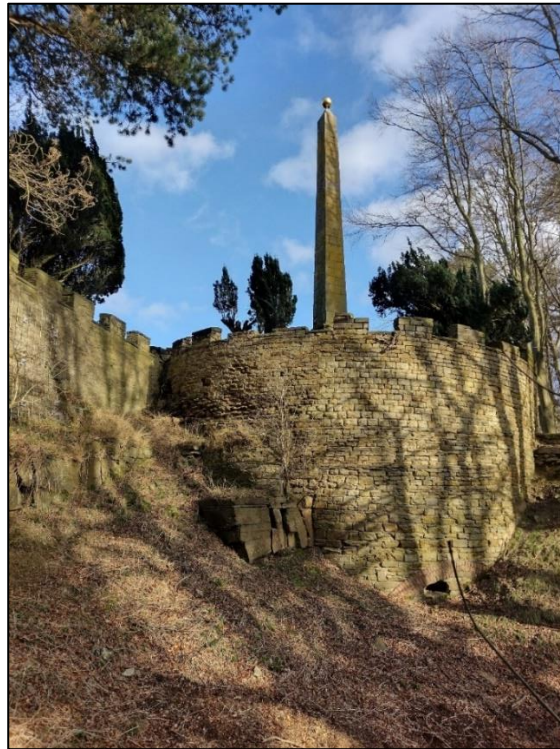




**WENTWORTH CASTLE GARDENS
QUEEN ANNE'S MONUMENT & BATTLEMENTS
SCHEDULE OF STRUCTURAL INTERVENTIONS**

Commissioned by



**Report 20340-Y-RP-003-R0
21 September 2022**

WENTWORTH CASTLE GARDENS QUEEN ANNE'S MONUMENT & BATTLEMENTS SCHEDULE OF STRUCTURAL INTERVENTIONS

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ISSUE LOG FOR REPORT 20340-Y-RP-003

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Issuing office Mason Clark Associates (York). Refer to final page for full office details.

1 INTRODUCTION

Mason Clark Associates (MCA) was commissioned by the National Trust, via Surveyors Hollis Global Ltd (Hollis), to provide conservation engineering assessment and design services at Wentworth Castle Gardens, Park Drive, Barnsley S75 3EN.

Donald Insall Associates (DIA) have been appointed to manage repair works to a series of historic structures including Queen Anne's Monument, the Battlements, and the Walled Gardens and Orangery. MCA were tasked to carry out inspections and assessments of these structures and provide proposals for stabilisation and repairs.



Aerial view of Wentworth Castle Gardens to show extent of site © 2022 Google.

Architects Donald Insall Associates are acting as Conservation Architect and **Principal Designer** for the remedial works.

This report focuses on the Queen Anne's Monument and the Battlements.
Our initial inspection report is available, reference 20340-Y-RP-001.

2 PURPOSE OF DOCUMENT

This document sets out the scope of structural repairs, alterations and interventions required for the above project.

This schedule is intended to be developed by a suitably experienced contractor to produce detailed method statements for the various elements. Tendering contractors are expected to visit site to familiarise themselves with the works required.

The work should be carried out to minimise the damage to fabric of historic significance, such as original plaster, timber, and masonry. It may need to be carried out under an archaeological watching brief and this should be confirmed at tender stage.

In structures of this age, it is likely that further concealed defects will be present, particularly at foundation level. As construction activity proceeds, additional remedial works may be required. These should be carried out with a similar level of care for historic fabric and workmanship as the scheduled works.

The main building contractor should demonstrate an appropriate level of experience and competence in this type of project and should allow for suitable site supervision during the works. A programme should be agreed with the National Trust, DIA and MCA to enable proposed interventions to be reviewed in good time, to amend the schedule and provide additional details as may be required.

The tendering contractor is to allow for the full costs of design and installation of any temporary works or access scaffold required.

This schedule should be read in conjunction with the Architect's and MCA's drawings and specifications, together with any further instructions from the National Trust.

ALL ITEMS ON THIS SCHEDULE ARE TO BE REVIEWED ON SITE AND AGREED WITH MASON CLARK ASSOCIATES PRIOR TO ANY ORDERING OR SITE INSTALLATION.

3 DESIGNER RISK APPRAISAL

This section sets out our Designer Risk Appraisal and Residual Risks for the structural engineering interventions to the Monument and Battlements.

3.1 Design Responsibility

Provide a brief description of the scope and extent of your design responsibilities.

Structural design of interventions to monuments, to extent defined via DIA drawings.

Identify if the Contractor will be required to undertake any significant design to complete your proposals. This may include for example specification of components to comply with a performance specification, component detailing or a requirement to design temporary works.

Design of all required temporary works including access scaffold.

3.2 Pre Design/Construction Information

Confirm what pre-construction information you have used whilst preparing your design.

Severn Partnership point-cloud scanning reports. DIA proposal drawings revision 0.

Confirm you are satisfied with the information or identify if you require further information/surveys to inform your design.

Further trial pits and opening-up works will be required during the construction phase to allow completion of the structural design and confirmation of final details.

3.3 Residual Hazards

Advise if the pre-construction information has identified any significant residual hazards which will or may impact on your design (for example asbestos; contaminated land; water bearing strata; buried services etc.).

Stability of Battlement walls during masonry consolidation. Previous strengthening / repair interventions have not been recorded.

If applicable advise how you have addressed/avoided any significant issues.

Careful intrusive trial holes / exploratory openings to be carried in each area of proposed intervention to check construction and condition prior to works commencing.

3.4 Construction Strategy

Provide a brief description of how you envisage the principal elements of your design to be constructed / undertaken.

Access scaffolding will be required to Obelisk and Battlements.

Include reference to any unconventional construction methods/processes or significant assembly sequences.

No unconventional methods anticipated.

3.5 Significant Construction Hazards

Provide details of any significant hazards that will be encountered in consequence of undertaking the proposed works. This may include addressing any significant residual site risks like dealing with hazardous materials or a potentially hazardous construction procedure.

No significant hazards anticipated.

Ensure any significant hazards identified are clearly indicated on applicable construction drawings i.e. if there is a gas pipe in a location to be excavated or asbestos within a void to be accessed as part of the electrical installation label it on the drawing.

No significant hazards anticipated.

3.6 Post Construction Residual Hazards

Provide details of any significant or unusual hazards that will remain post construction. Examples may include an area or void containing asbestos or a high-iinstallation that requires specialist access for routine servicing etc.

Long-term impact of nearby trees and roots on stability of masonry.

Include any significant issues that may present a potential hazard to any future substantial alteration or demolition works.

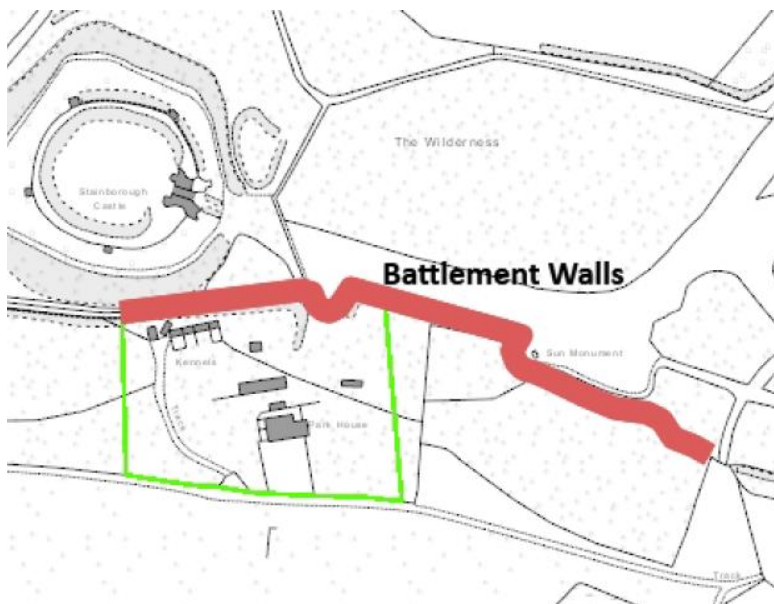
Conservation Management Plan to include tree canopy management, vegetation clearance and regular inspection of structures.

4 PROPOSED STRUCTURAL INTERVENTIONS

Area references are taken from DIA proposed interventions drawings (related to photograph numbers). MCA reference sections are as given below for the Battlements.



Battlements from National Heritage List mapping with section references indicated.



Battlements from Hollis sketch, indicating required length of wall to be included in survey.



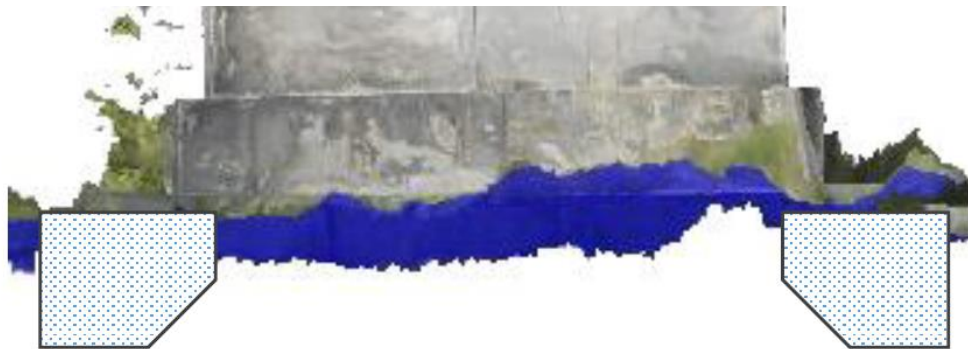
**QAM01 Replacement / indent stone repairs and lime pointing to cracks.
Refer to DIA drawing 2001**

- i Stone indent repairs to plinth / pedestal / obelisk will give opportunities for careful intrusive investigation to the core of the monument.
- ii Include for diamond drill coring in 3no. locations (assume 75mm diameter) behind the removed facing stones. Check for rubble fill or voids.



QAM02 Displaced base stones around perimeter of pedestal.

- i Carry out a trial hole, near to the monument, to confirm the local soil conditions and inform the underpin detail proposed below. Trial hole assume 450 x 450 x 900mm deep.
- ii Carefully remove the base stones in an agreed sequence. Install a perimeter mass concrete footing in short lengths and re-bed the base stones. Infill all open joints and pack tight to the plinth course.



- iii Assume footing dimensions 400 x 450mm deep, for full perimeter of base. Concrete grade GEN1. All to be confirmed following trial hole. Lime bed to replaced base stones.



QAM03 **West elevation. Deep void behind plinth stone.**
Replacement of corner stone – refer DIA drawing 2001.

- i Allow for lime grouting to deep voids within plinth.



**QAM04 Rebuilding to Pyramidion.
Refer to DIA drawing 2002.**

- i Careful dismantling as DIA drawing.
- ii Allow for inspection by Engineer when lower courses exposed.
- iii Allow for consolidation of open voids / joints to base courses with lime mortar.
- iv Include for stainless steel dog cramps and vertical dowels set within upper three bedjoints. Assume M10 stainless threaded stud, 150mm long. Dog cramps ex 5mm thick plate. Arrangement to be agreed on site following inspection.



QAM05 General slight westwards lean observed to Monument.

Previous laser-scan monitoring by Severn Partnership suggested no significant recent movement.

- i Install stainless or brass projecting pins to all four faces of the pedestal, to allow accurate tilt monitoring of the Monument to be carried out following repair works.
- ii Studs to comprise:
 - Install in vertical pairs to allow accurate tilt monitoring using a 2m straightedge.
 - 8mm brass threaded stud.
 - Embed up to 40mm into stone with resin.
 - Project maximum 25mm to allow tilt bar to be used without touching the stone.
 - Stainless dome headed nut (glue on to prevent removal).
 - Washer/nut with NT reference stamp
- iii Propose monitoring on a six-month basis for two years, then every two years assuming no significant change.
- iv Visually monitor the Monument for further fresh cracking (on the same frequency as the tilt monitoring). Should cracking recur, consider the installation of proprietary sock anchors to resist bursting forces.



**BA01 Section 1. Reinstatement of merlons generally.
Refer DIA drawing 2011, photos 1,2.**

- i Agree stainless cramping / dowelling of new merlons, once coping lifted to expose wall head below.
- ii Assume M10 stainless threaded studs, 150mm long. Allow 4no. studs per course with stainless dog-cramps ex 5mm thick plate. Final specification and arrangement to be agreed on site.



BA02 Section 2. Local rebuilding.
Refer DIA drawing 2013, photo 1.

- i Allow for inspection of wall base and core once displaced stone removed above.
- ii Ensure all embedded roots carefully removed.
- iii Include for stainless ties to bond in replaced stone with walling either side. Allow for 8mm stainless helical bars, to inner and outer leafs, at 225mm maximum centres vertically. Resin fix minimum 150mm into joints either side of rebuilt section, with minimum 450mm projection into rebuilt section. Final arrangement to be agreed on site.



BA03 Corner, Sections 2 to 3. Local rebuilding.
Refer DIA drawing 2013, photo 3.

- i Similar approach to BA02.



**BA04 Section 3. Lower bulging section of wall.
Refer DIA drawing 2012, photo 2.**

- i Allow for careful rebuilding and consolidation of lower bulging section of Battlements as DIA drawing.
- ii Work in an agreed sequence. Assume short lengths of walling, maximum 600mm unless otherwise agreed.
- iii Method for grouting / packing deep voids to be agreed on site following initial opening up works.
- iv Maintain or install weepholes at regular intervals. Allow for 75mm diameter holes at maximum 2m centres.



BA05 Section 3. Lower bulging section of wall.

- i Allow for similar careful rebuilding and consolidation of loose base courses, as BA04.



BA06 Section 1. Lower bulging section of wall.

- i Allow for similar careful rebuilding and consolidation of loose base courses, as as BA04.



**BA07 Section 3. Long term monitoring of rock anchored wall and adjacent bulge.
Refer DIA drawing 2012.**

- i Open joints to be packed and repointed in lime.
- ii Visually inspect this section of wall for signs of cracking, further bulging or movement.
- iii Inspections to be carried out annually, with record photographs to compare with previous years.



**BA08 Battlements largely obscured by undergrowth.
Long term management of battlements.
Refer to DIA drawing 2011 and 2012.**

- i During the construction phase, clear undergrowth and vegetation growth, to both sides of the Battlements, for the full length of proposed repairs.
- ii Continue to carefully clear vegetation on a regular basis to minimise root penetration and deterioration.
- iii Confirm with the National Trust which trees adjacent to the wall are protected, and whether any can be carefully removed. Agree a tree canopy management programme to maintain the health of the trees whilst minimising further growth.

5 GENERAL SPECIFICATION / ADDITIONAL STRUCTURAL ITEMS

This document provides key standards, performance and execution (workmanship) clauses for the structural elements on the above project. It is assumed the Contractor has access to, and is familiar with, the latest edition of the following industry standard documents:

- *The Building Regulations Approved Document A*
- *BS 8000 (all parts): Workmanship on building sites*
- *BS 8103 (all parts): Structural design of low rise buildings*
- *The National Structural Steelwork Specification*
- *The National Structural Concrete Specification*
- *The National Structural Timber Specification*

A separate specification has been provided following the National Building Specification common arrangement of work sections. In addition, information relevant to the heritage interventions is given as follows.

5.1 Scaffolding

Scaffolding should allow caps to tie bars or compressible packing to minimise damage to masonry. All fixings into stone or facework should be minimised. Where unavoidable, these should be taken into masonry joints rather than into facework.

5.2 Crack stitching

Minor cracking to be repaired using twisted stainless HeliBars set into bedjoints using HeliBond grout. All works to be carried out to HeliFix recommendations.

Unless noted specifically:

- Bars generally 1m long, set centrally about vertical crack location.
- Bars installed every 2no. courses vertically (maximum 150mm ccs).
- Bars to be bent to repair corner cracks.
- Where longer bars are required, lapped HeliBars are acceptable to HeliFix recommendations.
- Repoint with suitable lime mortar to match the existing surrounding brickwork for colour / texture.



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CIVIL ENGINEERING Bridge design, maintenance and construction Wharfs, jetties and marine structures Highway design and maintenance Retaining wall and slope stability solutions Land remediation advice Road and sewer design to adoptable standards Section 38 and 104 Agreements Sewer requisitions and diversions Section 98 and 185 Agreements Flood Risk Assessments Coastal erosion flood breach analysis Flood risk management / prevention schemes Underground drainage design Stormwater attenuation SUDS Ponds, lakes and balancing ponds PROJECT MANAGEMENT QUANTITY SURVEYING & CONTRACT ADVICE CDM SERVICES BUILDING SURVEYING SERVICES Design, Remedial Repair / Improvement Schemes Contract Administration Building Surveys Professional Opinion Reports Condition Surveys & Schedules of Condition Measured Surveys Dilapidation Claims Party Wall etc. Act Representation Disabled Adaptations EXPERT WITNESS SERVICES Civil & Structural engineering disputes Project Disputes Health and Safety Regulations STRUCTURAL ENGINEERING Residential and commercial building structures Education and healthcare facilities Heavy industrial development Feasibility studies for development sites Building Regulations and Planning Applications Access and maintenance gantries Modular building design Blast design Subsidence management and resolution Temporary works design and specification Site and soils investigation Sulphate attack specialists Confined spaces assessments CONSERVATION ENGINEERING Engineer Accredited in Building Conservation CARE Registered Engineer Heritage and conservation engineering Listed Building refurbishment Historic Parks and Gardens Scheduled Ancient Monuments Monitoring and investigations Liaison with Local Conservation Officers Buildings at Risk and Managed Ruins 3D LASER SCANNING AND DATA CAPTURE Latest Generation 3D Laser Scanning Measured Building Surveys Topographical Surveys Monitoring Surveys 3D modelling (Revit, CAD, Inventor, Solidworks) M & E Modelling Volumetric / Level analysis Scan to BIM Scan data cloud hosting Hi-Def HDR photographic surveys		