



London City Wall,

Roman Wall of the City of London & Roman Fort Gatehouse

at the London Wall carpark

Conservation Works

Prepared by Sally Strachey Historic Conservation Ltd.

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1. Summary

The City of London Corporation (the City) has appointed Sally Strachey Historic Conservation Ltd to undertake a programme of conservation works to conserve the remains of the London City Wall: Scheduled Monument No. SM 26323, HA 1018885; a section of Roman Wall within the London Wall carpark and the Roman Wall of the City of London and Roman Fort Gatehouse: Scheduled Monument No. SM 26328, HA 1018889; the West gate of Cripplegate fort and a section of Roman wall within the London Wall carpark.

Both sites are owned by the City of London Corporation and the City Surveyors department of the City of London is responsible for the care of the remains.

Scheduled Monument Consents were obtained for the conservation works.

The present document is an illustrated report on the work that took place, prepared by Sally Strachey Historic Conservation Ltd.

2. Historical Context

The City Wall is a Scheduled Ancient Monument largely within the boundaries of the City of London and consists of standing remains from various periods, mostly Roman and Medieval. Within the wall there are a number of forts.

The section of the Roman City Wall within the London Wall carpark is all that remains of a longer section of walling, approximately 64m, which was uncovered in 1957 during the construction of the London Wall road and carpark. Most of the wall was subsequently demolished during the building works.

The remaining section of Roman Wall, built in the 1st Century AD, is of a typical construction, usually referred to as 'opus mixtum', with dressed Kentish Ragstone for the faces and a core of Kentish Rag, Chalk and other materials. Set at three levels are terracotta tiles which run through the width of the wall and were used to tie the wall together; these have a triple course on the lower two levels and a double course at high level (a height of approximately 2m).

The archaeological remains of the West gate of Cripplegate Fort and Roman Wall of the City of London, within the London Wall carpark are only at low level. They were also uncovered in 1957 during the London Wall road and carpark construction. The Roman Fort Gatehouse was built c. 120AD. The remains of the northern tower, including the guardroom and the stone piers which supported the arches spanning the gates is all that can now be seen. Large blocks of sandstone formed the base, some weighing over 500kg. The remaining masonry consists of Kentish Ragstone.

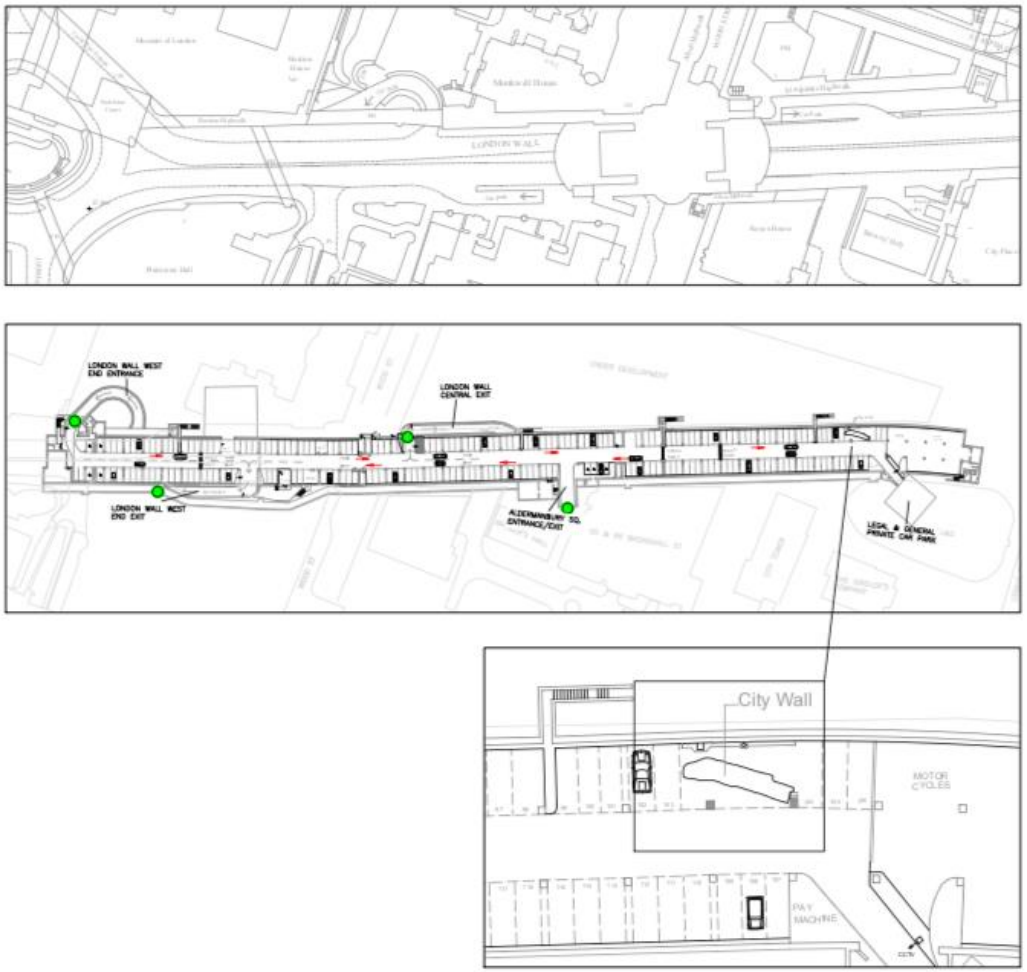
To the North of the fort is the remains of the fort wall which was incorporated into the Roman City wall when internal thickening was added c. 200AD. The wall is constructed of Kentish Ragstone, sandstone and other materials.

The archaeology was consolidated in the middle of the 20th Century by the Ministry of Works and was the subject of a report by Nimbus Consultancy in 2002 and further reports by Odgers Conservation Consultants in 2010 and 2018.

3. Contract Brief

Specialist repair of two Scheduled Monuments.

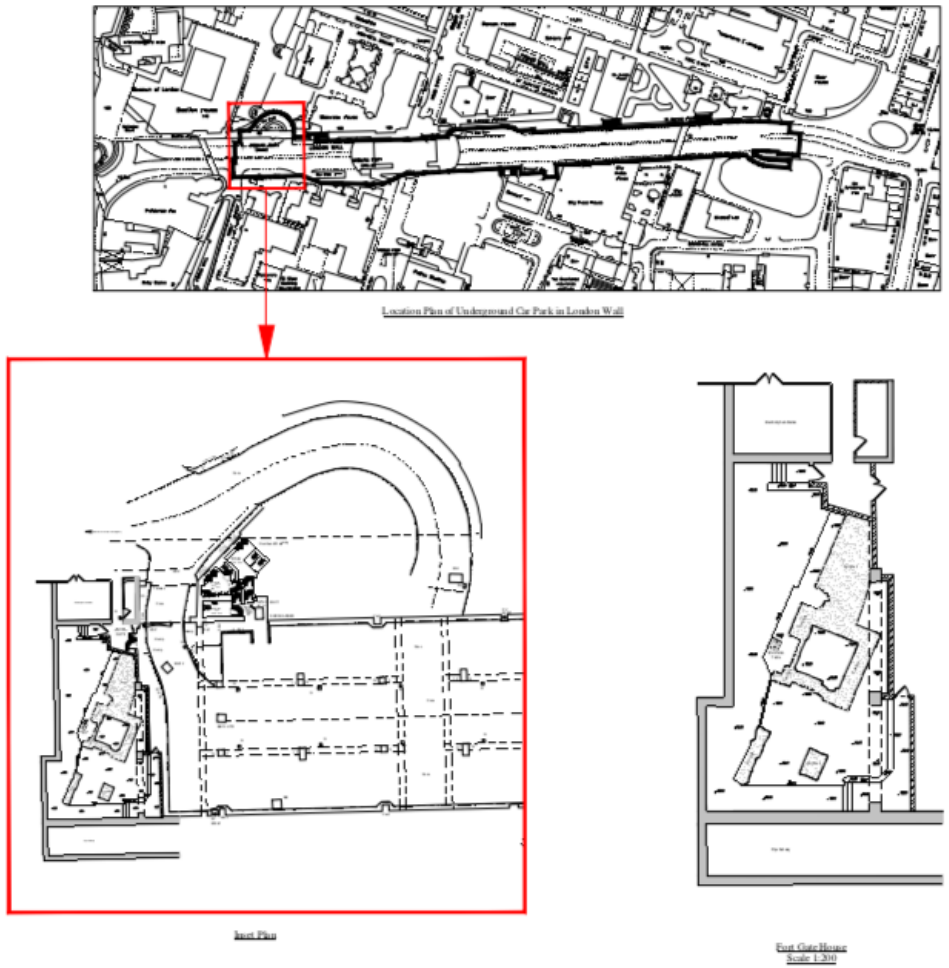
3.1 Project Brief:



No. SM 26323, HA 1018885, consisting of a section of Roman Wall within the London Wall carpark.

The general location of the site is illustrated on Drawing 1 - Contract Drawing No. 1-C-41352 -01

Drawing 1 - Contract Drawing No. 1-C-41352 -01



No. SM 26328, HA 1018889, consisting of the West Gate of Cripplegate Fort and a section of Roman Wall in the London Wall carpark.

The general location on the site is illustrated on Drawing 2 – Contract Drawing No 1-C-41335 -01

Drawing 2 – Contract Drawing No. 1-C-41335 -01

The repairs to the section of Roman City Wall included the following works;

- cleaning the masonry wall
- consolidation of friable stones with lime injection mortar
- filling voids with lime mortar
- raking out and re-pointing deteriorated mortar joints
- re-setting loose stones
- excavation of the concrete around the Wall and filling resulting trench with Selfbinda gravel

The repairs to the Fort Gatehouse and City Wall included the following works;

- cleaning the archaeology
- cutting out and re-pointing areas of mortar joints
- re-setting loose stones
- removal of existing gravel cover and installation of new membrane, separator and different coloured Selfbinda gravel
- excavation of concrete band adjacent to archaeology and adding separator to the resulting trench before filling with Selfbinda gravel

All as per the Schedule of Works, Materials and Workmanship.

The site is owned by the City of London Corporation.

Planning permission, Scheduled Monument Consent and Faculty for the works were obtained prior to the commencement of the works.

3.2 Contract Particulars

Location	London City Wall and the Roman City Wall and Fort Gatehouse City of London Corporation carpark London Wall London. EC2V 5DY
Employer	The Mayor and Commonalty and Citizens of the City of London, ("the City")
Supervising Officer/ **Contract Administrator/** **Principal Designer**	Susana Barreto Heritage Estate Officer City Surveyors' Department, City of London P O Box 270 Guildhall, London. EC2P 2EJ Tel: 0207 7332 1801
City's Safety Officer	Peter Dempsey Health & Safety Manager (Property) City Surveyors' Department, City of London P O Box 270 Guildhall, London. EC2P 2EJ Tel: 0207 332 3687 Mob: 07841 808048
Conservation **Consultant**	David Odgers Odgers Conservation Consultants The Old Stable, Peacock Hill House Barton St. David, Somerton Somerset. TA11 6BN Tel: 01458 851209 Mob: 07725 658185

Health & Safety Consultant	Stace LLP 273 High Street Epping Essex CM16 4DA Tel: 01992 565565

4. Samples and Trials

Samples of original mortar taken from the Roman City Wall were sent to Rose of Jericho for analysis.
From the samples and analysis results Rose of Jericho provided both a dry sample, in a petri dish, and a wet sample.

On the 24th September 2020 an inspection meeting took place on site. The sample was assessed by David Odgers (Conservation Consultant), Jane Sidell (Inspector of Ancient Monuments – Historic England), Kathryn Stubbs (the City's Assistant Director Historic Environment) and Ulrike Wahl (the City's Heritage Estate Officer).



Photograph 1 – the dry sample provided by Rose of Jericho.

Material	Quantity
Lime Putty	1
Bramshill Coarse sand	1.75
Ballast	0.5
Chalk	0.25

For situations where greater bulk was required 0.5 gravel should be added to the mortar.

4.1 Approved Sample

On the 24th September 2020 the mortar sample was approved for pointing, fixing and filling voids. It was noted that the finished texture needs to be rougher and more irregular to match the retained mortar adjacent to the sample.



Photograph 2 – Mortar sample situated on the internal North wall of the Fort Gatehouse.



Photograph 3 – Mortar sample situated on the South elevation of the City Wall.

4.2 Sources and Suppliers

The following sources/suppliers have been used:-

Material	Supplier
Lime Putty Mortar	Rose of Jericho Horchester Farm Holywell Dorchester. DT2 0LL www.roseofjericho.co.uk
Terram T1000 Geotextile	EasyMerchant Limited Fairy Farm Toppesfield Road Braintree CM7 4EP www.easymerchant.co.uk
Marmox Multiboard 12.5mm	Insulation Express SIG Adsetts House 16 Europa View Sheffield Business Park Sheffield. S9 1XH
Selfbinda Path Gravel	All Green Group 46 Buckland Road Pen Mill Trading Estate Yeovil Somerset. BA21 5EL www.allgreengroup.co.uk
Dispersed Lime Injection Mortar	Deffner & Johann GmbH Mühläckerstraße 13 DE-97520 Röthlein www.deffner-johann.de
Gravel	Salvaged on site from previous landscaping
Ragstone	Salvaged on site from previous works

5 Repair Programme for the London City Wall – London Wall carpark

5.1 Conservation Works to Masonry

5.1.1 Specified Works:

- Remove surface dust and debris with the use of soft brushes and a vacuum cleaner.
- Clean all areas of stonework using clean water and small stiff brushes or dry steam. (see photographs 4, 5 & 6)
- Using approved lime mortar fill small voids (up to 150 x 100 x 100mm) in all elevations. Allow 40 No.
- Using approved lime mortar and small sections of stone fill larger voids (up to 300 x 100 x 150mm) in all elevations. Allow 12 No. (see photographs 7 & 8)
- Using dispersed lime injection mortar consolidate fragmented stones on South elevation. Allow 2 No. (see photograph 9)
- Rake out and repoint deteriorated mortar joints on all elevations. Allow 15 linear metres. (see photographs 10 & 11)
- Re-set any loose/fallen stones. Allow 10 No. (see photographs 12 & 13)

5.1.2 Variations Instructed:

Additions:

- Single upright stone in cement mortar should be removed, cleaned off and used elsewhere on the wall.

Omissions:

- Use of dry steam to clean stonework.

5.1.3 Commentary on works carried out and variations undertaken:

- Most of the removed dirt consisted of particulates that tend to be sticky but were successfully removed with water and stiff brushes.
- Horizontal surfaces that had some areas of slightly friable mortar were brushed and vacuumed to a sound surface. (see photograph 14)
- Smaller sections of Ragstone either from the wall or from the excess stones in the Fort gatehouse were included in the mortar fills of larger voids.
- When filling voids the mortar was left well recessed from the front so as to retain the sense of the original void and herringbone construction of the wall. (see photograph 15)
- The single upright stone was re-set in a more appropriate section of the wall. (see photograph 16)

5.2 Preventive Conservation and Presentation of site

5.2.1 Specified Works:

- Excavate concrete for a width of 300mm around base of wall to a depth of minimum 200mm or to full depth. (see Drawing 3 & photograph 17)
- Fill the resulting trench with well compacted, Selfbinda limestone path gravel (colour 'C' - Cotswold Buff) to existing finished floor level.
-

5.2.2 Variations Instructed:

Additions:

- Remove the disused vent adjacent to the wall.

Omissions:

- It was not possible to excavate the concrete to a depth of 200mm in all areas of the trench.
-

5.2.3 Commentary on works carried out and variations undertaken:

- A sample of the vent concrete was taken for asbestos analysis. Once a negative result was confirmed the vent was demolished.
- Upon excavation of the concrete around the base of the wall two gaps, partially under the wall were uncovered. Remains of deteriorated modern timbers were present in the gaps. The gaps were approximately 100mm in depth and in one an RSJ was visible. The concrete around these gaps extended under the Roman wall. (see photographs 18,19, 20, & 21)
- It was agreed that the gaps under the Roman Wall should be filled, as far as possible, with the Selfbinda gravel.
- At the East end of the Roman wall the cementitious pointing and Ragstone overlaps the concrete floor. (see photograph 18)



Photograph 4 – Roman Wall, North face, before cleaning.



Photograph 5 – Roman Wall, North face, after cleaning.



Photograph 6 – Roman Wall, East face, left side after cleaning/right side before cleaning.



Photograph 7 – Roman Wall, North face, stone inclusion in void fill.



Photograph 8 – Roman Wall, North face, stone inclusion to fill void and support stone.



Photograph 9 – Roman Wall, South face, dispersed lime injection mortar consolidation.



Photograph 10 – Roman Wall, South face, before pointing.



Photograph 11 – Roman Wall, South face, after pointing.



Photograph 12 – Roman Wall, North face, re-set large loose stone.



Photograph 13 – Roman Wall, North face, re-set small loose stones.



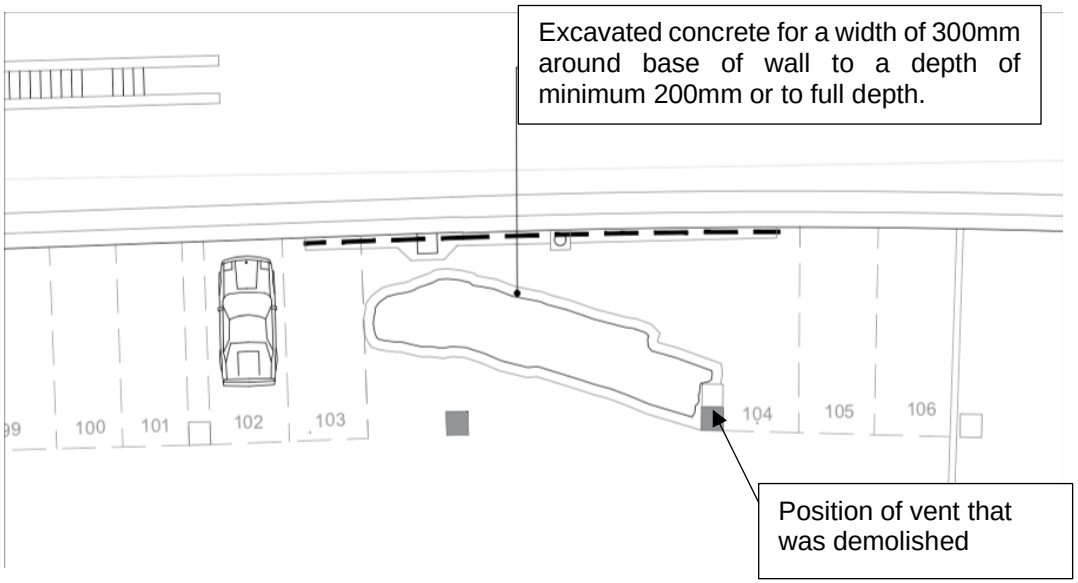
Photograph 14 – Roman Wall, North side, Friable mortar that was brushed to a sound surface.



Photograph 15 – Roman Wall, North side, Herringbone construction maintained.



Photograph 16 – Roman Wall, North side, re-sighting of the upright stone.



Drawing 3 – The trench excavated around the Roman Wall.



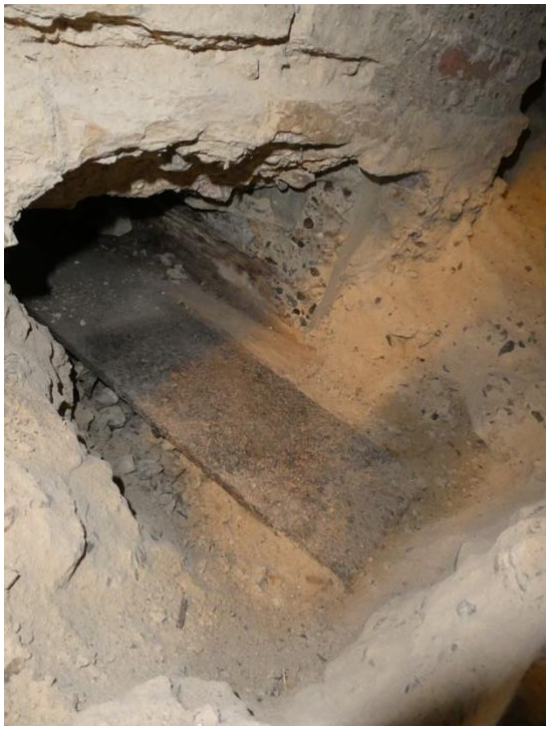
Photograph 17 – Roman Wall, West side, excavated trench.



Photograph 18 - Roman Wall, East side, section of concrete extending under wall. Overlapping of cementitious pointing, stones and concrete flooring.



Photograph 19 -Roman Wall, South side, gap under wall.



Photograph 20 – Roman Wall, South side, RSJ. and gap under wall.



Photograph 21 – deteriorated modern wood excavated from gaps.



Photograph 22 – Roman Wall, North side, after conservation.



Photograph 23 – Roman Wall, South side, after conservation.

6 Repair Programme for the Roman City Wall and Fort Gatehouse

6.1 Conservation Works to Masonry – Central pier of gateway

6.1.1 Specified Works:

- Remove dust and debris from surfaces with brushes and a vacuum cleaner.
- Carefully brush off salts.
- Rake out and re-point small areas of mortar joints. Allow 6 No. – not exceeding 150mm long.
-

6.1.2 Variations Instructed:

Additions:

- None.

Omissions:

- None.
-

6.1.3 Commentary on the works carried out and variations undertaken:

- Some areas of pointing undertaken were below the finished gravel level.

6.2 Conservation Works to the Masonry – Archaeology in centre of gateway

6.2.1 Specified Works:

- Remove dust and debris from surfaces with brushes and a vacuum cleaner.
- Carefully brush off salts.
- Lift off and re-set loose stones. Allow 3 No. (see photograph 24)
- Consolidate decayed surface of stones. Allow 6 No.
- Rake out and re-point joints as required. Allow 2 linear metres.

6.2.2 Variations Instructed:

Additions:

- None.

Omissions:

- Consolidation of decayed stones was omitted.

6.2.3 Commentary on the works carried out and variations undertaken:

- Consolidation of decayed stones was omitted as the removal of the concrete and the pointing of the stones should stop salt crystallisation through the masonry.

6.3 Conservation Works to the Masonry – North turret guardroom

6.3.1 Specified Works:

- Remove dust and debris from surfaces with brushes and a vacuum cleaner.
- Carefully brush off salts.
- Rake out and re-point all mortar joints on internal face of east wall. Allow 10 linear metres. (see photograph 25)
- Rake out and re-point other mortar joints as required. Allow 3 linear metres.
- Consolidate laminated stones on east wall. Allow 2 No.

6.3.2 Variations Instructed:

Additions:

- None.

Omissions:

- Consolidation of decayed stones was omitted.

6.3.3 Commentary on the works carried out and variations undertaken:

- Consolidation of decayed stones was omitted as the removal of the concrete and the pointing of the stones should stop salt crystallisation through the masonry.

6.4 Conservation Works to the Masonry – Fort Wall

6.4.1 Specified Works:

- Remove dust and debris from surfaces with brushes and a vacuum cleaner.
- Carefully brush off salts.
- Lift off and re-set loose stones. Allow 2 No.
- Rake out and re-point all joints up to and including offset on west side of wall. (see photograph 26)
- Consolidate laminated stones on east wall. Allow 2 No.

6.4.2 Variations Instructed:

Additions:

- None.

Omissions:

- Consolidation of decayed stones was omitted.

6.4.3 Commentary on the works carried out and variations undertaken:

- Consolidation of decayed stones was omitted as the removal of the concrete and the pointing of the stones should stop salt crystallisation through the masonry.

6.5 Preventive Conservation and Presentation of site

6.5.1 Specified Works:

- Carefully collect up and dispose of gravel from within the north turret guardroom.
- Remove concrete to full depth in a channel 150mm wide around the edge of the north turret guardroom.
- Remove concrete to full depth from channel 150mm wide along west edge of north turret guardroom and fort wall.
- Carefully collect up and dispose of gravel from all other areas of the site – assume average depth of 150mm and total 10 cubic metres.
- Remove and dispose of all geotextile membrane and fibre board inserted to separate gravel from archaeology. (see photograph 27)
- Allow provisional sum of £500 for archaeological watching brief during all removal.

Please refer to Drawings 4 & 5 and photograph 28 for these following points:

- Insert new waterproof insulation board in vertical strips around all the archaeology. This should approximately follow the topography of the wall but should be set 150mm away from it. Insulation board should be cut to correct depth to match existing floor level and held in place using mortar flaunching.
- Lay new geotextile membrane on all general areas up to the insulation board.
- Lay Selfbinda gravel (colour 'A' - Mendip Grey) onto geotextile membrane up to existing floor level. Finish by tamping according to manufacturer's instructions.
- Lay Selfbinda gravel (colour 'B' - Somerset Gold) over existing concrete within north turret guardroom. This should be laid to existing floor level. Finish by tamping according to manufacturer's instructions.
- Lay Selfbinda gravel (colour 'C' - Cotswold Buff) within channels. Finish by tamping according to manufacturer's instructions.

6.5.2 Variations Instructed:

Additions:

- Removal of all the concrete floor within the north turret guardroom.
- Removal of single brick course along kerb and rendering of top surface in coloured (red) render. (see photographs 29 & 31)
- Removal of cementitious mortar in the channel on the west side of the fort wall. (see photograph 30)

Omissions:

- Watching archaeological brief.

6.5.3 Commentary on the works carried out and variations undertaken:

- The removal of the single brick course along the kerb resulted in the finished level of the landscaping being reduced, allowing more of the archaeology to be visible.
- The channel around the archaeological was excavated to the lower edge of the fibreboard and the main area to ensure that 75-100mm of Selfbinda gravel could be laid.
- The top surface of the kerb was coloured (red) render to provide a demarcation between publicly accessible areas and the archaeological remains



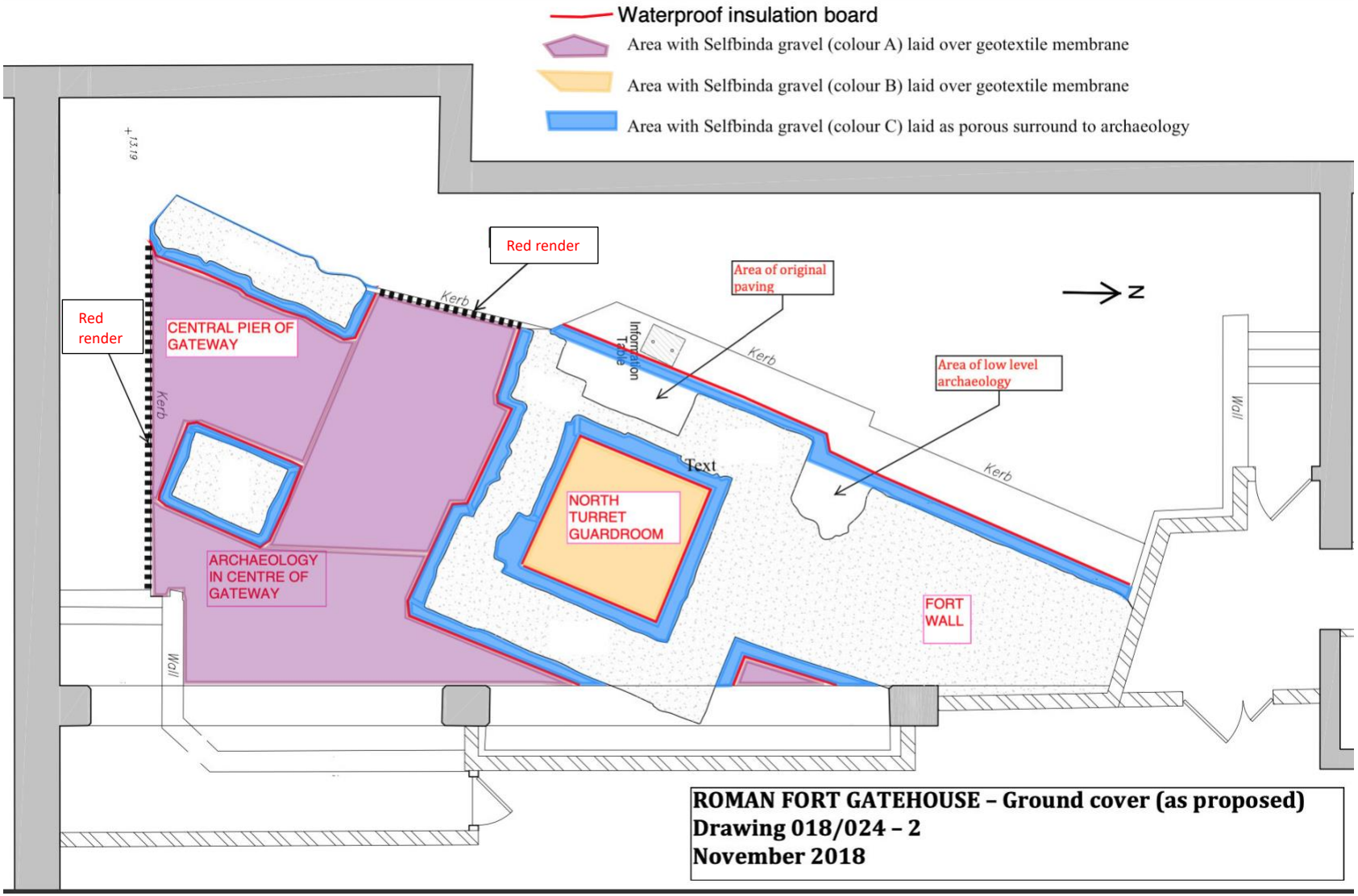
Photograph 24 – archaeology in centre of gateway, East side, re-set loose stones.



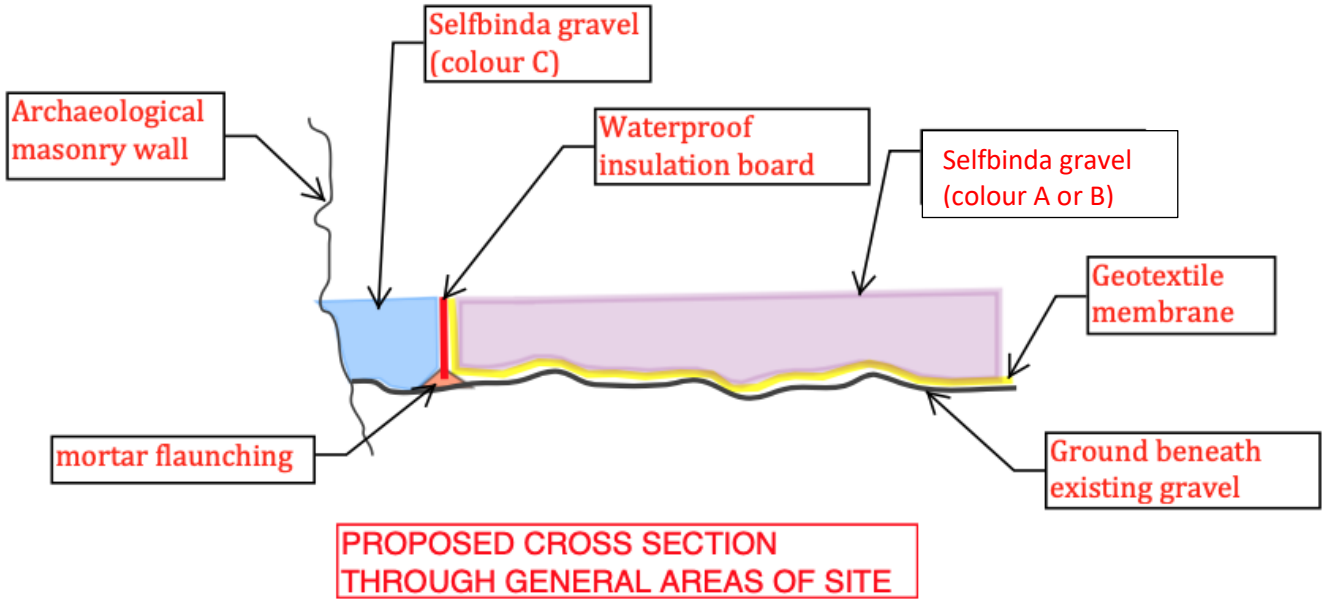
Photograph 25 – North turret guardroom, internal East side, repointed stonework.



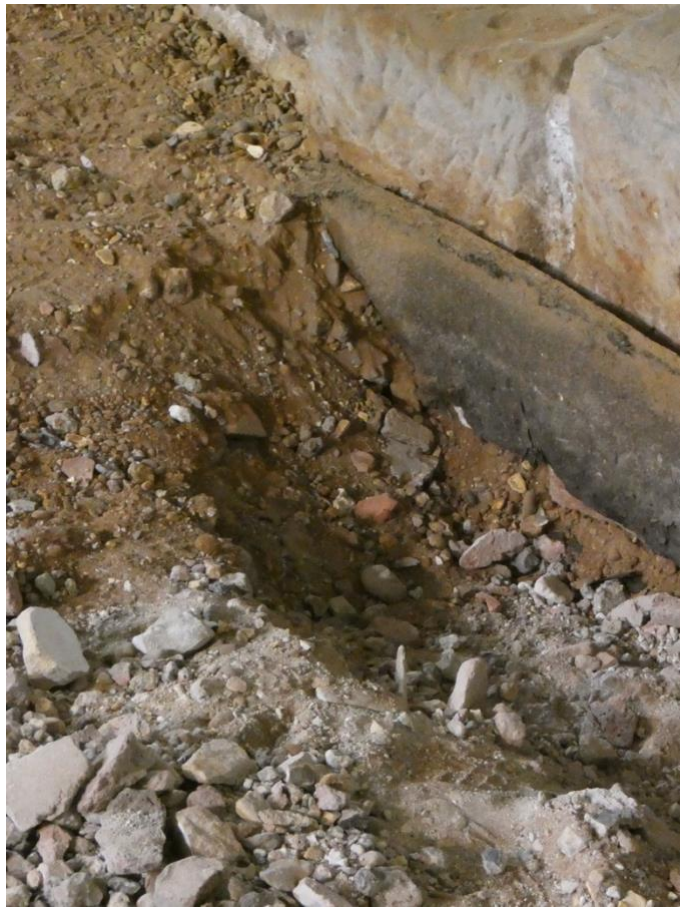
Photograph 26 – Fort Wall, West side, repointed stonework.



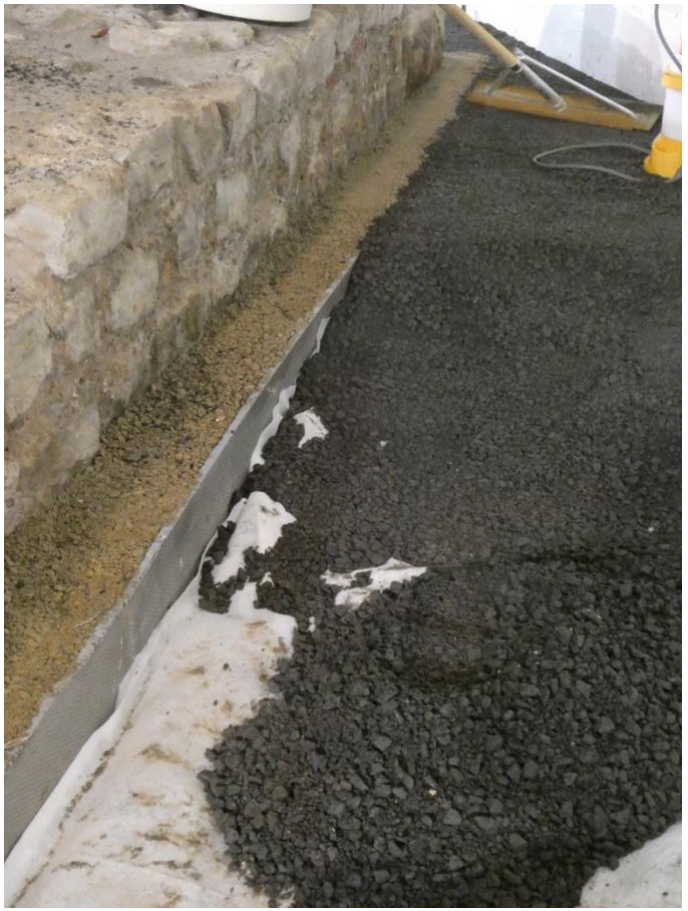
Drawing 4 – Presentation of the Roman wall and Fort Gatehouse site.



Drawing 5 – Cross-section of the presentation of the Roman Wall and Fort Gatehouse site.



Photograph 27 – Roman Wall & Fort Gatehouse, removal of gravel and fibre board from around archaeology.



Photograph 28 – Roman Wall & Fort Gatehouse, laying of insulation board, geotextile membrane and Selfbinda gravel around archaeology.



Photograph 29 – layer of bricks removed from kerbs.



Photograph 31 – red mortar render on new kerb level.



Photograph 30 – Fort Wall, West side, removal of cementitious mortar in Channel.



Photograph 32 – Roman Wall & Fort Gatehouse, before conservation.



Photograph 33 – Roman Wall & Fort Gatehouse, before conservation.



Photograph 34 – Roman Wall & Fort Gatehouse, after conservation.



Photograph 35 – Roman Wall & Fort Gatehouse, after conservation.

7 Observations

The Roman City Wall had previously been pointed with a cementitious mortar, two different types can be seen on the Roman City Wall. This mortar, together with the impervious concrete floor abutting the wall was causing the ground moisture to wick up into the stones and tiles. The evaporation of ground water through the stones and tiles was resulting in salt effloresce nce and the deterioration of the stone surfaces.
While much of the cementitious mortar remains the addition of a porous channel adjacent to the wall will mitigate further deterioration.

The Roman Wall and Fort Gatehouse was also previously been pointed with a cementitious mortar. This mortar together with the concrete floor abutting the archaeology on the West side of the Fort Wall and the internal walls of the North turret guardroom was directing any ground water to evaporate preferentially through the stonework causing salt efflorescence and the deterioration of the stones and tiles.
The repointing of the selected areas of stonework and the addition of a porous channel adjacent to the archaeology will allow the ground water and associated salts to preferentially evaporate through the lime mortar and porous gravel.

8 Future Maintenance and Recommendations

The Roman City Wall and adjacent area should be kept clear of rubbish to ensure the monument does not look neglected, thus encouraging mistreatment of the site.

The stonework should be monitored for further salt efflorescence and deterioration.