Southampton City Council Archaeology Unit
Report 583

Roman Town House, Mosaics Conservation Study, Colliton Park, Dorchester

Carol Edwards BA AIFA AMUKIC

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SOUTHAMPTON CITY COUNCIL

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ROMAN TOWN HOUSE, COLLITON PARK, DORCHESTER
MOSAICS CONSERVATION STUDY
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Carol Edwards, Conservator, Southampton City Council Archaeology Unit

1. Introduction

1.1. The 4th century Roman Town House site in Colliton Park, Dorchester was excavated in 1937-39 prior to the construction of Dorset County Hall, Fig. 1. In the West Range of the town house, extensive mosaic floors were discovered and following documentation the floors were re-buried under a layer of soil and turf. The exception was the polychrome geometric mosaic in room 8 that was displayed under the protection of a wooden structure. Since then cleaning and algae removal programmes have been undertaken in room 8.The floors in rooms 14 and 18 were re-exposed and re-buried in 1959.

1.2. A new cover building was designed, by John Stark and Crickmay Partnership, and erected in 1996-99 to display the mosaics and protect the exposed and deteriorating walls of the west wing, (The Roman Town House at Dorchester, Puttnam), (Plate 1). The Dorset County Archaeological Officer at the time was Laurence Keen and AC Archaeology excavated the mosaics and other buried archaeological features. A programme of mosaic conservation was undertaken by the Cliveden Conservation Workshop (CCW).

1.3. Since then the mosaics have been on display, with the public having access to the covering building to view the mosaics. Recently the algal growth has detracted from the visitors' experience.

2. Aims

2.1. The main aim of this study is to assess the long-term conservation and display options for the mosaics in the Roman Town House with the following subsidiary supporting aims.

a. To assess the use and effects of biocides and alternative measures to avoid their use.
b. To assess whether the form of presentation should be modified in order to facilitate long term conservation or to improve the quality and understandibility of the display.
c. To assess whether any treatment could mitigate the white deposits on some of the mosaics that may be the remains of hard mortar.
d. To assess the effects of ground water and the potential of the proposed drainage scheme.
e. To assess the effects of wind blown water through the wall openings and any potential mitigation.
f. To reassess the potential visitor access including disabled access, based on the experience of the present state of the mosaics since completion of the work in 1999 in conjunction with World Heritage Ltd.
g. To assess whether different ventilation provision would assist in preserving the mosaics.
h. Can the voids identified by the previous conservators be treated and if so how?

2.2. Maintenance plans have also been requested both for the current situation and a second one relating to the recommended works.

2.3. At the request of John Lowe, Historic Environment Manager, Dorset County Council this report has been prepared by Carol Edwards, Conservator, Southampton City Council Archaeology Unit, following a site meeting and inspection of the mosaics on 7 April 2003. All photographs were taken on 7 April 2003 by Carol Edwards.

Fig.1. Roman Town House Plan, Colliton Park, Dorchester (Selby 1938)

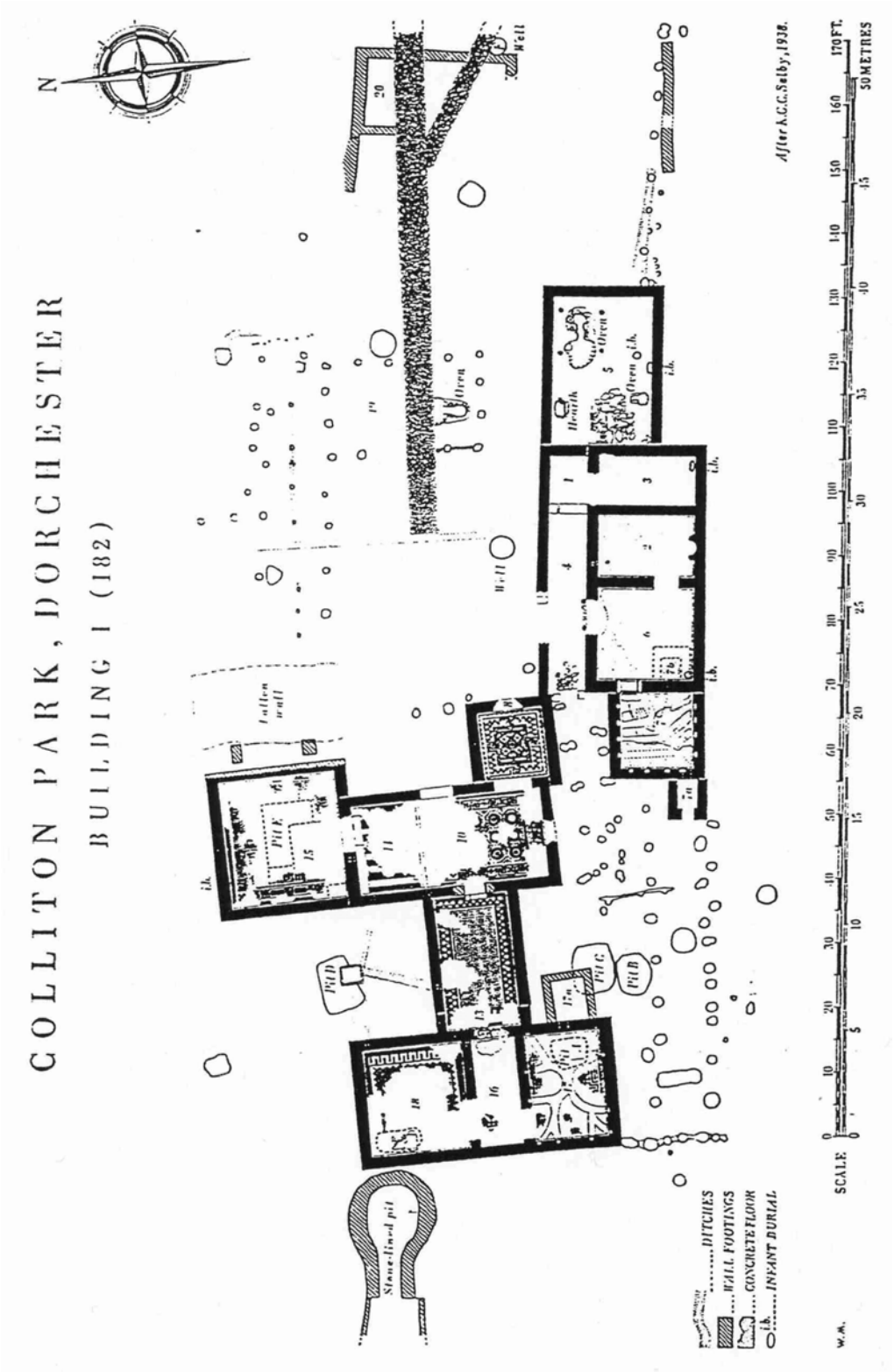

Plate 1. Roman Town House Cover Building and Dorset County Hall

3. Previous Works

3.1. Cover Building,1996-99

3.1.1. The mosaics and surviving walls and archaeological features of the West Range were covered by a steel- framed structure that was set in concrete blocks on the surviving roman walls. The steel frames supported glass panels. There were gaps between each panel and also between the glass panels and the frame to allow for air- flow. There were also spaces between the steel frame and the tops of the walls, (Plate 2). The building's gable- ends were open, (Plate 3), except for room 10 which was in-filled with wooden boards to prevent entry of wind blown rain that was causing a damp problem. The roof was constructed of an oak frame supporting a Purbeck stone tile roof.

Plate 2. Room 15. Steel- framed glass panel

Plate 3. Room 15. West, open gable-end.

3.1.2. There was a drainage system with a field drain to the south of the West Range discharging into a soak -away east of room 17. There was another drain running northwards from room 8 and one southwards from room 15 both leading to a soak-away east of room 14. A drain ran eastwards from room 14 and one northwards from room 13, both leading to a soak-away slightly to the north (Drainage Plan-Roman Town House).

The surface water drainage for County Hall discharges into the stone lined pit, 14ft x16ft, to the west of the town house.

3.2. Previous Works, Mosaics, 1997-99

3.2.1. In 1997-99 following the excavation of the site and mosaics by AC Archaeology, and trial conservation (Bartlett, 1998), a conservation programme was undertaken by CCW. (Bartlett and Peacop, 1999).

3.2.2. A summary of these works are given below:

a. During the programme of works, the mosaics were given an application of a biocide, Wykamol, Microtech Biocide 25X, to control algae and mosses.

b. The surfaces of the tesserae (mosaic cubes) were cleaned.

c. Tesserae around the edges of the mosaics were lifted and re-bedded in lime mortars in rooms 10, 14,15 and 18. Extensive mosaic areas in room 13 and the mosaic fragments in room 16 were lifted and re-bedded. Retained tesserae from the excavations were incorporated into the mosaics in rooms 10, 13,15, and 18. In rooms 14 and 16 the retained tesserae were re-set in lime mortars around the edges of the mosaic fragments.

d. The tesserae interstices in most of the mosaics, except for room 8, were cleaned by micro -steam cleaning and surface grouted with a lime mortar. During micro-steam cleaning it was necessary to hold down the finer tesserae with a steel mesh to keep the tesserae in place.

e. Other small areas of tesserae loss (lacunae) in rooms 10, 13 and 18 were in-filled with lime mortars. Large areas of lacunae in rooms 10, 13, 14 and 16 were also in -filled with lime mortars. The lime mortar in the rooms 10, 13 14 and 16, where the public were directed to walk, were gauged with cement in the top final mortar layer. In rooms 15 and 18 Terram sheets, a geotextile, were laid in the large lacunae with Breedon gravel on top.

The mosaic in room 8, which had been re-grouted with a hard, white mortar and may have been re-laid at an unknown date, was biocided to remove extensive algae. The tesserae in areas of collapsed substrate were lifted and re-laid in lime mortar. Unsuccessful attempts were made to remove the hard white deposit with dilute citric acid.

3.2.3. When the cover building opened, visitors entered the West Range via room 10 onto the lime mortar floor. They could view the mosaic from behind a moveable rope barrier that was in position to prevent passage on to the mosaics of rooms 8 and 10.There was a restricted view to room 8. This was best viewed from outside the building through the glass panels.

There was open access to the mosaic fragment in room 14 and a fixed barrier to prevent access to the mosaic fragments in room 15.

Visitors were directed across the mosaic in room 13 in order to see the fragmentary mosaics in rooms 16 and 18 and the hypocaust in room 17.

3.2.4. A maintenance programme for the mosaics has not been implemented.

4. Current Situation, Cover Building and Surrounding Environment

4.1. The monument and cover building is situated in a grass bowl with surrounding banks and in the proximity of the town walls and ramparts, (Plate 4). The underlying geology is chalk.

Plate 4. West end of cover building

On the south side of the cover building the grass banks are highest at the east-end against the wall to room 8. The overhanging eaves to room 8 are at near head height and care needs to be taken. There is a narrow gravel pathway around most of the cover building but no access path across the grassy banks to it from the top concrete path and steps

4.2. The cover building was inspected internally. A doormat is positioned at the main entrance in room 10 to keep mud and dirt off the floors.

At the base of some of the steel frame supports on beams running parallel to the tops of the walls, algae were forming where rivulets of water had run down the steel beam and onto the tops of the walls, (Plate 5).

Plate 5. Room 15. Steel-frame structure with glass panels. Note: algae on horizontal frame and the gap between frame and wall.

The spaces and gaps between the glass panels, the steel frame and the walls are sufficiently large to allow leaves, litter, animals and birds to enter the building. Children are known to enter the building through these gaps including through the stoke hole to the hypocaust of room 17. Whilst working in the villa later in the afternoon of 7 April 2003 a child was seen in room 16 and as CE was working in room 10 at the time the child could not have entered via the doorway entrance. The child, (whose parent was outside and the family were playing football), was asked to leave via the door.

4.3. During the site visit, sunlight shone through the glass panels onto the mosaics. During the day as the sun moved around, the direction of the sunlight falling on the mosaics changed. The mosaic in room 13, adjacent to the south facing glass panels, was the one most affected by the sun. Rooms 8 and 10, also on the south side, although partially protected from the sun by restored roman walls and the in-filled gable-end of the cover structure at room 10, had direct sunlight moving across the floor surface through glass panels and an open window.

4.4. Externally on the south side, under the eaves, there were stains on the wooden roof supports suggesting water movement or penetration, (Plate 6). There were no gutters and in the roof valleys a channel was situated directing the flow of rain water down-wards onto the gravel pathway.

Plate 6. Cover building, South side, under eaves,. Note: stains on wooden roof supports

There were four open gable-ends to the pitched rooves and these were sufficiently large to allow birds to enter and the cross- bracing would be convenient for birds to roost on. A pigeon's feather was found in room 18 and a dead robin in room 16, (Plate 7-8). There was also the potential for driving rain to enter and sunlight to fall on the mosaics through these open ends. Rain entering the cover building will increase areas of dampness and could accelerate algal and plant growth. Salt movement could increase and on drying give salt efflorescence on the tesserae.

Plate 7. Room 18. Note: Debris on floor surface and algae at base of wall.

Plate 8. Room 18. Note feather and debris on mosaic surface.

5.0. Current Situation, Mosaics and Archaeological Features

5.1. The mosaics and the archaeological features within the cover building were inspected by Carol Edwards together with John Lowe, Dorset C.C. and Michael Ridley of World Heritage Ltd on 7 April 2003.

5.2. All the mosaics were in a dusty and dirty condition with leaves lying on the mosaic floors, mortar and gravelled areas. The mosaic in Room 10 was especially dirty with debris collecting on the mosaic surface and in the corners of the room, (Plates 9-11).

Plate 9. Room 10. Note: debris and algae on the surface and sunlight through the windows

Plate 10. Room 10. Note: algae on the mosaic surface and leaves collecting in the corner.

Plate 11. Room 10. Note: dirt and salt efflorescence on tesserae

Litter, glass fragments, black beetle, bird droppings and feathers, including a dead robin in room 16, were also evident on the floors. The litter and leaves were collecting in corners. Gravel from the external paths was scattered across the floors.

5.3. Intermittent areas of green algal growth and white powdery crystals of salt efflorescence were visible on the mosaics and in a few places moss was beginning to grow especially on the outside and top of the east wall in room 15.

The extent of these conditions depended on the position of the mosaic and the room.

5.4. In room 8 the algae was almost continuous along the base of the south wall with small areas along the base of the west and north walls, (Plate 12). There were patches of algae across the central geometric mosaic. Salt efflorescence was also present in small areas mainly on the guilloche (twisted cable design) and the black tesserae. The full extent of efflorescence is difficult to monitor

because there is a white deposit on the tesserae surface that is thought to be residue remaining after surface grouting, (Plate 13).

Plate 12. Room 8. Geometric mosaic. Note: algae, salt efflorescence and residues of mortar on tesserae surface.

Plate 13. Room 8. Mosaic detail showing algae, salt efflorescence, mortar residues and repairs.

5.5. In room 10 the algae is mainly along the base of the south wall, SE corner and a small area along the base of the east wall with small areas on the mosaic surface. There was white powdery salt efflorescence mainly in the black tesserae (Plates14-15).

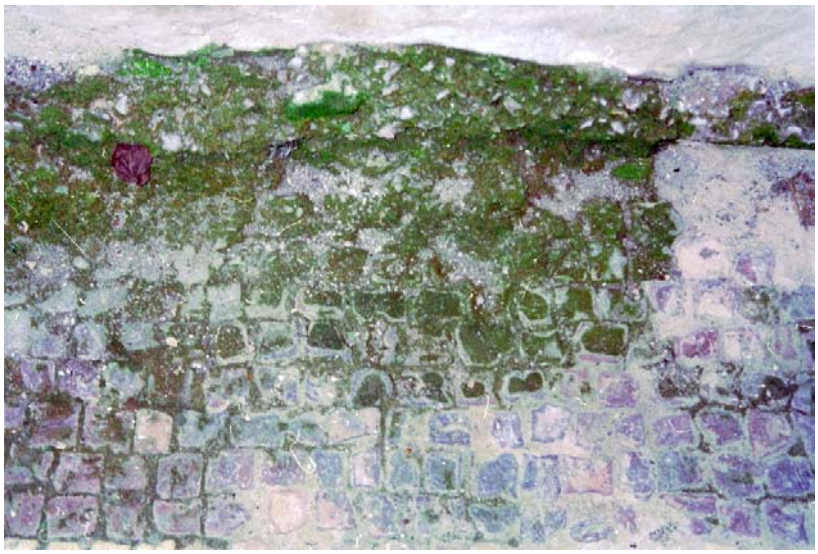

Plate 14. Room 10. Detail: Algae on tesserae surface and at base of south wall

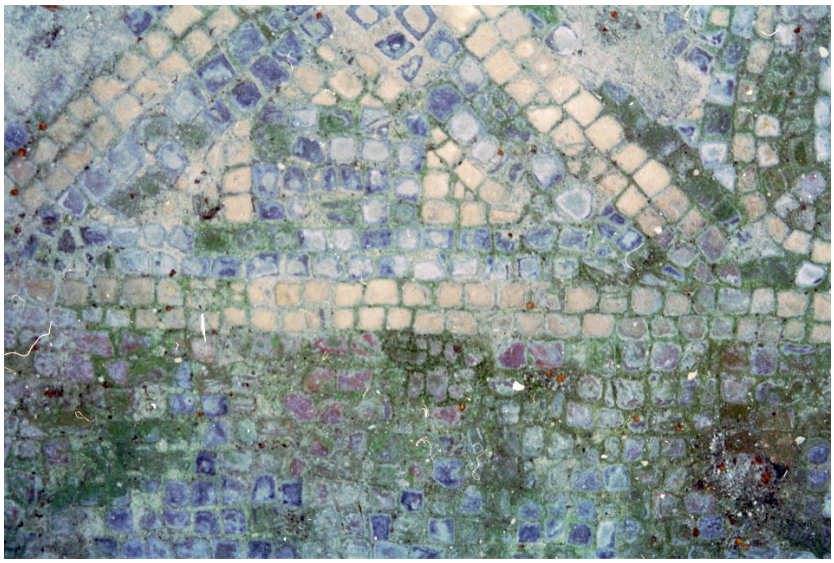

Plate 15. Room 10. Detail: salt efflorescence mainly on black tesserae.

In room 14 the algae were forming on the roman lime mortars around the edge of the mosaic fragment “island”.

5.6. In room 15 there was intermittent algae and salt efflorescence across the tesserae of the mosaic fragment “islands” on the west and north areas. It was mainly found on the west area, (Plates 16-17). There was algal growth also on the surviving roman mortar areas and the north wall. Moss was growing on the external and top of the east wall. On the east tessellated area small plants were beginning to grow in the lime mortar bedding and in the gravel.

Plate 16. Room 15. West side of mosaic. Note: sunlight, shadows and algae.

Plate 17. Room 15. Detail of algae and salt efflorescence on tesserae surface.

5.7. In room 13 the algal growth also ran mainly along the base of the south wall and on the adjacent tesserae and in the interstices, (Plates 18-19). There were also signs of a faint white deposit on the tesserae surface; it is thought to be areas of salt efflorescence with traces of lime mortar. Moss was starting to form in some of the interstices together with a small grass shoot.

Plate 18. Room 13.Note: sunlight, algae and leaves on mosaic surface.

Plate 19. Room 13. Leaves in the corner and algae along base of south wall

In room 18 algae was present on the east wall and in the NE corner on the tesserae.

5.8. The mosaics in rooms 8 and 10 were briefly tapped for voids below the mosaic surface. There were various sound changes across the floors and this could be due to loose tesserae, and/or detached layers and/or larger voids due to disintegration of bedding materials, subsidence or animal activity. On the mosaic in room 8, in an area with a drum -like sound, the depth of a small hole in the interstices was measured and found to be 10mm depth. This is the likely depth of the tesserae and therefore there may be an insufficient gap for injection grouting. The trial conservation undertaken by CCW also indicated this, (Bartlett, 1998).

Tesserae impressions in the mortar setting bed could be seen in room 10 and it is not known if these tesserae were accidentally dislodged or deliberately removed.
On the lime mortar floors, gauged with cement and where the visitors walk, there are cracks in the surface particularly in room 10 and room 14. The surface creaks like ‘thin ice’ when walked over, (Plate 20).

Plate 20. Room 10. Cracks in lime mortar surface.

6.0. Summary of Subsidiary Aims

6.1. A summary of the subsidiary aims are set out below and further details are found in the Maintenance Plans and the Conservation Programme Proposals.

a. It is preferable for algae and plant growth to be controlled by maintenance and other means rather than by the use of biocides. It is recommended that biocides should only be used if algae and plant growth is extensive. Tests should be undertaken to ensure that there is no interactivity with other treatments and that there are no visual changes to the tesserae surface, either in colour, gloss or texture. The biocide should also be effective in removing the specific algae, moss or plant species, (Teutonico et al,1997).

Since the display of the townhouse to the public, algae and plant growth on the mosaics and monument have been applied when necessary with the biocide Wykamol Microtech Biocide 25X. The biocide trials undertaken by CCW showed this biocide to be effective however it is understood from John Lowe, DCC, that occasionally the applications have not been successful in effective control of the biological growth. It should be checked that the manufactures' instructions concerning dilutions and application methods are followed. Enquiries have been made to English Heritage and the product Microtech from Wykamol (Stewart 2003, pers comm) was recommended for use on masonry materials. Alternative biocides will require further investigation.

When a maintenance programme is undertaken and the appropriate measures to the cover building and environment carried out, applications of a biocide to the mosaics to control algae should be minimal.

b. The means of combining long-term conservation with display requirements are outlined in the Conservation Programme Proposals. A

policy of preventing foot traffic across the mosaics together with alternative display schemes via platforms and/or walkways and viewing through the glass panels should be considered as a priority.

Carpeting is not advisable on the mosaic surface because of rising damp and moisture may be drawn up from below. The surface is not level and a carpet over the top may cause uneven wear and will hide any damage. Maintenance and the preservation of the mosaics by a protective environment are fundamental to their display.

c. The white deposits on some of the mosaics are the powdery crystals of salt efflorescence and the mortar residues remaining after surface grouting. It is preferable for these deposits to be removed physically.

d. Ground water has caused many problems in the town house as can be seen from the algae growth on the mosaic floors and the archaeological features. The building is situated in a grass bowl and previous drainage schemes have not proved completely effective. It is understood from John Lowe, DCC, that the surface water from Dorset Count Hall drains into the stone -lined pit to the west of the town house and seepage from this may be contributing to the problem. An additional field drain is proposed by DCC and this should alleviate the situation to the south of the West Range. However care must be taken with drainage schemes that too extreme drying of the mosaic surface does not cause salt efflorescence and that drying of the bedding mortars does not cause cracking and crumbling of the floor foundations.

e. In addition to the problems caused by ground water, the damp at the edges of the mosaics and on the walls may be partially due to rainwater draining off the roof and onto the external gravel areas. Rainwater may also be forced by the wind through the openings in the cover building

structure or down the glass panels onto the walls and the edges of the floors. A guttering system and other modifications to the building are discussed in Conservation Programme Proposals.

f. The potential for visitor access is based on the proposal that there is no foot traffic across the mosaics. This will protect the mosaics and minimise the need for continuing repairs and allow a minimum interventive approach to the conservation and lessening the need for expensive interventive conservation. New raised pathways will not only assist with the protection of the monument but may also give better access for disabled persons in order to view areas that are at present inaccessible.

g. The areas of algal growth indicate that there are places that are continually damp. This is caused by many factors and it is preferable to solve the causes of damp rather than dry the surface by ventilation or heat. If the source of the damp is not dealt with, and the surface dries, salt efflorescence may result. However adequate ventilation and sufficient airflow should be maintained with any modifications to the cover building.

h. The voids below the surface of the mosaics identified by the previous conservators need to be located, recorded and, if appropriate, the void injected with a weak lime mortar.

7. Conservation Programme Proposals and Options

7.1. Initiate a Maintenance Programme

7.1.1. This Maintenance Programme and the action frequencies are recommended for the mosaics and the cover building in their present situation. The action frequencies are a guideline and can be adjusted to suit the time of year and requirements of the mosaics.

It is suggested this work is started immediately in order to present the monument for display and protect the mosaics and reduce the likelihood for interventive conservation treatments, (Torraca, 1988). It is recommended that in the first instance a conservator carry out the maintenance work. Subsequently this could be undertaken by a nominated member of staff in the heritage section of DCC following instruction and guidance from the conservator. An annual inspection by a conservator is recommended especially after any alterations to the mosaics' environment.

The cover building should be regularly checked for defects such as leaking roof and blocked drains and well maintained and kept in good repair. When cleaning the steel supporting frame and glass panels, care should be taken that water and other debris do not fall onto the mosaic and that ladders and other equipment are not placed on the mosaics, roman mortar, or other roman features.

The mosaics' and archaeological structures' condition and maintenance tasks will vary in extent during the year according to the season, eg. more plant growth in Spring, more litter in summer and more leaves in Autumn. The checks should be carried out and the operations carried out if necessary. At different times of the year certain conditions made not need direct action.

7.1.2. Pick up all the litter, loose leaves, bird debris and any other extraneous material from the mosaics, floors and other archaeological structures. Litter is unsightly and plant debris will biodegrade and encourage insects. It is recommended that the door to the cover building is kept shut to minimise dust and debris blowing into the building particularly on room 10 mosaic. Display clear notices to show when the cover building is open.

Action frequency: the mosaics, mortar floors and other archaeological features should be inspected and the litter, leaves etc removed each time the building is opened to the public and for a minimum of once a week when closed to the public.

7.1.3. Snip off any plant growth at the stem as close to the tesserae and mortar surfaces as possible. Do not pull up any plants as the roots may pull up the tesserae or damage the mortar bedding. Plant growth in the gravel may be pulled up if the roots do not extent into any tessellated or mortar areas or structures.
Action frequency: each time the building is opened to the public and for a minimum of once a week when closed to the public. If the plant growth persists it may be necessary to apply a biocide to that individual plant.

7.1.4. Check and carefully remove all loose dirt and cobwebs that are likely to fall on to the floors from the roman walls using soft brushes and small tools, ensuring that debris does not fall onto the mosaics or roman mortars.
Action frequency: once every 3 months

7.1.5. Check and carefully remove loose dust and dirt from the floors by carefully brushing tessellated and lime mortar areas with soft natural hair brushes appropriate to the conditions. ie fine ones for the fine tesserae and larger brushes for the modern lime mortars. Do not create dust clouds. Dirt and dust obscures the mosaic design and provides nutrients for algae and plant life.
Action frequency: once every 2 months or when required.

7.1.6. Check and remove white, dry, powdery crystals of salt efflorescence by gently brushing with natural hair or bristle brushes. Wipe the surface with a barely damp (use de-ionised water) small sponge swab. Water should be kept to a minimum to prevent movement of salts. Absorb excess moisture from the surface using good quality absorbent paper rolls. Salt crystals require removal as they can gradually break up the tesserae surface. It is less damaging for the salts to form on the outside of the tesserae than inside in the internal pores(Woolfitt, 2000) . Salt efflorescence will be minimised if the movement of water in the mortar beds is reduced. Salts will crystallise in a low Relative Humidity environment.
Action frequency: once every 3 months or when required.

7.1.7. Check and remove any moss from the mortar surfaces of the floors and from the walls, internally and externally, with wooden scrappers or small tools. Moss retains moisture and contributes to a damp environment. If the stone or mortar material will allow, wipe off the algae with a damp sponge or damp brush. Absorb excess water with absorbent paper. It is preferable to damp wipe, rather than dry brush. If unable to remove the algae from the mortar and the walls, apply biocide to the algae. After application this must be left for the recommended time to take effect and before the building can be used and cleaning continued. Manufacturers' instructions should be followed.

If a biocide is not effective an alternative may be required as biocides are specific to types of algae, moss and fungi. There are health risks with biocides, and Health and Safety and COSHH regulations should be followed. Wykamol Microtech biocide 25X and Panacide 'M' were found to be effective during the trial conservation carried out by CCW.

Enquiries have been made at English Heritage for appropriate biocide products. Currently the recommended biocide for masonry uses is Microtech from Wykamol.
Action Frequency: avoid the use of biocide products and keep application to a minimum. Follow manufacturers' instructions and health and safety measures.

7.1.8. Check and remove algae from the mosaic using a small, damp sponge swab and small natural bristle brushes. Remove excess moisture using a good quality absorbent paper roll. Algal growth requires light, nutrients and moisture and the control of these factors will inhibit its growth. Algae can produce acidic residues on the tesserae and can cause damage to their surface both chemically and physically. (Caneva and Salvadori)
Action frequency: once a month or as required.

7.1.9. If the algal growth is extensive the application of a biocide may be considered. It is often preferable to clean off the algae first and then apply. This gives a cleaner surface on which the biocide can work, inhibits re-growth and minimises the number of biocide applications. If it is proposed to apply a biocide before cleaning the mosaic, undertake trials to ensure that the tesserae surface does not smear when cleaned. It is preferable not to use any biocides on mosaics if it can be avoided because prolonged use can damage or stain the tesserae. It may be necessary to spray the algae on the exposed roman mortar bedding and 1996-99 lime mortar areas of the mosaics with biocides.
Action frequency: only apply the biocide if algal growth is extensive or cannot be removed by cleaning.

A record of all maintenance work should be kept and any defects to the mosaics or cover building noted.

7.2. Proposals to Preserve the Mosaics from Deterioration with Minor Interventions whilst Maintaining Accessibility.

7.2.1. It is suggested that the following proposals proceed after the maintenance programme, however it is recommended that securing the building to prevent unauthorised entry into the cover building should be implemented as soon as possible.

Secure the cover building by sealing the larger gaps and spaces to prevent children entering through them into the cover building. Notices should be erected warning of the dangers within an archaeological site. This is not only a Health and Safety issue but also should reduce the risk of vandalism, damage and theft to the monument.

It is suggested that environmental monitoring is considered in order to record air temperatures and Relative Humidity, both internally and externally and also the

temperatures and moisture levels of the mosaics and monument. Monitoring will assist with understanding the problems and planning the conservation programme proposals. Inspecting the building during extreme weather conditions may assist with determining problem areas.

7.2.2. The public should be prevented from walking on any of the mosaic floors by erecting suitable barriers adjacent to the remaining mosaics to stop entry onto the mosaics in rooms 8, 10, 13 and 14. This is essential if these roman mosaics are to survive. The mosaics in rooms 10, 13 and 14 plus those in room 15 can be viewed from the large areas of lime mortar in rooms 10 and 14 and the public will still have access to the cover building. Room 8 can be viewed through the glass panels.

A barrier at the entrance to room 13 will also prevent entry to rooms 16, 17 and 18 however viewing to rooms 16, 17 and 18 could be through the external glass panels via the gravel path that surrounds most of the cover building. The gravel pathway around the cover building will need to be assessed and modified if necessary to ensure it is suitable for increased visitor usage.

These mosaics are 1700 years old and are subsequently unsuitable for the foot traffic from visitors. This is an accepted policy on most roman mosaics in Britain. Mosaic sites abroad have only to be examined to see the damage occurring through visitors walking across the floors and often in unsuitable footwear, (Melucco 1990).

Preventing the public walking on the mosaics will assist in keeping the mosaics and floors free of dirt and grit and cut down the cleaning required in the maintenance programme. Grit is very abrasive on mosaic surfaces and this together with the effect of the action of walking can damage the tesserae surface. Accidental kicking can dislodge tesserae and increase the repair programme.

Information panels should be re-sited within the cover building so that they can be read from outside.

7.2.3. Except for room 8 and room 13 where there has probably been extensive lifting and relaying of the tesserae, the mosaics in the other rooms survive mainly on their roman bedding materials. These archaeological structures and materials should be retained, where possible, with minimum intervention.

7.2.4. In room 13 there is an area of mosaic along the south side of the room adjacent to the south wall that remains as excavated and has neither been lifted, nor re-laid, nor surface grouted. The tesserae are firmly fixed with compacted soil and it is not uncommon for roman mosaics to have an earthy, mortar fill in the interstices and as long as the tesserae are held firmly they do not require surface grouting and/or lifting and/or relaying, (Plate 21). This is only necessary when tesserae are loose and becoming dislodged.

Plate 21. Room 13. Re-laid tesserae on left and original mosaic on the right adjacent to wall. Note: algae at base of wall.

7.2.5. In rooms 8 and 10, areas of sound change were detected indicating detached tesserae, and/or detached layers and/or voids beneath the tesserae in the mortar beds and foundations. A ‘tapping’ survey should be undertaken across all the mosaics and the different sounds areas marked on drawings.

If the tesserae are firmly held and sitting on the bed surface, no action is required. If the layers are detached and there is no gap between them no action is required. However if there is a sufficient void below the tesserae and mortar beds, injections using a lime mortar can be undertaken to support the tesserae and beds. This injection grouting should be carried out between the tesserae and in the interstices and into the voids below.

The lime mortar floor in rooms 10 and 14 should be closely examined due to the cracks and ‘creaking’ sounds that occur as it is walked across. It should be examined to ensure it is safe for the public to walk across.

7.2.6. The hard white deposit remaining on the mosaic in room 8 is thought to be the residues left from surface grouting. It is unsightly, it dulls the colours and is obscuring the mosaics’ pattern. Unsuccessful attempts have been made in the past to remove it. The trials using dilute citric acid by CWW show that this solution is not effective. A stronger acid is not advisable because if the acid is able to dissolve the mortar deposit, it will also most likely attack the tesserae particularly the chalk and limestone.

The most satisfactory means of removing this deposit may be using physical methods. Care will be needed to remove the deposit but without damaging the tesserae. Gentle brushing with a glass bristle stick and /or glass bristle eraser pen may be successful. A very fine grade abrasive paper may used to remove the more thick areas of mortar but the abrasive paper must not come in contact with the tesserae otherwise scratch marks will occur. Experimental methods and trials will be needed on site before a programme of treatment can be carried out.

If the physical methods are unsuccessful other chemical means will need investigation.

It is not advisable that wax or lacquer coatings are applied to the tesserae surface in room 8 as this will cause other problems for example, sealing crystallising salts into the stones causing their disintegration or discolouration.

7.3. Proposed Major Modifications to the Cover building and Environment

7.3.1. The preferred method of conservation and maintenance is via an environment sympathetic to the requirements of the mosaic floors and the archaeological structures. It increases the long-term survival prospects of the monument and decreases the frequency required for maintenance and reduces the need for continual repairs, (Torracca, 1988).

Modifications to the cover building need careful thought and alterations need to be assessed to ensure that Relative Humidity, temperature, air- flow, ventilation, lighting and other factors are fully considered. An architect and a drainage engineer need to be consulted to determine if the modifications are viable or to suggest alternative solutions.

7.3.2. The following are recommended for consideration:

7.3.3. To install gauze or mesh or alternative into the gaps and spaces between the steel frame and glass panels of a size suitable to stop litter and plant debris blowing into the cover building. The mesh or material selected should not corrode or cause staining on the walls or mosaics in wet conditions.

7.3.4. To cover the glass panels on the south side of the cover building, adjacent to room 13, to cut down the light falling on the mosaics on the south side of the town house. This should minimise salt efflorescence, algal growth, and the heat transference through the glass panels. These coverings could be internal or

external depending on the material used. External shutters mean that the public could have access to view the villa at all times. Site staff would control internal blinds.

Shutters or blinds should also be considered for windows on the south side in rooms 8 and 10 where light enters, forming algae intermittently across the surface.

Algae were growing on the mosaics in room 15 where sunlight from the east and west falls on the mosaic. It is suggested that shutters or blinds are installed on the west and east side as mentioned previously for the south side of the cover building. Removing dirt and dust via a maintenance programme and lowering the moisture levels by drainage or modification to the building should assist with limiting algal growth. Covering selective glass panels on the south, west and east sides should reduce the heat transference through the glass. Fluctuating temperatures cause expansion and contraction giving stresses across the floors. This situation should be monitored as regards the lime mortar areas laid in 1997-99 adjacent to the mosaics as they may constrict the mosaics and movement of the mosaics may occur, (Torracca, 1988).

7.3.5. To implement the drainage proposals in order to alleviate the damp problems. The DCC drainage scheme proposes the installation, on the south side of the West range, of a new deep field drain leading into a soak pit adjacent to room 17. The soak pit should not drain towards the building. The drainage should reduce the damp and flooding that occurs from the bank into room 8, room 10 and 13. Care will be needed that the mortar beds in the floor foundations do not dry out as this may lead to cracking and crumbling of the floors and increase salt efflorescence on the surface. The drainage of County Hall surface water to the stone-lined pit west of the town house should be checked to ensure that there is no leakage or excess seepage.

Lowering the grass bank outside room 8 and 10 may assist with reducing damp levels on the restored roman wall and give improved public access to the south side.

To consider installing a guttering system to prevent the rain flowing off the channels in the roof valleys and off the rooves onto the ground during prolonged rainfall. This may reduce the damp at the base of the walls and the edge of the mosaics and limit the rain blowing into the cover building. The moss growth on the top and external side of the east wall to room 15 indicates this is a particularly damp area.

To consider in-filling the open gable-ends with a material eg, mesh, wood or constructional quality textile, to prevent wind blown rain entering into the cover building, to prevent entry by birds, and to minimise the light to inhibit algal growth. Care would need to be taken that any meshes or materials used are safe for birds and animals. Additional weight should be taken into account in relation to the increased loading on the supporting frame and on the walls. Alternative ventilation, air-flow and lighting systems may be necessary if the cable-ends are enclosed.

7.3.6. To assist with the presentation of the rooms 10, 13, 14, and 15 and as an alternative to the visitors walking on the lime mortar floor surface, a platform and pathway could be erected above the lime mortar floor and a barrier constructed around the platform edge.

The construction would need to be such that any installation was secure and on sound material to prevent undue weight on the lime mortar bedding.
This would give additional protection from vandalism and accidental damage.
Reduced foot traffic should prevent further cracking of the lime mortars.
This would allow the other barriers in front of the mosaics to be removed.

If entry to room 13 was thought necessary in order to view rooms 16, 17 and 18, from inside the cover building, consideration could be given to the construction of a walkway above the surface of the mosaic on the north side of room 13. The tessellated surface on the north side is fragmentary and the best tessellation to view is on the south side.

Access in and out of room 13 entails negotiating steps that are difficult for disabled persons. Provision would be needed to overcome this.

The mosaic fragments in room 16, currently with open access to the public, could be individually protected from trampling. Precautions would be needed to ensure that this was not a tripping hazard.

As mentioned in Section 6, carpets are not advisable on the mosaic surface as they may draw up moisture from below. The surface is not level and a carpet over the top may cause uneven wear and will hide any damage.

7.3.7. A problem that has not been addressed is the effect of fluctuating temperatures. High temperatures from the sunlight through the south side glass panels have been considered but low, freezing temperatures in winter can also be damaging to the mosaics and other structures and break up lime mortars and stones. (Torraca, 1988).There is no insulation or temperature control within the building therefore it is desirable during the winter months to protect the mosaic floors from freezing with an insulating but breathable covering. It must be breathable because of rising damp conditions.

Different materials could be considered eg. fabric used to protect statuary at country houses and stately homes. Information on insulating materials has been sought from English Heritage and one such mentioned is Pertex, a sports fabric, used for the winter protection of outdoor sculpture, usually on a framework. This material is not known to have been used for mosaics. The problem with these

covers is the attraction for mice and rats. (Stewart, 2003 pers com). Having no cover may cause less damage than having the wrong type. Further enquiries need to be made.

A mosaic covering of a geotextile and silver sand is a possibility but this is a lengthy, labour intensive and time -consuming process. Trials are recommended taking temperature readings on the mosaic surfaces, both outside and underneath the insulating material together with the internal and external air temperatures

If a suitable fabric is found and the town house is open for display during the winter, attention should be given to an easy and careful means of placing and removing the cover without pulling at the tesserae and the mosaic edges. Consideration may have to be given to keeping the mosaics covered and the West Range closed to the public during the coldest months of the year.

Consideration should be given to installing an inner waterproof lining to the roof to prevent water ingress. Consideration could then be given to insulating the roof minimising the extremes of temperature. An alternative ventilation and air flow system would need to be considered.

Prevention of condensation on the glass panels and on the mosaics must be taken into account with all modifications to the building. Dew point temperatures should not be reached. Too high Relative Humidity values will encourage algal growth and too low will cause salt efflorescence.

7.3.8. Check that the gravel path gradients around the cover building are suitable for access and if required, extend and widen them. Although the removal of gravel and re-surfacing with a different surface would lessen the gravel scattering inside the building and reduce the grit brought in to the town house by visitors, the gravel currently takes the drainage of rain- water from the roof.

Up-grading the surrounding pathway with re-positioned information panels would give an alternative presentation from outside the cover building and would not require custodial presence.

The construction of a pathway across the grass from the upper concrete path to the roman town house would provide wheel chair access and minimise dirt and dust depositing onto the floors.

7.3.9. Installation of electricity, solar powered or other means of power should be considered to enable lights, monitoring, security and environmental systems systems to be installed if required. Heating would be required for staff if the town house had a custodial presence in the winter.

Toilet facilities would also be required if the cover building is staffed.

Custodial staff presence may not be required if viewing was through the glass panels or if entry was restricted to an internal barrier platform in room 10 and 14.

7.4. Maintenance Plan following Modifications to the Cover Building.

7.4.1. This Maintenance Plan and action frequency is suggested for the mosaics if modifications to the cover building are implemented. The action frequency is an indication only as it is dependent on the works carried out and can be adjusted to suit the time of year and requirements of the mosaics.

The cover building should be regularly checked for defects such as leaking roof and blocked drains and well maintained and kept in good repair. When cleaning the steel supporting frame and glass panels, care should be taken that water and other debris do not fall onto the mosaic and that ladders and other equipment are not placed on the mosaics, roman mortar, or other roman features.

The maintenance tasks and conditions will vary in extent during the year according to the season, eg. more plant growth in Spring, more litter in summer and more leaves in Autumn. The checks should be carried out and the operations carried out if necessary. At different times of the year certain conditions may not need direct action.

7.4.2. Pick up all the litter, loose leaves, bird debris and any other extraneous material from the mosaics, floors and other archaeological structures. Litter is unsightly and plant debris will biodegrade and encourages insects. It is recommended that the door to the cover building is kept closed to minimise dust and debris blowing into the building particularly on room 10 mosaic. Display clear notices to show when the cover building is open.
Action frequency: the mosaics, mortar floors and other archaeological features should be inspected and the litter, leaves etc removed each time the building is opened to the public and for a minimum of once month when closed to the public.
7.4.3. Snip off any plant growth at the stem as close to the tesserae and mortar surfaces as possible. Do not pull up any plants as the roots may pull up the tesserae or damage the mortar bedding. Plant growth in the gravel may be pulled up if the roots do not extent into any tessellated or mortar areas or structures.
Action frequency: each time the building is opened to the public and for a minimum of once a month when closed to the public. If a plant growth persists a biocide may need to be applied to an individual plant.

7.4.4. Check and carefully remove all loose dirt and cobwebs that are likely to fall on to the floors from the roman walls using soft brushes and small tools, ensuring that debris does not fall onto the mosaics or roman mortars.
Action frequency: once every 6 months

7.4.5. Check and carefully remove loose dust and dirt from the floors by carefully brushing tessellated and lime mortar areas with hand held soft natural hair

brushes appropriate to the conditions. ie fine ones for the fine tesserae and larger paint brushes for the modern lime mortars. Do not create dust clouds. Dirt and dust obscures the mosaic design and provides nutrients for algae and plant life.
Action frequency: once every 6 months

7.4.6. Check and remove white, dry, powdery crystals of salt efflorescence by gently brushing with natural hair or bristle brushes. Wipe the surface with a barely damp (use de-ionised water) small sponge swab. Water should be kept to a minimum to prevent movement of salts. Absorb excess moisture from the surface using good quality absorbent paper rolls. Salt crystals require removal as they can gradually break up the tesserae surface. It is less damaging for the salts to form on the outside of the tesserae than inside. Salt efflorescence will be minimised if the movement of water in the beds is reduced. Salts will crystallise in a low Relative Humidity environment.
Action frequency: once every 6 months or when required.

7.4.7. Check and remove any moss from the walls, internally and externally, with wooden scrappers or small tools. Moss retains moisture and contributes to a damp environment. If the stone or mortar material will allow, wipe off the algae first with a damp sponge or brush. Absorb excess water with absorbent paper. It is preferable to damp wipe, rather than dry brush. If unable to remove the algae from the mortar and the walls, apply a biocide to the algae. After application, this must be left for the recommended time to take effect and before the building can be used and cleaning continued. Manufacturers' instructions should be followed.

If a biocide is not effective, an alternative may be required as biocides are specific to types of algae, moss and fungi. There are health risks with biocides, and Health and Safety and COSHH regulations should be followed. Wykamol Microtech biocide 25X and Panacide 'M' were found to be effective during the trial conservation carried out by CCW.

Enquiries have been made at English Heritage for appropriate biocide products. Currently the recommended biocide for masonry uses is Microtech from Wykamol.
Action Frequency: avoid the use of biocide products and keep application to a minimum and follow manufacturers' instructions and health and safety measures.

7.4.8. Check and remove algae on the mosaic using a small, damp sponge swab and damp, small natural bristle brushes. Remove excess moisture using a good quality absorbent paper roll. Algal growth requires light, nutrients and moisture and the control of these factors will inhibit its growth. Algae can produce acidic residues on the tesserae and can cause damage to their surface both chemically and physically (Caneva and Sallvadori, pp196).
Action frequency: once every 4 months or as required.

7.4.9. If the algal growth is extensive the application of a biocide may be considered. It is often preferable to clean off the algae first and then apply. This gives a cleaner surface on which the biocide can work, inhibits re-growth and minimises the number of biocide applications. If it is proposed to apply a biocide before cleaning the mosaic, undertake trials to ensure that the tesserae surface does not smear when cleaned. It is preferable not to use any biocides on mosaics if it can be avoided because prolonged use can damage or stain the tesserae. It may be necessary to spray the algae on the exposed roman mortar bedding and 1996-99 lime mortar areas of the mosaics with biocides.
Action frequency: only apply abiocide if algal growth is extensive or cannot be removed by cleaning.

A record of all maintenance work should be kept and any defects in the mosaics or cover building noted.

8.0. Conclusion

The current condition of the monument indicates that the implementation of a maintenance programme is essential. Regular maintenance of the cover building and monument together with keeping the floors and walls free of dirt, plant growth, salt efflorescence and algae are necessary to preserve the mosaics and to achieve a standard suitable for display.

Improvements can be undertaken to protect the mosaics by securing the cover building, preventing the visitors from walking on the mosaics, and improving the external pathways. These protective measures allow a policy of minimum intervention to be adopted. An improvement in the appearance of the mosaics and their consolidation can then be achieved by simple treatments.

Environmental monitoring will assist with understanding the conditions that the mosaics and monument are subjected to. The current state of the mosaics and the experience gained since the construction of the covering building show that modifications to the cover building and the environment should be considered for the protection of the roman mosaics and the monument and their display.

Each modification will affect different aspects of the monument and their inter-relationships must be considered.

This will require consultation and co-ordination with the relevant specialist. It is preferable to provide a protective environment and consideration could be given to the following:

- Fitting a mesh or similar in gaps to prevent litter, debris, birds and animals entering.
- Installing a removable cover over the glass panels to reduce the effects of sunlight.

- Implementing the DCC drainage scheme; lowering the grass bank against the south walls; installing a guttering system, and infilling the open gable ends, all alleviating the damp problems.
- Constructing raised platforms; installing secure barriers; improving the external paths to protect the mosaics from visitors' foot traffic and to give better access.
- Investigating suitable materials and methods of insulating the mosaics in winter to prevent them from freezing.
- Constructing a pathway across the grass slope to improve access and reducing the dirt tramped into the building.
- Possibly installing electricity to operate required services.

Ventilation systems and lighting will need to be considered as the modifications will affect these.

Modifications should reduce the frequency of maintenance and cleaning, minimise the need for expensive interventive conservation treatments and improve the visitor experience.

It is unique for a roman town house with such extensive mosaics and walls to survive in the centre of a continuously inhabited town and as such its survival and display is paramount.

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Carol Edwards, Southampton City Council Archaeology Unit, April 2003