.	30.6.2 Undertake masonry repair work on fracture by stitching and re-pointing.
		30.5.3 Undertake replacement or repair of timber members of mezzanine. Alternatively, remove the temporary mezzanine in its entirety.	30.6.3 Timber propping considered to be in a satisfactory condition. It is recommended that a long term maintenance and inspection regime is implemented.
		30.5.4 Replace structural members above opening with suitably designed members. Install a new member to support the inner face of masonry. Undertake a masonry repair to the fractured wall above, approx. 2m2. Alternatively, remove the opening by blocking it up.	30.6.4 Undertake masonry repair work to areas of missing masonry. Approx. 1m2.
			30.6.5 Re-render external elevation. Alternatively, carefully remove loose or debonded render and if required apply re-pointing to stone substrate.
			30.6.6 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
Retaining Wall 18 - Foundary		31.5.1 Remove vegetation to enable full inspection. Once the vegetation is cleared, it is crucial to address any voids or gaps that become visible. These voids should be promptly filled with appropriate materials to restore structural integrity.	31.6.1 Undertake repointing work on wall. Alternatively, undertake a programme of long term monitoring.
			31.6.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

Retaining Wall 19 - Foundary		32.5.1 Undertake masonry repair work approximately 1m2.	32.6.1 Re-render the external elevation. Alternatively, carefully remove loose or debonded render and if required apply re-pointing to stone substrate.
		32.5.2 Undertake repointing work on wall.	32.6.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
		32.5.3 Remove vegetation to enable full inspection.	
		32.5.4 Access should be made available for the inspection of the non accessible room behind RW19.	
Retaining Wall 20 - Foundary		33.5.1 Undertake masonry repairs works on areas of missing masonry.	33.6.1 Undertake repointing work on wall. Alternatively, undertake a programme of long term monitoring.
		33.5.2 Remove vegetation to enable full inspection. Once the vegetation is cleared, it is crucial to address any voids or gaps that become visible. These voids should be promptly filled with appropriate materials to restore structural integrity.	33.6.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
Retaining Wall 21 - Foundary		34.6.1 Remove vegetation to enable full inspection. Once the vegetation is cleared, it is crucial to address any voids or gaps that become visible. These voids should be promptly filled with appropriate materials to restore structural integrity.	34.7.1 Undertake repointing work on wall. Alternatively, undertake a programme of long term monitoring.
			34.7.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
Retaining Wall 22	35.4.1 Halt the current onset of corrosion of exposed reinforcement by applying a protective coating and include the wall in a programme of long term monitoring.	35.5.1 Undertake reinforced concrete repair work splicing new steel if required. Approximately 10m2.	35.6.1 If necessary, retrofit 50mm diameter weep holes within the wall at intervals of 2.5m and provide a scheme of surface water / land drainage fronting the wall to remove any seepage from the area.
	35.4.2 Remove all loose debris due to wall failure to make the area safe and monitor.	35.5.2 Undertake reinforced concrete repair work to 2No. localised areas. This repair work may involve cutting out the damaged concrete and recasting the affected areas, covering approximately 4m2 in total.	35.6.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
		35.5.3 Remove vegetation to enable full inspection.	
		35.5.4 Monitor the deterioration of the wall due to water penetration and any impact seepage may have on its performance.	
Retaining Wall 23	36.4.1 Remove vegetation to enable full inspection.	36.5.1 Remove exposed and corroded beam with a suitably designed member.	36.6.1 Undertake repointing work on wall.
	36.4.2 Restrict access beneath corroded fence.	36.5.2 Undertake masonry repair on wall on areas of loose masonry.	36.6.2 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.
		36.5.3 Dismantle the steel safety fence to prevent any further corrosion and minimise the potential hazard of the fence falling onto pedestrians.	
Retaining Wall 24 - Blast Furnace Charging Wall	37.4.1 Monitor vertical-diagonal crack.	37.5.1 Dismantle the steel safety fence to prevent any further corrosion and minimise the potential hazard of the fence falling onto pedestrians. Restrict access to top of wall via temporary fencing.	37.6.1 Undertake masonry repair on wall, ensuring that any fractures wider than 5mm are addressed through stitching (helibar or similar). Additionally, it is recommended to conduct annual monitoring of the wall for maintenance purpose.
	37.4.2 Remove vegetation to enable full inspection.		37.6.2 Undertake repointing work on wall.
			37.6.3 Replace timber propping with a suitably designed member.
			37.6.4 Remove lighting units.
			37.6.5 Re-render top of buttresses.
			37.6.6 Install new parapet at top of wall.
			37.6.7 Implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.

Structure	Emergency Works (within 12 months)	Short Term Recommendations (1-2 years)	Long Term Recommendations (2-5 years)
Room 1	35.5.1 Restrict access to room.	35.6.1 Remove and replace corroded lintel lintel with a suitably designed structural member. Alternatively, restrict access to room.	35.7.1 Any section of the wall that exhibits a deviation from verticality exceeding 1/3 of the total height, that specific portion of the wall will require rebuilding.
	35.5.2 Remove vegetation and implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.	35.6.2 Dismantle and rebuild pier supports. This task will necessitate the use of temporary support structures during the reconstruction process to ensure stability and safety. Alternatively, by designing a suitably designed lintel, the necessity for rebuilding the support can be eliminated.	
	35.5.3 Overpump standing water to prevent moisture affecting the base of surrounding structures.	35.6.3 Undertake masonry repair work on the failed spandrel. To prevent future failures and enhance the strength of the spandrel, strengthening measures such as reinforcing bars may be required.	
		35.6.4 Monitor vertically of walls on an annual basis.	
		35.6.5 Undertake masonry repair on barrel roof.	
Room 2	36.4.1 Overpump standing water to prevent moisture affecting the base of surrounding structures	36.5.1 Clear debris from drainage. Implement a routine maintenance plan to ensure drainage gully is cleared on a regular basis.	
Room 3 - Cupolas	37.5.1 Restrict access to room.	37.6.1 Remove cupola ancillaries which are at risk of collapse.	
	37.5.2 Remove vegetation and implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.	37.6.2 Remove and replace steel columns.	
	37.5.3 Overpump standing water to prevent moisture affecting the base of surrounding structures.	37.6.3 Remove areas of corrosion and apply protective coating.	
		37.6.4 Prevent water ingress and reduce corrosion by water proofing existing deck	
		37.6.5 Replace corroded columns.	
Stairs (Room 3)	38.4.1 Prevent access up stairs.	38.5.1 Remove debris build up.	
Room 4 - Brymbo Adit No. 12		38.5.2 Replace the steel frame with a suitable member to support the corrugated steel or whichever material that will be used to segregate room 3 and the stairs Alternatively, if it is deemed unnecessary to have a replacement member, the frame and corrugated steel can be removed altogether. In such cases, it is crucial to ensure the safety of individuals using the area by providing suitable handrails that comply with relevant safety standards.	
		38.5.3 Construct a drainage system that directs surface water away from the building, ensuring a proper and appropriate discharge at a recommended distance of 5 meters from the structure.	
	39.5.1 Restrict access to room.	39.6.1 Clear moss and algae growth.	39.7.1 Undertake repointing work on masonry joints.
	39.5.2 Overpump standing water to prevent moisture affecting the base of surrounding structures.	39.6.2 Undertake remedial works to ensure the flooring is adequate to walk on.	
		39.6.3 Pump the excessive water out of the room. Conduct a CCTV footage within the existing system to ascertain the blockage.	
Room 5 - Annealing Furnace	40.5.1 Restrict access to room.	40.6.1 Clear moss and algae growth.	40.7.1 Undertake repointing work on masonry joints.
	40.5.2 Apply protective coating on exposed and corroded steel beam.	40.6.2 Address the drainage issue in room 4.	
		40.6.3 To prevent corrosion and mitigate potential damage to the surrounding masonry, it is recommended to remove the corroded steel beam, as it is no longer serving a structural purpose.	
		40.6.4 Remove plasterboard to maintain natural appearance of the arch brick. Apply protective coating on brickwork to ensure the structure's durability.	
		40.6.5 Replace door frame with a suitable frame.	
		40.6.6 Replace door with a suitable door.	
		40.6.7 Undertake masonry repair work on brickwork.	
		40.6.8 Undertake masonry repair work to arch barrels by forming a mechanical tie between the two arches and address any cosmetic concerns by patching up the voids.	
Room 6 - Switch Gear Room	41.5.1 Monitor deflected lintel on annual basis.	41.6.1 Remove and replace deflected lintel with a suitably designed structural member.	41.7.1 Undertake repointing work.
			41.7.2 Undertake masonry repair work.
Room 7 - Transformer and Swtich Gear Room		42.6.1 Undertake masonry repair work on wall.	42.7.1Undertake cosmetic concrete repair work.
		42.6.2 Remove vegetation and implement a long term maintenance and inspection regime. For this type of structure, recommend annual vegetation removal with annual general inspection.	42.7.2Undertake repointing work on wall.
Room 8 - Glass Store			43.7.1 Undertake cosmetic repair on lintel.
			43.7.2 Undertake cosmetic repairs on brickwork.
Room 9			44.7.1Undertake cosmetic repair on lintel.
Room 10 - Winch Room	45.5.1 Monitor corrosion on corroded beams.	45.6.1 Remove corrosion and reapply protective coating on corroded beams.	

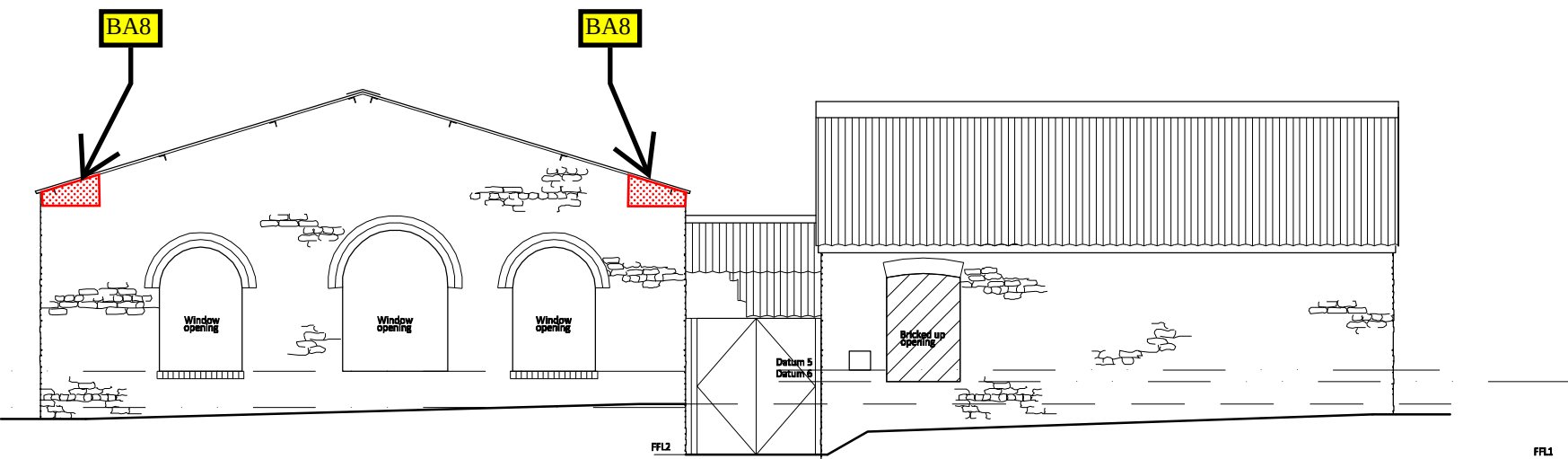
APPENDIX D

Defect Sketches

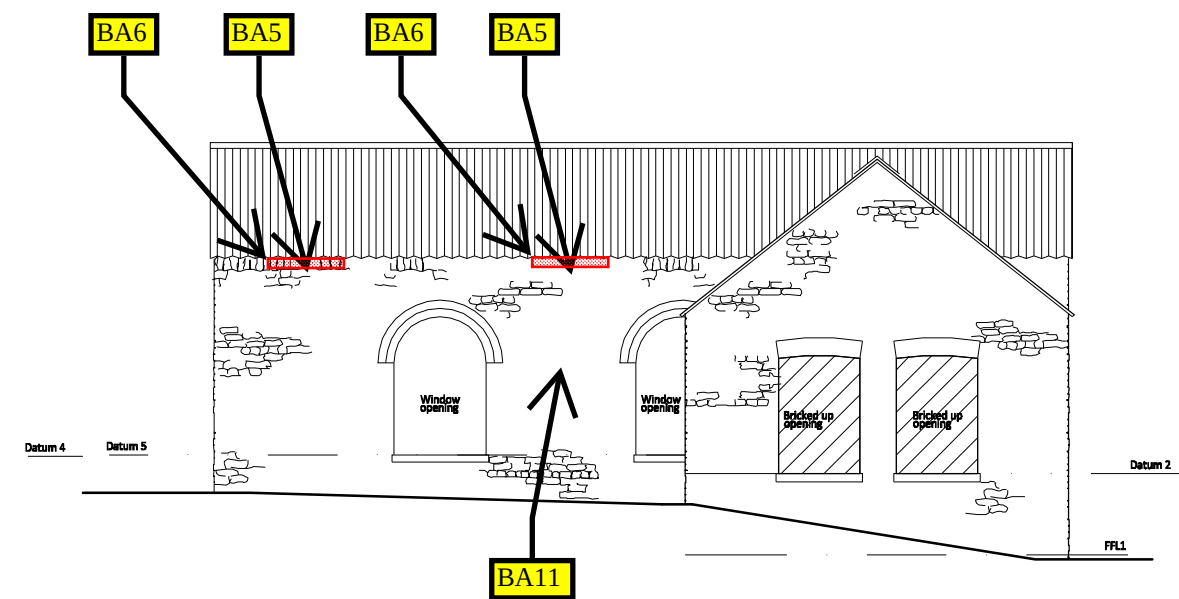


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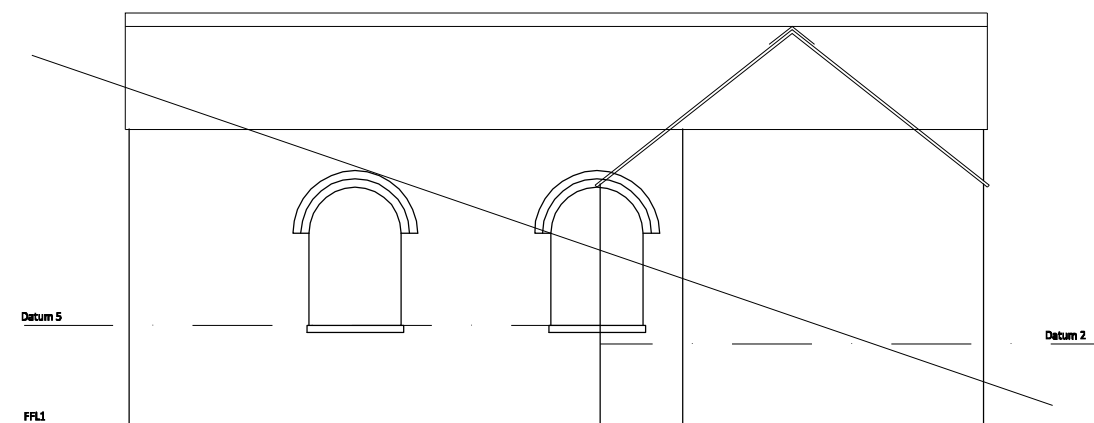


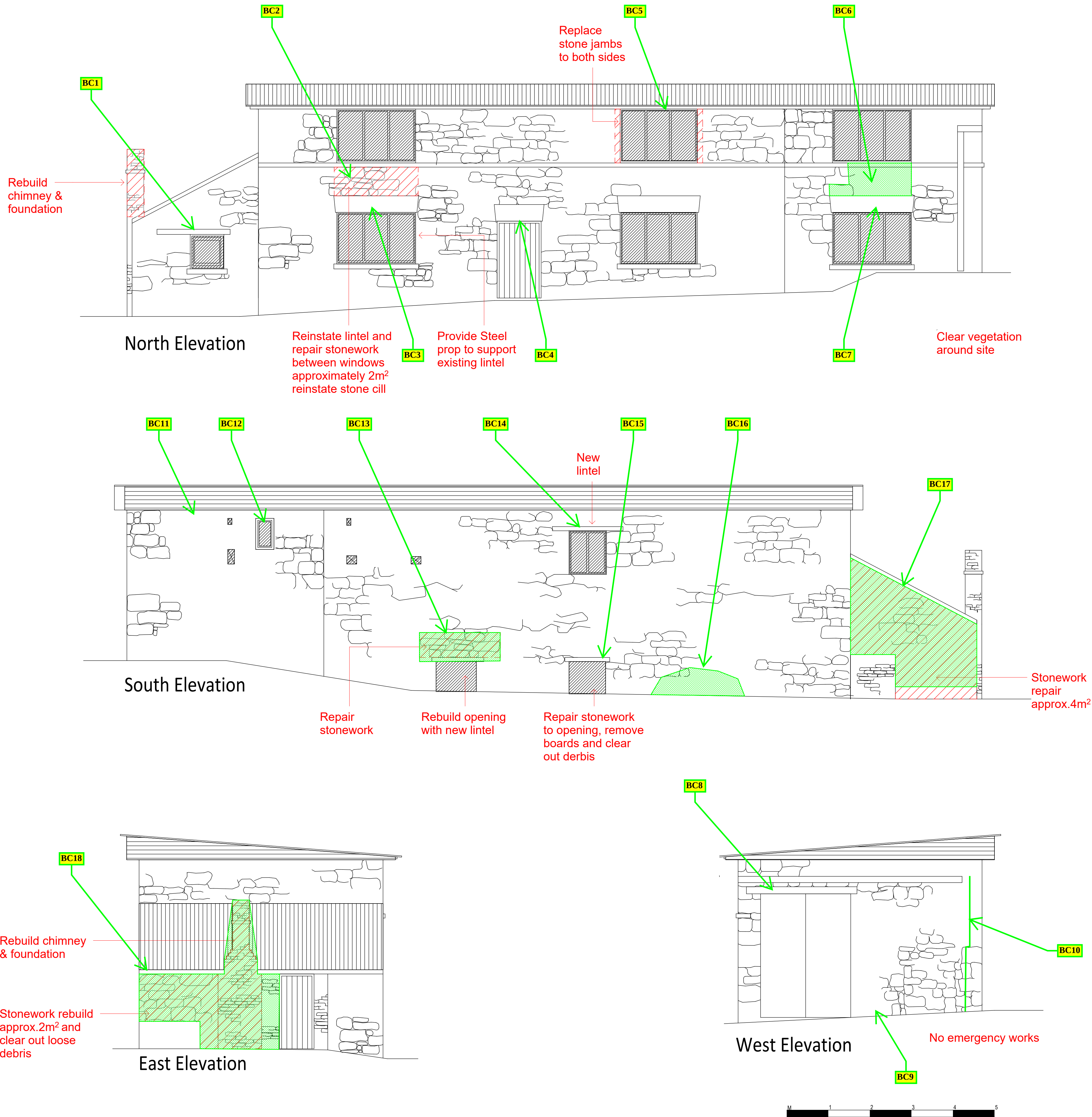
Back elevation



Side elevation

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1. Contractor to verify all dimensions and check level datums on site
 2. All of the designs are the sole property of TACP Architects Ltd and may not be used without their written agreement
 3. All prints, specifications and their copyright are the property of TACP Architects Ltd
 4. Do not scale off drawings
 5. All dimensions shall be checked on site before commencement of shop drawings, manufacture and all discrepancies must be reported to TACP Architects Ltd

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BRP comments in GREEN

Revisions				
Rev	Date	Description	By	Check

Client
Brymbo Heritage Trust

Project Title
Brymbo HLF

Sheet Name
Agent's House

Purpose of Issue
Emergency Works

Status

Scale
1 : 50@A1

Date
25/05/23

Drawn By
AKT

Checked By
JB

Office
Wrexham

Job Number
17003

Project*Originator*Zone*Level*Type*Role*Number
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Revision

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