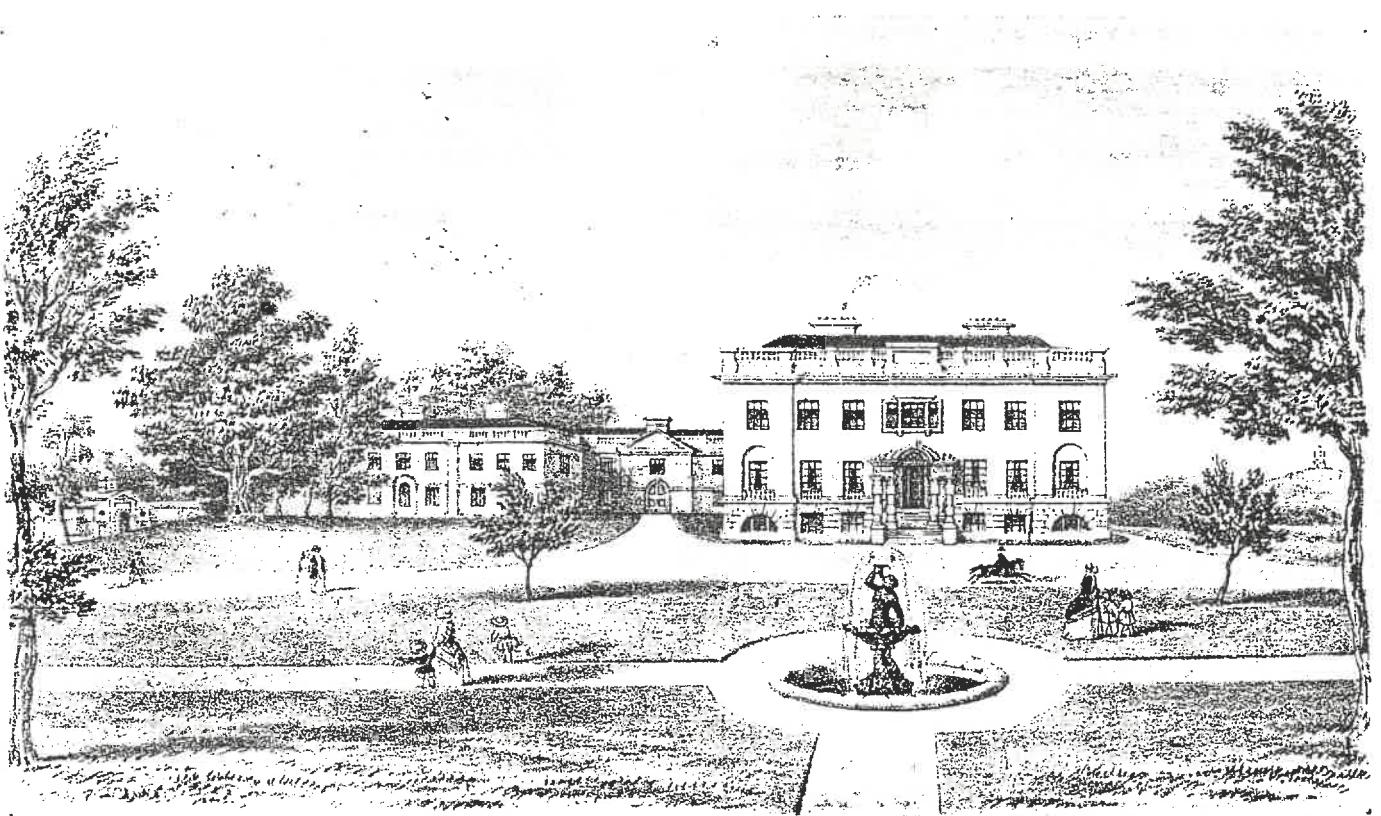


## Middleton, Dyfed: Historic Landscape Assessment - Proposed Botanic Garden and Country Park



Augustus Butler Lith.

Osmond & Son Lith. Found. St.

MIDDLETON HALL, DYFED.  
FRONT VIEW  
THE LANT OF ETHEL-ABRAM 1853.  
1853.

The front (south western) view of Middleton Hall in 1853, a lithograph by Augustus Butler (see also the companion view opposite paragraph 4.2.28). Note in particular the layout of paths in the foreground, the "plantation" of trees to the north west of the house, the stone pillars on the entrance portico and the views to the stable block and to Paxton's Tower in the distance.

## **Introduction**

**1.1** The following is an assessment of the landscape of Middleton, Dyfed. It has been prepared for the Planning Department of Dyfed County Council, in connection with proposals to develop Middleton as a Botanic Garden and Country Park.

**1.2** It is firstly an analysis of the major elements of William Paxton's design, extant or extinct. It is also an appraisal of such features of his design that can still be seen in the park, of their present condition and of the work that will be needed to reinstate them, if required. Finally, it is concerned with the impact that a development of Middleton along the lines proposed may have on its fabric and design.

**1.3** In the discussions following, the Tithe map (1847/48) and to a lesser extent the OSD (1813) and the OS 1st Ed.1"plan (1830) have been taken as the primary historical sources for the layout of Paxton's park. As described in a previous study, (C.Gallagher, "Middleton: Historic Landscape Survey" 1990), little evidence has been found for any major reworking of this design subsequent to his death. The plan of Surviving Trees, Field Archaeology, Lakes, Ponds and Views, produced as part of the above report, has for ease of reference been included with plans accompanying the present study.

**1.4** As part of this inquiry, the Tithe map, together with information from the other main historical plans, has been transposed onto a copy of the modern Ordnance Survey plan of Middleton (1:2500). The Analysis of Design and Recommendations plan, with which the bulk of this report is intended to be read, refers in many cases to the Tithe map and has therefore used it as its base. Numbers on this plan refer to the relevant paragraphs in the section "Specific Proposals and Recommendations".

## Middleton

**2.1** In the absence of information to the contrary, it is assumed in this study that Middleton as we see it today is largely the creation of William Paxton, and that it was laid out between about 1785 and 1824. The extent to which Samuel Cockerell, the architect of Middleton Hall, was also involved in the design of the landscape, is a matter for further investigation: as yet no firm evidence has been found to link him with these developments although his influence, at the very least, cannot be discounted.

**2.2** As a piece of landscape design, Middleton appears at first glance as unremarkable, if somewhat peculiar in the sense that although very much the product of its time, it owes much of its style and character to its originator. Closer inspection reveals, however, that in his use of water Paxton was the equal of any of his contemporaries, even though he may in certain instances have anticipated the more robust style of the later 19th century, rather than echoing that of the period in which he was operating.

**2.3** It was undoubtedly its streams, cascades and the vast expanses of water which gave Middleton its individual character. This is confirmed by contemporary writers, who remarked on them most often of all the features of Paxton's estate. It must have been an extraordinary eye which initially saw in the wooded river valleys of Middleton, a vision of the string of lakes whose remnants still remain. It must also have taken an unshakeable self-confidence to put that vision into practice, for the earthworks associated with some of Paxton's ponds are gargantuan in scale. So well are they disguised however, as cascades, waterfalls, wooded hills, that to a casual observer they might hardly exist at all as feats of engineering and have become simply parts of the natural surroundings.

**2.4** Since Paxton's time the underlying landscape of Middleton has remained almost untouched. Parkland areas continue to be farmed, albeit in a manner very different to that of the 18th and early-19th centuries; trees have gone and been replaced by others, although not usually of the same species or in the same positions; the lakes and ponds have breached their dams and been colonized by trees, modifying their appearance; the house which Paxton built as the centrepiece of his design has disappeared entirely, but the land itself has mercifully escaped those ineradicable changes that have altered so many other similar parks, such as roads, housing estates, industrial development.

**2.5** In addition to this, and notwithstanding the apparent difficulties which beset any form of development in an historic landscape, Middleton benefits also in having the bulk of its designed landscape still under a single ownership. This cannot be overemphasised, for it allows a unity of vision and purpose in decision-making which could not otherwise be exercised.

## **General Proposals and Recommendations**

**3.1** Although comments and proposals concerning specific areas of the park are included later in this report, it is possible also to make some general recommendations concerning the whole of the park and developments proposed for it. These can in some cases be read as a summary of points raised in the specific proposals.

**3.2** All developments, and visitor facilities in particular, should wherever possible be arranged to impinge upon the landscape as little as possible. This can be extended as a fundamental principle to all aspects of planning and development.

**3.3** In order to illustrate this, the paths at Middleton are a useful example. The landscape of Middleton, in common with many others of its time, was laid out in a particular way. The paths through it were, generally speaking, intended to be followed in a particular way, with the associated views then seen to best effect. If the above principle is adhered to, modern-day routes through the proposed Country Park will be designed use the lines of the old paths, even if the physical remains of these are now practically defunct. In this way, the resulting path network will be in harmony with the landscape, for the simple reason that the two were originally designed to complement each other.

**3.4** Conversely, if a new path through a particular area ignores the historical route, it also disregards the design of the landscape around it and is therefore likely to diminish the pleasure of being there.

**3.5** A second, associated principle is that management decisions should aim always to enhance the landscape. To put this another way, no developments at Middleton should cause, in the long term, an actual degradation of its fabric or design. In certain cases, this may mean doing nothing where the only course of action available at a given time may cause damage. An example of this case is the Lower Pool adjacent to the Pont Felin-gat area, where an interim or temporary restoration of the dam (suggested for other pools in order that water may more quickly be returned to them without the immediate expense of a full restoration) is not recommended due to the large volumes of water in the Afon Gwynon in times of spate and the real possibilities of causing actual damage to downstream areas.

**3.6** Drainage is a major problem over much of the site. Large areas of the parkland are reverting to marshland, with rushes springing up in what has

hitherto been grazing lands. Many of the woodland areas are reverting to Willow and Alder carr and in places trees have succumbed to waterlogging. It is possible that this may be due in part to the silting-up of the various ponds, as in the past these were the main drainage channels for the park, but many of the minor drains are also choked with vegetation and silt and it is likely also that field drains may in places need renewing.

**3.7** The present study has been handicapped, to an extent that is difficult to assess, by the lack of a comprehensive archive and bibliography. Few documents have been seen, for example, which offer clues to the whereabouts or appearance of any of the various ornamented springs, bath houses or other garden buildings described in the Sales Particulars of 1824 (a copy of these are included in the Appendix which accompanies this report). The sequence of events in the creation of Paxton's design is also unknown. While the development of Middleton as a public open space does not necessarily require such information, its provision would remove some of the uncertainty inherent in future management decisions.

**3.8** Certain assumptions have been made which have influenced the specific proposals made in the following sections. One of these is that the proposed Botanic Gardens development in the walled gardens area will go ahead. This has determined proposals both for that area and to a lesser extent for other areas not directly connected with this development. In particular, exotic tree species are suggested for various parts of the park which are appropriate solely within the context of both the proposed Botanic Gardens and Country Park developments. In the absence of one or other of these, native species only would be appropriate in replanting.

**3.9** Repairs and renovations to various built features at Middleton have been carried out which are in certain cases unsympathetic to their surroundings. The main problem in most cases seems to have been the choice of materials employed in these repairs, particularly the use of hard cement mortar on structures originally constructed with a lime-based mortar. Some documents concerning the production and use of lime-based mortars are also included in the Appendix to this report. Future building works at Middleton must be carried out under the guidance of suitably-qualified persons, skilled in the restoration and rebuilding of historic structures.

**3.10** Where structures have been rebuilt, the procedure by which their location and design for rebuilding has been arrived at is also unclear. It is doubly regrettable that much of the rebuilding of features at Middleton seems to have been carried out without the benefit of prior archaeological investigation and reporting. Thus, not only are the designs of existing, restored, structures open to question, but the very basis for judging their historical accuracy - the archaeological record - has also, in most cases, very likely been destroyed. Such reports and documentation as are available are included in the

Appendix to this report. Where possible, comments on individual structures are included in the specific proposals. It is strongly recommended that, in future, no structures be restored or rebuilt without thorough archaeological investigation and that full written and photographic documentation be included as part of all studies.

**3.11** Middleton is fortunate in having much of its landscape included within the boundaries of the park. In certain areas where detailed proposals have not been made but which are nonetheless important in views to or from the former house site, general recommendations are included which are intended to enhance or protect the visual properties of the landscape. This principle can be extended to the wider landscape outside the immediate parkland, which in some places forms a part of the offskip. Areas to the south east of the park and to the north between the park and Paxton's Tower are particularly vulnerable to unsympathetic development, although there are wide views out of the park in both northerly and southerly directions. Some form of statutory protection, perhaps involving consultation prior to any developments in these areas, would do much to protect the wider visual landscape of Middleton.

**3.12** Contrary to their rather random appearance, many of the clumps shown on the Tithe map have in practice been shown to be precisely located with regard to their function in controlling and framing views both to and from the former house site and within the landscape as a whole: they thus should be replanted wherever possible, in the positions indicated by the Tithe map. As a general rule it seems that they were of Oak or Beech: exceptions, where these are known, are detailed in specific proposals.

## Specific proposals and recommendations

**4.0.1** These are considered under the following Areas, which in general correspond to areas defined in the Brief for Consultants and to tenancy subdivisions. The main exception to this has been Area 2, which to accommodate certain proposals has been extended to include parts of adjoining Areas:

- 1      The western block as defined in the brief (the walled gardens area and site of proposed botanic gardens).
- 2      The eastern block as defined in the brief, including Pond Du, the lower pond and areas between; the Pont Felin Gat area including the site for the proposed car park; the wooded river valley to the east as far as the former fish pond, including the ponds, cascades and bridges. Also including areas west and east of Pond-du and the lower pond, as indicated on the Plan of Recommendations.
- 3      Parkland and woodland to the west of the above, as far as the public road, and south as far as the former house site.
- 4      The remainder of the park west of the public road
- 5      The site of the house and immediate areas, including areas to the east and north, the gardens as far east as Pond-du and the field south as far as Bryn-cadw and Waun-las ponds.
- 6      Bryn-cadw and Waun-las ponds
- 7      Southern and western areas of the park.
- 8      Areas in the south and east of the park, south of the Deer farm and east of Waun-Las pond.
- 9      The deer farm areas.



## **The western block as defined in the brief (the walled gardens area and site of proposed botanic gardens)**

### **The Pond**

**4.1.1** This is shown as a pond on the Tithe map. It should be restored.

- 1 This will always be a marshy area, unless it is drained completely which is not recommended. Waterlogging is a major problem over the whole of this area: if restored this pond would tend to act as a drain, particularly if the remainder of the lakes were also restored.
- 2 This pond if restored would also tend to provide a link between the Botanic Gardens area and the rest of the designed landscape. It would attract waterfowl and could also be stocked with ornamental fowl as a feature in the Botanic Gardens and an attraction for younger members of the public (and the young at heart). Wetter areas at the margins of the pond would provide suitable conditions for trees species such as *Taxodium distichum*, *Alnus spp.*, *Salix spp.*, *Populus spp.* and for bogland or marshland communities. The marshy area to the north and east of this pond, across the path here, could also be managed in a similar fashion.
- 3 There is no historical justification for the lake, proposed in the report by the Burgess Partnership (October 1991), to the west of this position. In terms of drainage, it would seem to make more sense to manage this area as wetland, if required, and to recreate a lake where there is an historical precedent for one.

**4.1.2** The area south of the pond, adjacent to the road, is shown as woodland on the Tithe map. It contains Willow, Alder and Ash with Hazel coppice. It is a pleasant area and provides a useful belt between the road and the walled gardens area: it should therefore be retained, but requires management. It would provide a useful site for a working demonstration of woodland coppicing and associated activities such as hurdle and basket making etc.

**4.1.3** Woodland at the west of the site also contains Alder, Willow and Hazel. Only part of this area was shown as woodland on the Tithe map. It is surrounded by deep ditches which serve to compartmentalize the area well. Also requires management but should be retained as woodland.

**4.1.4** The gateway across the ditch here, between the two areas of woodland described above marks a superb entry point into the walled gardens

area. From this point, the site suddenly opens out, with the walled gardens in front, the pond described above immediately in front and the ice house on the hillside to the left, topped by the woodland clump No.4.1.10.

- 1 We agree with the proposal made in previous plans to retain this as the main entry point into the site. Visitor facilities such as shops, pay kiosks, etc could be kept in the area to the south and west of this point, as indicated in previous proposals. This would both preserve as much as possible of the historic detail of this area and retain leave visitors' sense of "entrance" into the site undiminished as they cross the stream here through this gate.

**4.1.5** The fields in the south and west would seem to be ideal for use as car parking areas. These are outside the area of the designed landscape as indicated by the Tithe map and would not impinge too much visually. They are also easily accessible from the main road.

**4.1.6** The Ice House is in good condition, although recent restoration works appear to have been made to it with hard cement mortar, rather than the lime mortar which would originally have been used. This should be replaced. Well preserved Ice Houses are comparatively rare: this one provides an opportunity within the Botanic Gardens area for interpretation and education. It would also provide a "conceptual" link with the rest of the designed landscape.

- 1 A copy of a report on the Ice House, published by RCAHM Wales (1987), is included in the Appendix to this report. It suggests that the design of the Ice House may have been modified in its restoration. It is important that this structure is rebuilt to its former design, using the correct materials.

**4.1.7** The area to the north and west of the walled gardens proper was shown as woodland on the Tithe map and should be replanted as such. Choice of species would depend on the use of this area within the Botanic Gardens, but it should be kept in mind that they will be clearly visible from raised areas of the park to the south and east.

**4.1.8** The walled gardens themselves are very fine, although they are currently in a state of disrepair, with at least one of the larger buildings requiring urgent stabilisation. Recent repairs to the stonework at the south end of the gardens have again been made with hard cement mortar, which should eventually be replaced with lime mortar: this could be carried out as part of the restoration programme. On balance, repairs in this part of the gardens seem to have been of benefit in stabilising the walls and preventing further deterioration.

It is recommended that the area of the gardens within the walls be formally declared a "no build zone", as indicated in the proposals for this area, in order to preserve its current sense of spaciousness. A suggestion has been made to use the walled gardens as a location for old fruit varieties. This seems to be an appropriate use for this area, as there is currently within Great Britain a need for locations in which old varieties of apple can be preserved. The siting of such a collection at Middleton would be a further attraction and focus for a variety of related activities.

**4.1.9** This area should be planted with trees to screen the new houses from view. No trees are shown here on the Tithe map.

**4.1.10** A clump of trees is shown in this location by the Tithe map. The area has been a quarry at one time and is now used for dumping waste materials. This should cease and the whole area should be replanted with trees to hide the quarry.

There are strip lynchets and remains of ridge and furrow on this hillside, shown on the Surviving Trees, Field Archaeology, Lakes, Ponds and Views plan. These features again provide possibilities for education and interpretation and will provide a link between the Botanic Gardens, the designed landscape and the agricultural landscape which preceded these.

**4.1.11** Self-seeded Beech and Sycamore here should be removed, as well as Ash saplings growing in and around the walls of the Herb garden.

**4.1.12** There are remains of both a Thorn/Hornbeam hedge along both sides of the road here, as well as an informal avenue of Oak (trees from this survive and many stumps remain). It is recommended that both these be reinstated: the hedge will act as a boundary from the road to lands either side of it, while the Oak avenue will both reinstate a formal approach from the south to the house site (the heart of the landscape) and also will provide a physical link between the walled gardens area and lands to the east (presently divided by the road and very exposed).

**4.1.13** This area is shown as woodland on the Tithe map and on Butler's engravings (see frontispiece and opposite paragraph 4.2.28). It may have been a part of the "plantation" referred to in the sales particulars of 1824. It should be replanted, but in doing so it could, by use of appropriate species, provide a link between the Botanic Gardens development, the site of the former house and the Country Park development to the north.

**The eastern block as defined in the brief, including Pond Du, the lower lake and areas between; the Pont Felin Gat area including the proposed car park and associated facilities; the wooded river valley to the east as far as the former fish pond, including the ponds, cascades and bridges.**

### **The Pont Felin-gat area & the site of the proposed car park.**

**4.2.1** Repairs to the wall here are well made but have been carried out with a hard cement mortar rather than the lime mortar which would originally have been used in its construction. This is not, however, as important in a boundary wall as it would be in another structure (say a building or ornamental bridge). At present the repairs look very harsh but may soften over time as the wall is recolonized with ferns etc. This may be assisted with an application of slurry or liquid mud to the walls, which will also tend to disguise their appearance. If gaps still remain after several years some consideration should be given to rebuilding these areas.

**4.2.2** The same cannot be said for the entrance and stile here, on the western side of the bridge itself. Although the intention behind this feature is admirable - provision of a safe place out of the road to cross the stile and enter or leave the park - the means by which this has been put into effect has produced a structure entirely out of keeping with its surroundings. If an entrance is thought essential on this side of the stream, a simple wooden structure would suffice.

**4.2.3** Entry via the existing stile at the Pont Felin-gat site can potentially be difficult, especially in wet or icy conditions, for children or the elderly or for those with wheelchairs etc. Wire has been attached to the stile to provide a firmer footing, but this has become detached. A kissing-gate, or some such entrance, would make pedestrian access simpler while preventing the passage of mountain bikes, etc.

### **Car parking**

**4.2.4** The site currently proposed, adjacent to the existing entrance, is occupied by an Ash plantation (girths to 100cm). Many or all of these would have to be removed to accommodate car parking, creating a clearing in the woods. It seems unlikely that the area would also be able to accommodate a

picnic area, or indeed that people would want to picnic so close to a car park, even though it is presently an ideal site for this, being close by the river and not too far from the road.

- 1 A car park here and the proposed building(s) and road access associated with it would also represent an erosion of part of the fabric of the landscape and be an unwelcome intrusion into an area which at present is quiet and peaceful, filled with the noise of water and the play of light upon it between the trees. Furthermore, the capacity here for an expansion of car parking facilities, which would be a definite requirement in the event of activities at Gelli Aur being wound up, are strictly limited without severe alterations to the physical geography of the site.
- 2 I believe that it does no justice to the scale of the landscape of Middleton, neither indeed to its quality - although this may not immediately be apparent - nor to the opportunity and the potential it offers for development as a public park of the highest order, to view its restoration and renovation merely as an adjunct to that of the proposed Botanic Gardens.
- 3 Current proposals for car parking have been made with the proposed Botanic Gardens in mind as the primary focus within this site. However, if the Gelli Aur location is wound up, as it seems it inevitably will be, there may arise the need to provide an alternative facility of a similar character within the county: one moreover which will be able to absorb up to 60,000 visitors per year.
- 4 Even assuming the Botanic Gardens development to be well in gear by that time, people will require also a place to go which is either free or costs very little to visit - such indeed as Gelli Aur. However fine a place the Botanic Gardens may turn out to be, people will only want to go there so many times a year, especially if there is an entrance charge. In between, they will simply want somewhere to enjoy the air.
- 5 It would be extremely difficult, if not impossible, to accommodate this number of vehicles at the Pont Felin-gat site without serious damage to the fabric of the landscape here.

**4.2.5** An alternative location is therefore suggested for any substantial development of car parking facilities, in the open field to the east of the Pont Felin-gat site (currently part of the Deer farm).

- 1 This was formerly an access point to the park: indeed the former gate and drive (shown on the Tithe map) are both still extant, though now disused.
- 2 This area has the advantage of a level entry and of being outside the designed landscape. There is also plenty of space for expansion of facilities, should the need arise, without this being hampered by, or causing further damage to, the designed

landscape. Although at first sight access from this area to the park itself may appear to be difficult, there is in fact an old track leading directly to it from the northern corner of this area, adjacent to the Oak pollard here mapped as part of the previous study. Visitors might find an added interest in using a path to enter the park which may both be mediaeval in origin and have lain unused since the landscape was laid out in the 18th century.

**4.2.6** The Beech plantation on the hillside above the Pont Felin-gat site (c.20y old) is very fine and show signs of management. This should continue, although as the trees grow up management should be geared progressively to producing a Beech wood rather than a plantation.

**4.2.7** The main path through this area is along the line of that shown on the Tithe map and later by the OS 2nd Ed.25" plan. It should be retained. The path referred to above (paragraph 4.2.5) descends the hillside within the Beech plantation here (see above) to join this path at a point just south of the former dam (see paragraph 4.2.10 et seq.).

**4.2.8** The restored bath-house construction in the picnic area here is solidly built, although again this has been made using hard cement mortar, giving it a harsh appearance. The OS 1st Ed.1" plan (1830) indicates a "Bath" in this area, although it is difficult to determine its precise location on the plan and thus on the ground. The plan accompanying the Sales Particulars (1824) also appears to indicate an unidentified building in this area (see Appendix). No other plans that I have seen give any indication of this structure. Photographs taken at the time of its rebuilding (copies of these are included in the Appendix) give little clue to its former ground plan or construction details: it is therefore difficult to comment on its historical accuracy, although it would appear that the lower masonry courses were left undisturbed. It seems that no archaeologist's report was produced for this structure prior to rebuilding.

**4.2.9** Rock gabions which have been used to reinforce the east bank of the river here have been undermined and in some cases completely washed away: serious erosion of the bank has resulted, exacerbated by recent floodwaters. Immediate action is required here to prevent further erosion of this section of the river bank.

### **The lower pond, paths and woodland areas surrounding it.**

**4.2.10** The long-term aim here must be to restore the dam and lower pond, as shown by all the main historical sources. It is difficult to imagine any other future use for this area which would do as much justice to the landscape. Given its history and the clearly visible remains of Paxton's design for this area, it would also be very difficult to justify other development here, beyond simply maintaining it as at present.

- 1 The dam itself still appears to be in good order, with Portuguese laurel growing on it in places. Damage has been confined to the area of the former sluice, which has been more or less completely destroyed, with only some masonry remaining among the roots of self-seeded Beech and Ash (girths to 150cm). These trees themselves are being undermined by the river and would in any case have to be felled before rebuilding could begin.
- 2 The rebuilding of this feature and the restoration of the former pond here, will not however be simply a question of providing a temporary sluice, as has been suggested for some of the other ponds at Middleton. Most or all of the precipitation at Middleton ends up in this river: a rough calculation carried out recently on site indicated that, in spate, there is something of the order of  $10^5$  (100,000) tonnes of water per day flowing along this channel through the Pont Felin-gat site. This is an estimate of the Peak Flood Flow referred to in the previous report by consulting engineers, Sir William Halcrow & Partners, and has obvious implications for spillway construction both here and in other parts of the park. Even to an untutored eye, it is apparent that a substantial structure will be required here to cope with periods of exceptional flow and that a temporary solution is unlikely to be sufficient.
- 3 For the time being however, it is important only to ensure that further damage to this structure and the channel below it is prevented. The trees referred to above could also be cut back, but the stumps should not be poisoned and their roots would have to remain as they are likely to be providing some stability to this part of the dam.
- 4 Once the dam is restored, the path can be brought across it as indicated on the Tithe map (a foot-bridge is shown on the OS 2nd Edn.25" plan and there was presumably a cascade beneath). In the meantime, however, a circular route is desirable through this part of the park, which will require a bridge at some point below this pond.
- 5 Three locations for this crossing point are possible. The first is immediately below the dam where there still remains some stonework on both sides of the river bank; the path from this point would then closely follow the western side of the former pond. The second point is just below the former overflow channel shown on the OS 2nd Edn.25" plan (and mapped as part of the previous study here): this was the location used previously by the MSC team, although that bridge has now gone. A second footbridge would also be required here, across the overflow channel described above, to enable the path from this point to join the previous line along the western side of the former pond.
- 6 The third possible location is immediately upstream from the Pont Felin-gat bridge itself, where presently what appears to be a water pipe crosses the river, embedded in concrete. This is currently being used as a footbridge but is unsafe, especially in icy conditions: it is thought unlikely that it would continue to be used if a suitable alternative were provided. The pipe itself could be used as the basis for a footbridge, but it is ugly and the long term plan should be to remove it and put the pipe underground. A bridge could be built adjacent to the pipe, but this would appear somewhat absurd next to the road bridge and would obscure any view to it.

It is recommended then that one of the other two sites be used. Both have their advantages and disadvantages: neither appear to have any historical precedent so the final choice must be made in terms of practicality and of minimising damage to such evidence of previous structures as still remains in this area.

**4.2.11** The former lake bed itself has been planted with Ash (of the same age as those in the Pont Felin-gat area below) and young Beech, and extensively colonized by Birch, Willow, Alder, Ash, Dogwood and Elder. There are also large Ash, Alder and Beech at its western boundary (girths to about 150cm) and Beech (girths to 200cm) on a raised circular area adjacent to it: the remains of a small island shown on the OS 2nd Ed.25" plan.

1

It is recognized that this area is attractive as it stands and probably provides a fine wildlife habitat. Areas around the pond could be restored and managed quite well without the necessity to reinstate the pond itself. If it is decided eventually to restore this feature, however, it would be possible in the first instance to recreate a sense of what it may have looked like by removing trees and scrub growing in the lake bed and opening out the view across the valley here. The cleared bed of the pond could be planted with linseed, which when in flower (this is blue) can appear convincingly as a body of water.

2

If it is decided eventually to restore this pond, it is recommended that the felling of trees in the pond bed are carried out as soon as practicable, whatever the interim arrangements that are decided on. The smaller trees are felled, the less will be any public opposition to their removal.

**4.2.12** The area between this and Pond-du has been colonized by Birch, Willow, Ash and Alder and is planted with young Beech. The area should be managed for Beech, with the eventual aim of creating a Beech woodland here, linking the plantings on the Pond-du dam with those below. Birch requires immediate removal as it is smothering other species here.

**4.2.13** The OS 2nd Ed.25" plan shows a bridge over the south-eastern arm of this pond, connected probably by a path (still extant) through this area of woodland to the Pond-du dam, by the Beech pollard mapped here previously and shown on the plan of Surviving Trees, Field Archaeology, Lakes, Ponds and Views. Neither of these features are shown by the Tithe map and may thus date from the mid- or late-19th century, but the path would provide a useful alternative route, especially for those unable to climb the steep hill, east of the Cascade, where the path currently runs.

**4.2.14** These areas of woodland contain some fine Beech (girths to 280cm), with good self-seeded Oak in places, as well as Willow, Ash and Hazel. Areas should be managed principally for Oak and Beech with an understorey of Hazel, although other species (such as Willow, Ash, Alder, Holly, Thorn) can also be accommodated here. There is also an area of young Beech in the



north-western corner, similar in age to those elsewhere in this part of the park. These should be retained and managed with the eventual aim of producing pockets of Beech woodland.

**4.2.15** The woodland in these areas is of Ash, Cherry, Oak, Willow and Laurel, with many dead and fallen trees. It should be thinned to allow views to the north along the stream valley towards the lower pond.

- 1        The general air of the woodland in these areas is of extreme dereliction and is quite depressing. The ground underfoot is waterlogged and the current paths are narrow and muddy, being little more than desire lines between one point and another. It would benefit this area immensely for Paxton's design here to be reinstated, with the paths once more following their original line and the woodland opened out somewhat to create a few sunny glades.
- 2        Although there is no historical evidence for the planting of exotics in these areas, conditions here would favour tree species which thrive in damp areas, such as Redwoods, *Taxodium distichum* and *Cryptomeria japonica*. Planting of this kind, however, should be considered only in the context of the Botanic Gardens development.

**4.2.16** The quarry here is very overgrown with Willow and Alder, many of which trees have fallen over. It also contains a small pond which may have had an ornamental function (it is not shown on any plans), but is now silted up and stagnant. Unless a definite role in the landscape can be found for this area, it is probably best simply to clear up fallen trees and leave it untouched. It will probably be a good habitat for wildlife.

**4.2.17** The former paths here, shown on the Tithe map, are still clearly visible and should be utilised in any development of the landscape.

**4.2.18** The stone steps here, however, are a hazard and should be removed. Their form and construction are also out of keeping with a landscape of this kind. If steps are required in this part of the park they should be rebuilt in a more formal style.

**4.2.19** The outflow from Pond-du in this area is causing an immense amount of erosion. This is visibly altering the structure of the dam here: appropriate repair works are long overdue.

**4.2.20** The Tithe map indicates a small pond here, but much erosion has taken place here caused by overspill from Pond-du and no trace of it remains. Its restoration is not recommended.

**4.2.21** Adjacent to this is a covered stone spring, restored presumably by the MSC team (but now dry). Apart from the gargoyles, cast in cement or concrete (through which a plastic pipe formerly must have carried water), much of this structure appears to have made use of existing materials (part of the canopy is of dressed stone). Again it is not possible to comment either on the location or form of this restoration, although previous comments on the use of cement mortar apply here also. No archaeologist's report or photographs were available for this structure.

### **Pond-du, with the paths and woodland areas surrounding it.**

**4.2.22** Pond-du itself appears at one time to have been colonized by trees in much the same way as other ponds at Middleton are presently. Since the dam was repaired most of these have died, but remain standing, leaving Pond-du with an unpleasant air of ghostly dereliction.

- 1      These trees also disguise the true extent of the pond, or lake as it should properly be called. Pond-du covers an area of some 10 acres (4.05 ha). If all trees were cleared from its bed, it would be possible for an unbroken view along its length from north to south for over 440 metres - this is something in excess of a quarter of a mile. It is clear that Pond-du is a major landscape feature of Middleton. It is also apparent, however, that it is currently playing a role in the landscape far below its potential.
- 2      Given the above area and assuming an average depth as suggested in the working party report of 1.5m, this would indicate a volume for Pond-du of some 40,000 m<sup>3</sup>. This would seem to bring it under the auspices of the Reservoirs Act 1975, as described in the same report.

**4.2.23** It is clear that all trees living and dead in Pond-du should be removed. It seems likely also that dredging of the pond bed will also be necessary, as there are sizeable deposits of silt at its southern end. Both of these operations will require the pond to be drained, which will also be an opportunity for the repairs to the dam and lake bed described in the working paper on "Repair & Reinstatement of Old Dams" (Burgess Partnership, July 1991).

**4.2.24** No comments or recommendations will be made on the technical aspects of repairing leaks in the lake bed. Pond-du is of such importance to the design of Middleton that its reinstatement cannot but be considered as a major priority. It would be unwise, however, to misjudge the scale of such an undertaking: neither should one underrate the effect that this feature, once restored, will have on the landscape.

**4.2.25** At the northern end of Pond-du, the dam has been badly eroded in at least three places. Two of these are new spillways which appear to have been constructed in recent years to accommodate storm floods, but the overflow from them is causing serious damage to the dam itself: they should be removed and the bank fully reinstated. All damage should be repaired and consolidated. Several of the trees growing in the bank here are leaning and may cause damage in the future: these should be monitored and removed if they show signs of falling.

**4.2.26** For the most part, the main outflow from Pond-du should remain the ornamental cascade at its north-eastern corner. At present however, this is also the channel through which the bulk of flood water leaves Pond-du: it is obvious therefore that some provision for excess flood waters is also required, if the cascade is not to be damaged. It is suggested that this could be made at the north-western corner of the lake, where an outflow is indicated by the Tithe map and by the OS 1st Ed. 1" plan. This would ensure that, at times of average or reduced flow, there will be sufficient water both in the lake and flowing through the cascade for them to operate as intended, while the increased flow occasioned by heavy rainfall will be less likely to damage the cascade.

- 1            A masonry channel reported at the base of the dam here, may be connected with emptying the lake for repairs etc.

**4.2.27** The Pond-du dam has been built across what was formerly a stream valley and has thus substantially altered the form of the landscape here. The dam is effectively a viewing platform both down the valley and upwards towards the site of the former house. The paths around its shore, shown on the Tithe map, indicate that it was intended as a device for enhancing the view to the house, for these are mostly on its northern and eastern sides, facing to the south and west. Elsewhere, at its north-western corner, the view was again across water, but here along the north-eastern arm of Pond-du to the bridge at its upper end.

**4.2.28** The view from here to the south and west from the dam of Pond-du is shown on Butler's lithograph (opposite). This indicates that, as shown on the Tithe map, there were very few trees on the south-western shore of the lake, and also explains the peculiar arrangement of the path in the middle of the field here - laid out with care so as not to obtrude in the view, although its line is indicated here by the two trees in the middle distance and by the horse-man crossing the field.

- 1            Also shown on this lithograph are areas of woodland to each side of Pond-du, neatly framing the view to the house. A close inspection of the outline of Pond-du will reveal something of the care with which Paxton laid out his landscape, for the pond

narrows at these points and the woodland here, although planted presumably by Paxton, would have appeared natural and elegantly disposed. Also shown is the path on the eastern side of the pond which wound through the woodland here, one supposes with views of the house at intervals among the trees.

2 On the eastern side of Pond-du the placing of the woodland is equally effective, although here the Tithe map shows the path further from the lakeside and does not indicate the branch leading from it to the water's edge. Beech still survive in this area (mapped as part of the previous study): these are of a size likely to date to Paxton's time.

3 These areas of woodland also had another purpose. Immediately to the south of them, Pond-du widens, quite naturally it seems: to the west the inlet of a stream and to the east the curve of the headland is simply continued. From the north, however, the terminations of the water would be hidden from view, increasing its apparent extent: this was a device often employed by 18th and 19th century landscapers. We are fortunate at Middleton in having both evidence of this landscaping, in the form of Pond-du and in the disposition of woodland around it as shown by the Tithe map, as well as a graphical representation of their effects.

**4.2.29** It is recommended that both the woodland areas and the paths around Pond-du, shown on the Tithe map, be reinstated. Much of the woodland in the north-western corner of this area is still extant. The line of the path here is also plainly visible, although at the north-western corner it has been somewhat obscured by recent workings connected with repairs to the dam. In the long term, the path along the north western shore of Pond-du, shown on Butler's lithograph, should be reinstated. In the meantime, however, thinning of the woodland in this area will open up the view across the water to the east.

**4.2.30** Further south the western margin of Pond-du should remain open as far as the southernmost corner, where fine Oak and Beech (girths to 300cm) survive in woodland areas shown here on the Tithe map.

**4.2.31** Woodland along the eastern side of Pond-du should also be reinstated, as shown by the Tithe map. These areas are currently within the Deer farm and although a narrow fringe of trees including some fine Oak (girths to 250cm) are growing at the water's edge, there is insufficient depth in the woodland to provide a suitable backdrop to the lake and prevent views eastward into the rather bleak-looking areas of open farmland.

1 There is a natural break in the slope here, corresponding to the eastern boundary of the woodland as indicated by the Tithe map. This would be an appropriate boundary to the proposed woodland area, with the Deer farm fence moved back to this line. Deer do not appear at present to have access to Pond-du for water, and the proposed realignment of the fences should not deprive them of large areas of grazing, as the ground here is quite steep.

- 2 Field archaeology at the southern end of this area, mapped as part of the previous study, may be the remnant of the track here shown on the Tithe map.

**4.2.32** Reinstatement of the path along the eastern side of Pond-du, coupled with the rebuilding of a bridge across its eastern arm, as shown on the Tithe map, would then provide for a circular route through this part of the park, including much of this lake. Routeing of the path around the eastern corner of this inlet is not recommended.

- 1 We have no design at present for this bridge, although it is likely to have been of a single span, perhaps arched, and constructed of wood. It is possible that remains of abutments, footings, piers etc. still survive and these should be thoroughly investigated before any attempt at reconstruction is made. It should be noted that the bridge would have been an ornamental feature in the view to the east across the lake (see paragraph 4.3.6).

**4.2.33** This area is shown as open by the Tithe map and the OS 2nd Ed.<sup>25</sup> plan, but woodland here should be retained as a visual barrier between Pond-du and areas of the Deer farm to the east.

**4.2.34** At the south-western corner of Pond-du, a path (not shown on any historical plans but clearly visible as field archaeology) rises from the water's edge to join that crossing the field (this is shown by the Tithe map and indicated on Butler's engraving, as described above). These paths could be used as part of the return to the north. There would be a fine view to the north and east from this path, across the restored Pond-du.

- 1 An archaeological report (dated 6th July 1987 and published in the RCAHM Wales, 1987) details the remains of a brick-built structure in this area, perhaps a former bath house. It was approximately 14ft (3.8m) long by 5ft (1.5m) wide, apparently half-timbered with stone slates, and may have been partly tiled with plasterwork on the inside. It is likely that the path referred to above led to this building. A copy of this report is included in the Appendix.

**4.2.35** Within the context of a country park, there is likely to arise pressure for the creation of a path along the western shore of Pond-du as a direct and simple means of returning to the north: this should be firmly resisted. There is no historical precedent for such a path and, as shown by both the Tithe map and on the lithograph by Butler (see opposite paragraph 4.2.28), it is important for the view from the north that the lakeside here be kept clear of people.

**The wooded valley of the Afon Gwynon in the north and east of the park, as far as the former fish pond, including the various cascades and bridges.**

**4.2.36** The wooded escarpment here contains Ash, Birch, Sycamore and Beech (girths to 120cm). It requires thinning and management to create an open woodland. Some replanting will also be necessary: it is suggested with Beech and Oak (there are several Oak stumps in this area).

**4.2.37** Elsewhere, the valley has been planted with Ash, of the same age now as those in the Pont Felin-gat area. These have remained unmanaged for too long and have become rather overgrown. The whole valley here now has the appearance of unmanaged secondary woodland, with a dense understorey of Brambles which should be kept under control. Trees require progressive thinning as the young Beech and Oak, recommended previously, grow up, with the eventual aim of creating an underlying structure in this area of woodland of Beech and Oak.

**4.2.38** The woodland boundary around the whole of the valley here is very open and requires thickening with Oak and Beech: a Thorn hedge also may also be required along the line of the boundary itself.

**4.2.39** The path along the bottom of the valley here is along the line of that shown by the Tithe map. Other paths in this area, shown on the Surviving Trees, Field Archaeology, Lakes, Ponds and Views map, are not shown on historical plans, but are visible as field archaeology on the northern side of the valley. It is recommended that these paths be reinstated as alternatives to the existing path. They provide a different view of the valley: looking down into it lends the river valley an enhanced sense of scale.

**4.2.40** From this point on the side of the valley, a fine view is possible from the path here of the cascade leading from Pond-du. At present, however, this is obstructed by Ash growing in the valley bottom to the south and east: these should be removed and the view reinstated.

**4.2.41** The existing paths on the north side of the valley here appear to be along the lines of paths shown by the Tithe map, although again there are paths visible as field archaeology which are not shown by any historical plan, as well as a very prominent path to the north side of the Waterfall (apparently for viewing only) which is now disused. All of these paths should be reinstated as alternative to the single existing path, allowing different views along the valley to the various features.

- 1 All the paths here become very muddy in wet weather and require surfacing. Gravel is the most appropriate material to use, as the paths at Middleton were so described in the Sales Particulars of 1824 (see Appendix). It is recommended that gravel from a local quarry be used.

**4.2.42** The Tithe map indicates a bridge across the Afon Gwynon, just below the Waterfall at roughly the present crossing point, where the remains of former bridge abutments can still be seen. A bridge at this point should be reinstated.

- 1 The design of the original bridge here is currently unknown. If no further information is turned up, it is recommended to be replaced by a simple wooden bridge, as this is likely to differ least from the design of the original.

**4.2.43** The present bridge adjacent to the Cascade is roughly on the site of the crossing point as indicated here on the Tithe map. It is of a solid construction and does not overly intrude on the landscape, but its design is not that of a late-18th or early-19th century garden. It would be sensible to keep the existing bridge until such times as it is found necessary to rebuild it, when a more appropriate design can be reinstated. At present, the design of the original bridge here is unknown.

- 1 In the absence of documentary evidence as to the design of this bridge, it is as well also to keep the design of its replacement as simple as possible.

**4.2.44** The Cascade should be retained as the main outflow from Pond-du, although it may require some remodelling.

- 1 The Cascade itself is a stupendous thing when in full spate, with upwards of 60,000 tonnes per day thundering down it from Pond-du above. The damage that this amount of water would do to the dam in the absence of a suitable spillway is difficult to imagine, but is likely to be extensive. Proposals have been made above to redirect the bulk of flood waters away from this cascade (see paragraph 4.2.26), but its construction should still take into account a theoretical maximum flow. The great volume and force of water to date has undermined some of the Cascade's lower reaches and these require prompt action if this structure is not rapidly to deteriorate.

- 2 The present appearance of the Cascade, however, is inappropriate in its setting. Although photographs taken prior to restoration indicate that it does not appear to have been extensively remodelled (see Appendix), the style of pointing (in which this is given more prominence than the stone itself) and the use of hard cement mortar for this, has produced an effect which emphasises the engineering qualities of the cascade, rather than its ornamental characteristics. It is possible also that failure of the mortar used may also in part have been responsible for the collapse

of the lower sections. Repairs to the Cascade should be undertaken only after consultation with a qualified engineer.

- 3 No archaeological investigations of the Cascade were undertaken prior to its rebuilding. As so little evidence is available concerning its former design, it is recommended that its present structure be maintained, subject to recommendations made above concerning the involvement of an engineer.
- 4 The rustic pillars at the bottom of the Cascade are thought to be from the south front of Paxton's house (see frontispiece). These should be removed to a protected environment: they are in any event inappropriate in their present location.

**4.2.45** Woodland south of the Afon Gwynon is of Beech, Ash, Birch and Alder (girths to 100cm in general but with Beech to c160cm). It is too dense at present and could do with thinning to favour Beech. Birch should be removed altogether as it is invasive and can impede regeneration. The understorey here is less choked with brambles than on the north side of the valley, this should be monitored as the canopy is opened out to prevent it taking hold.

**4.2.46** The line of the existing path along the south of the valley towards the Waterfall is roughly that shown on the Tithe map and should remain, as should the short stretch of path leading from the crossing point below. The main path is being undermined in places by the river and needs to be repaired and stabilised. Both paths require surfacing.

**4.2.47** There is potentially a fine view from the path here towards the Waterfall, although at present several Ash trees are obstructing this. These should be removed, but care should be taken not to make the view look like a "window" cut through the trees, as can happen when a few trees are removed from a group to open out a view. To avoid this, it is suggested that trees in the valley bottom be formed into a small group or clump, so allowing the view between it and woodland further up the hill to the south.

**4.2.48** The informal path returning along the south side of the woodland area here is not shown on any historical plans, but follows an interesting line and could be retained, as it will not detract from any existing views. Short flights of steps may be required in places where it is presently rather steep. It is likely also the path will require surfacing, but bark or wood chips would be more appropriate than gravel on an informal path such as this.

**4.2.49** The new concrete steps on the path here are inappropriate in this setting and should be removed immediately. A flight of steps is needed here in this area to link with the path across the Cascade, but these should be of a ma-



terial more sympathetic to their surroundings, such as stone, or wood and gravel.

#### **4.2.50** The Waterfall should be retained and conserved.

- 1 This looks very fine when a good volume of water is flowing over it. This feature appears also to have been restored in recent years, but again the use of hard cement mortar has given it a harsh appearance unsympathetic to its surroundings. This mortar is also now breaking up in places and needs repairing.
- 2 No archaeological report or other documentation on the structure of the Waterfall prior to its restoration is available. Unless further information comes to light, the present structure should be maintained.

#### **4.2.51** The small pond behind the Waterfall, shown on the Tithe map, is choked with fallen trees and silt. It should be cleared out, dredged and restored to its former outline, but only after the Waterfall has been fully restored.

- 1 Unusually for Middleton, the restoration of this pond is a comparatively small project and visible results would be relatively easy to achieve. It could be tackled by a school conservation group or suchlike over the period of a summer (when the pond is dry) and would be of great value both for publicity and for education and community involvement, but only as part of a larger project to reinstate the park.

#### **4.2.52** The stone bridge here carrying the former approach road has been recently repaired and pointed, but once again hard cement mortar has been used: although the end result appears very solid it is unsympathetic to the structure itself. On the eastern face of the bridge, salts are being washed out of the mortar and disfiguring it.

- 1 Two problems are apparent here. The first is the seepage of water through the structure from above and the internal damage that this may be doing. This is an engineering problem: the expertise required to correct it may be found within the Council.
- 2 The second problem is one of the long-term stability and appearance of the facade. In common with many of the other restored features at Middleton, this bridge requires repairing and repointing with a lime-base mortar that will appear sympathetic to both its character and surroundings.
- 3 No archaeological report on this bridge prior to its rebuilding is available, although a photograph taken before work started is included in the Appendix.

**4.2.53** It is recommended that all such works at Middleton be carried out under the supervision (however this is arranged) of a practising stone conservator or a person experienced in this kind of work.

**4.2.54** Immediately south of the bridge, surface run-off out of broken land drains leading from Deer farm areas to the south is scouring the track: these drains should be repaired.

- 1 A report has been received of possible building foundations in this area. This should be thoroughly investigated prior to any works starting here.

**4.2.55** Direct access to this bridge from the road to the north is possible along the line of the drive shown on the Tithe map. This would cross the suggested car-parking area and so provide for a separate circular route through the park, entering at the Pont Felin-gat site and leaving by this bridge. Visitors would thus walk up the valley from west to east (the correct direction to view the various features), but would then be required to retrace their steps in order to leave the park.

- 1 Vehicular access across the bridge to the eastern end of the valley here would also be possible along this drive. This has obvious implications for construction traffic during an initial restoration phase and later for the provision of emergency services.
- 2 A small tea shop might be appropriate within the context of a country park, secreted away in the woodland to the south and west of the Waterfall. Level access to this point is possible from the bridge and it would be a very pleasant place to sit and enjoy the valley, with the sound of water in the background. Visitors would gain a sense of achievement, having walked up the valley from the west, and would be able to rest and relax while still remaining in the landscape. Access via an exit to the suggested car parking area would be a short walk across the bridge. Although a rustic shelter stood here until recently there is, however, no known historical precedent for a building in this part of the park.

**4.2.56** The appearance of woodland areas east of the bridge here provides an idea of what is achievable by management. The contrast in view up and down the valley from this point is very striking, with the woodland east of the bridge open and apparently well-managed, while that to the west is overgrown and lacking in signs of long-term management. Immediately to the east of the bridge, some limited underplanting of Beech and Oak may be necessary, but no thinning here is currently required.

**4.2.57** The boundary of the eastern block as described in the brief is at the west side of the former fish pond here. To the east, fencing associated from the Deer farm crosses the fish pond. It is suggested that this boundary be relocated at its eastern side, where an area of Alder woodland provides a natu-

ral visual boundary to the park and would also disguise the deer fencing beyond.

**4.2.58** The fish pond is currently choked with fallen trees and filled with silt, which it is recommended be removed and the pond reinstated. This would provide a natural physical barrier to any trespass onto Deer farm lands.

**4.2.59** The Cascade here (which to avoid confusion will be referred to as the Fish Pond Cascade) has also been restored in recent years. Comments made previously about the use of materials apply here also. No archaeological report on this structure prior to rebuilding is available, although photographs taken before and during works (see Appendix) indicate that some modifications of its design may have taken place in the course of reconstruction.

- 1        The design of the Cascade is very specific, being in two parts: the first, upstream, weir presumably intended to retain water in the pond behind it, while the second, with a circular drain below the main spillway, has an ornamental appearance in times both of low and high water flow.
- 2        It is recommended that the design and construction of the Cascade and of the pond behind it be integrated in any future restoration. For example, the former level of water in the pond, which is be apparent from its field archaeology and to which it should be restored, will determine the level of the first (upstream) weir. It is evident that this presently is too low, as very little water is being held in the pond behind it.
- 3        Some undermining and cracking of the north wall downstream of the cascade has taken place and should be repaired promptly. A drain in this wall carries water into the Afon Gwynon from another source, perhaps the road above to the north. This raises questions concerning the possibility of pollution of this watercourse.
- 4        Undermining of the main bank of the river is also taking place on the south side of the Cascade and needs stabilising.

**4.2.60** South of this pond, the path climbing the hill to the east from the bridge (shown by the Tithe map) led formerly into open parkland, now areas of the Deer farm. It is still extant, albeit very muddy and waterlogged, but is obstructed by deer fencing at the eastern end of this area. It would be possible to reinstate part of this path and to create a viewing area above the Fish Pond, but it is doubtful how successful this would be and it may encourage trespass into Deer farm areas. It is recommended therefore that this area be managed for wildlife conservation and that visitors be discouraged from entering it (this may be achieved by the simple expedient of leaving the path overgrown)

## **Parkland and woodland to the west of the above, as far as the public road, and south as far as the former house site.**

**4.3.1** This area, and its companion area adjacent to the walled gardens (4.1.13) are both shown as wooded on the Tithe map and also indicated as such in Butler's engravings (see frontispiece and opposite paragraph 4.2.28). They may have composed the "plantation" between the house and the kitchen gardens referred to in the sales particulars of 1824. This part is now an open area with scattered Horse Chestnut, allowing a view from the road to the farm buildings here. It should be replanted as an extension to the woodland north and east of it, but could also be integrated into the Botanic Gardens development by the suitable choice of exotic or ornamental species.

**4.3.2** This woodland is mainly of Hornbeam coppice, although there is some young Oak and the remains of several large Oak stumps. To the east it is bounded by a broad bank and ditch, suggesting an ancient origin, while to the west its present boundary is the stream. It is recommended that the Hornbeam here be re-coppiced and that the area be replanted with Oak standards. At its eastern boundary, the hedge should be thickened with plantings of Oak, as it is very exposed and bleak at present.

**4.3.3** These areas should be returned to woodland as for 4.3.2 above. The stream should be dug out again and a bridge provided as a crossing point.

1      These areas, formerly woodland, are now open although the valley near Pond-du has in recent years been invaded by Willow, Alder, Hazel and bramble scrub. The stream here has at some point been piped underground, but this has obviously become blocked and the ground is now very marshy (the grass here is also very green, suggesting some nitrogen-bearing run-off from the farm above into the stream).

**4.3.4** The track through this area, shown on the Tithe map, is still visible in places. This should be restored to link the house area and the Botanic Gardens development with Pond-du and the proposed country park.

**4.3.5** Paths in the field here could also be reinstated as alternative routes, although in this location it would not be appropriate to gravel them: they could be maintained simply as grass tracks across the fields.

**4.3.6** There is a fine view across Pond-du from this area to Paxton's tower.

**4.3.7** This area is wild and heath-like, with Oak pollards and bracken giving it a mediaeval appearance. It should be maintained as it stands at present, which will mostly involve removing self-seeded Ash to prevent it turning into an area of secondary woodland.

**4.3.8** This area, part of a woodland belt shown on the Tithe map, is very waterlogged and is reverting to Alder carr. It is recommended that the whole of the belt shown on the Tithe map be replanted, as the skyline is very open and bleak here in the view from the east.

- 1            Replanting will require drainage of the northern sections.
- 2            A mixed woodland of Oak, Beech, Ash, Hazel, Thorn and Holly would be appropriate here, with perhaps a planting of Lime adjacent to the road itself to acknowledge its former function as one of the main approaches to Middleton Hall.

## **The remainder of the park west of the public road**

**4.4.1** This area forms an important visual and physical buffer between the main park landscape of Middleton and areas outside it to the north. It is currently farmland, while the various clumps and the belt of woodland along the roadside to the south, shown by the Tithe map, are no longer extant. The track around the edge of this area, although visible in places as field archaeology, is no longer used - access from the western edge of the park to the walled gardens area and the former house site is via a more recent track shown by the Ordnance Survey.

**4.4.2** The area is presently very bleak and exposed; it is also separated by the road from the rest of the park. It is recommended that the woodland belt along the road here be reinstated, in the manner described for area 4.3.8 above.

**4.4.3** These clumps could also be replanted to pick out the boundary of the park. Although this area is of lesser importance in the landscape design, it is important nevertheless to safeguard it against unwanted or intrusive developments, as it provides a backdrop to views from the house site.

**The site of the house and immediate areas, including areas to the east and north, the gardens as far east as Pond-du and the field south as far as Bryn-cadw and Waun-las ponds.**

**4.5.1** The loss of Middleton Hall has, without doubt, been a tragedy both to the landscape, for it has lost its major focus, and to Carmarthen, for it has lost one of its major houses. It has also, however, provided the opportunity and the location for a development of the landscape which it is doubtful would have been countenanced, were the house still extant.

**4.5.2** That said, a restoration of the landscape is still faced with the problem of providing a focus for it, for although the view from Paxton's house must indeed have been fine (it seems that this would have been from a height of eight to ten feet above the present ground level), it would have been the view to the mansion from various parts of the park, that was most striking. A visual *leitmotif*, repeated again and again with different perspectives, the house would have served to unify the disparate elements of the landscape into a cohesive design.

**4.5.3** This is not a problem that will be solved easily. No proposals will be presently be made for this area, beyond the general recommendation that no alterations or development of any kind be allowed for the time being. These remarks apply equally to areas north and east of the house site, as far as the path 4.2.34, and to the field between the house site and Bryn-cadw pond, which includes the formal garden site and several paths.

## Bryn-cadw and Waun-las ponds

### Bryn-cadw pond

**4.6.1** This should once again be filled with water. It is a major landscape feature and will serve to link the Botanic Gardens area with the rest of the landscape.

1 In common with many of the other former ponds or lakes at Middleton, this has been colonized with Alder, Willow and the like. It has been assumed that all were already in the process of being colonized when their various dams were breached. The existing bed of this pond, however, is some distance below the apparent bank level (varying between about 1 metre at the western end and 3 metres at the east). This suggests that, although probably silt-rich, the depth of silt in this pond may not be as great as has been thought, and that its restoration may be a matter only of removing colonizing trees and other plants and repairing the dam at its eastern end.

2 Even if this did prove to be the case, it would probably improve the final result if a limited amount of dredging were carried out in this pond prior to its restoration.

**4.6.2** The dam at the western end of this pond is a substantial earthwork, and appears itself to be in good condition. Outflow into Waun-las pond was formerly via a stone sluice/cascade arrangement, with the main southern approach road carried across it on a stone bridge. All of these have now collapsed and further damage is being caused to the structures by self-seeded Beech, Ash and Thorn which are growing out of the stonework. There is a drop of some 10 metres between the top of this dam and the supposed water level in Waun-las pond below, indicating a substantial cascade (shown by the OS 2nd Edition 25" plan).

1 To restore water to Bryn-cadw pond, it may be sufficient in the first instance simply to rebuild a form of sluice/cascade here to the point where it retained water. This need not in the first instance be an historically accurate reconstruction. At this stage it would seem to be more important to the landscape as a whole and to the momentum of its restoration that there once again be water in the lakes, than to worry unduly about the means by which it is kept there. A more elaborate restoration of these structures could be delayed until a later date, even though this may prove to be the more expensive option in the long term. This in itself may be offset by the improved cash flow which will result from extending this part of the overall project and by the increased interest in the landscape which will certainly result from a restoration of its water features.



It is important that a thorough, documented investigation of the sluice/bridge remains here be carried out prior to any rebuilding works.

## **Waun-las pond**

**4.6.3** The bed of this pond has similarly been colonized by Willow, Alder and Ash, but there is also a fine Oak pollard at its southern bank (mapped previously), suggesting an origin for at least part of its outline in an existing field boundary. It is suggested that water be returned only to the northern areas of this pond, following similar procedures to those outlined above for Bryn-cadw pond.

**4.6.4** Southern areas of this pond are extensively overgrown and appear to have been so for many years (they are shown as such on both the Tithe map and the OS 2nd Edition 25" plan). Given this, and given also the likely possibility of damage by tree roots to the pond bed here, arguments for a full restoration appear to hold as little water as would the resulting pond. It seems sensible therefore to retain these southern areas of Waun-las pond as woodland and to manage them for their value as a wildlife habitat. They may also have educational value as a practical demonstration and/or study of succession in a wetland habitat.

**4.6.5** The dam at the northern end of this pond is a substantial structure and again appears to be in good condition. The sluice has disintegrated, however: a stream now runs beneath the road bridge into Pond Du. Remarks made above concerning the sluice at the eastern end of Bryn-cadw pond are also appropriate here. Thorough documented investigations of all structures involved (sluice etc.) must also be carried out here, prior to any rebuilding works.

## **Southern and western areas of the park.**

**4.7.1** The Tithe map shows an area of woodland here, no longer extant. At present the area is managed for grazing, which would be lost if the woodland were replanted, but some boundary plantation is required here, perhaps a belt of trees along the line of the fence to the south would suffice.

**4.7.2** A small area of woodland, containing Ash, Oak, Beech and Sycamore, with some Hazel and Holly. If the small wood referred to above (paragraph 4.7.1) is not replanted, this should be planted with Oak and Beech, with Hazel understorey. It is surrounded by a hedge of Willow and Ash, which needs management to preserve as a stock-proof barrier.

**4.7.3** Of the former woodland clumps indicated in this area by the Tithe map, very few trees remain. Beech survives in the large clump nearest to the public road, with Oak stumps in three other places. These clumps were would have been just inside the visual boundary of the park as viewed from the house, with those further to the east acting as elements in the view from the southern approach, also shown on the Tithe map (see paragraph 4.7.6 et seq. below).

**4.7.4** This hedgeline is effectively the visual boundary of the landscape to the south as viewed from the house site. It contains Thorn, Holly and Elder, with young self-seeded Oak growing through. It is important that it be maintained as a solid boundary at the southern horizon. Elder in the hedge should be removed as this eventually allows stock to break through the hedge. Single stems of Oak should be selected and managed as standard trees.

**4.7.5** South of this hedgeline, the farmland here provides a buffer between the main road and the landscape. It seems unlikely at present that this situation will change.

**4.7.6** A former clump of Oak, not shown on the Tithe map, but surrounded by a circular bank (and presumably also a hedge). Survived by 5 Oak stumps and an Ash (girth 160cm). There is no reason why this clump should not be replanted with Oak.

**4.7.7** These two Oaks (girths 250cm and 280cm) survive from a former track between two fields here. Again, there are fine views of the house site and of Paxton's tower from this point. Oak should be planted to mark the line of these field boundaries.

**4.7.8** This former clump, shown on the Tithe map, should be replanted with Oak.

1        A single surviving Oak here (girth 360cm) hints at its former role in the landscape. It had a dual purpose, firstly to frame a view to the house from the entrance to the south-east (see paragraph 4.8.6 below) and secondly to hide a view of the house from the southern approach here, until it could be seen to best effect. From the house, it would have formed the middle ground of a view to the south and east.

2        There is also a fine view of Paxton's tower from this point.

**4.7.9** This clump, shown on the Tithe map, is also of Oak. It marks a break in the slope here and formed a middle ground feature in views to the house from the south.

**4.7.10** The line of the drive shown here on the Tithe map is still visible as field archaeology. It formerly crossed the narrow channel between the Bryn Cadw and Waun Las ponds (now collapsed) and swept up to the house, entering the gardens at a point just east of the oval garden.

**4.7.11** Part of this clump, shown on the Tithe map, is still extant. It contains Oak (girths to 200cm) and Ash.

**4.7.12** It is important to note that the visual boundary of the park in this area lies outside the park and includes fields and woodland in the south and east adjacent to Llanfawr and Pant-glas.

## **Areas in the south and east of the park, south of the Deer farm and east of Waun-Las pond.**

**4.8.1** Large area of Alder and Willow, not shown on the Tithe map (two small clumps shown here). This woodland is on very wet ground, but provides a good habitat for wildlife and should be retained, although some management may be required to maintain its conservation value. Although this area is visible from the house site, it is at the southern boundary and does not in any way detract from its appearance. It is considered that its conservation value outweighs any effects that it may have on the landscape.

**4.8.2** This fine Oak (girth 420cm) may have been a field boundary tree and is visible from the house site. It should be retained.

**4.8.3** The drive shown here on the Tithe map is still clearly visible as field archaeology, although its former entry from the road in the south of the park no longer exists and a deep storm drain now cuts across its line here.

1            Once inside the park, the line of the drive is along the bottom of a gentle valley, crossing the ditch here by a bridge, still extant.

2            There would be little point at present in attempting to reinstate this approach

**4.8.4** The woodland here contains some fine Oak (girths to 250cm) along the line of the ditch and on its northern side, but these are not shown by the Tithe map.

**4.8.5** This former clump shown on the Tithe map now contains only two Oak (girths c300cm) on the line of the Parish Boundary. Much of the former area occupied by the clump has now been taken up with a lay-by.

**4.8.6** There is a fine view of the house site from this point, with the clumps 4.7.6 and 4.7.8 framing the view. The clump 4.7.7, marking a break in slope, provides the middle ground.

**4.8.7** This clump, marked on the Tithe map, still survives, although the ground here is very marshy and the clump consists almost entirely of Alder (girth to 120cm), with Oak on the field boundary (girths to 260cm).

**4.8.8** The entrance and track here are still in use. There is a headed Beech and an Oak by the entrance here (girths to 300cm).

**4.8.9** An area of planted Beech woodland (girths to 320cm, trees headed at c3m). Also self-seeded Sycamore and Ash, with an Elder understorey. This wood is potentially very fine but has not been managed for many years. It requires replanting with Beech now to maintain its continuity as an area of woodland when the larger trees die.

**4.8.10** A fine area of Beech and Oak woodland, the remnant of woodland shown on the Tithe map, with trees up to 300cm girth and an understorey of Hazel coppice. It requires replanting with Beech and Oak to maintain continuity with its present state, and the Hazel needs to be coppiced at regular intervals.

**4.8.11** This clump, marked on the Tithe map, now contains three Sycamore (girths to 280cm), one of which is badly diseased and should be removed. Although Sycamore is not apparently a species which has been much used at Middleton, there is no reason to suppose that this clump was originally of any other species, so it should be replanted with Sycamore.

**4.8.12** Nothing now survives of the clump shown here on the Tithe map. It would be visible from the house site and should therefore be replanted. No evidence was found of the original species used here, but Oak is the least likely to be incorrect.

**4.8.13** Two Oak survive here, of girths 420cm & 408cm, the latter badly damaged. There is also a dying Ash tree, but this should be retained if at all possible as it is being used by woodpeckers.

**4.8.14** An area of Hazel coppice, also shown on the Tithe map. This requires coppicing at regular intervals.

**4.8.15** Fine Woodland of Oak (girths to 355cm) and Beech (girths to 320cm), shown on the Tithe map. Underplanting with new trees of these species is required now to maintain continuity here.

**4.8.16** This clump shown on the Tithe map is survived now only by some Oak stumps and a circular bank. It should be replanted with Oak, within the existing boundary. Oak could also be planted along the field boundary to the south and east of this clump.

1 To the south and east a field boundary Oak survives near the track (girth 280cm). There is a fine view from this clump of the house site and of Porthyrhyd church spire.

2 Extensive field archaeology was also noted in this area, probably the remains of a field system. This area would be a good location for training in the use of field archaeology as a tool in garden history.

**4.8.17** Beech (girths to 315cm) planted probably by Paxton, were mapped at the eastern end of this clump as part of the previous study. It is now a conifer plantation but should be replanted with Beech.

1 Strip lynchets to the east of this clump were also mapped previously.

2 Other clumps in this area indicated by the Tithe map are no longer extant, although they were shown by the OS 2nd Ed. 25" plan. Three small quarries here contain young Oak, Ash and Thorn.

**4.8.18** This former clump, shown on the Tithe map, is now an area of scrub woodland, with self-seeded Ash, Oak and Thorn. It could be replanted with Oak, but unless the dense Thorn thicket here is removed, these will be difficult to establish.

1 Parts of the former drive in this area were mapped as part of the previous study.

2 No sign of the building and enclosure also indicated here on the Tithe map was visible on the ground. Its identification and purpose is a mystery, for unless it were very tall it would not have been possible to see the house from it. This tends to suggest that its function (whatever this was) was unconnected with the designed landscape.

3 There is, however, a very fine view of Paxton's tower from this location.

**4.8.19** The clump shown here by the Tithe map is survived by an area of scrub woodland around a derelict quarry, with Oak, Ash and Thorn, of similar age and appearance to the clump 4.8.18. Fine Beech (girths to 385cm) and Oak (girth 370), associated with a field boundary to the north of this area, and a covered well, were mapped as part of the previous study and are shown on the plan of Surviving Trees, Field Archaeology, Lakes, Ponds and Views. This area is of great importance to the landscape and should be replanted with Beech and Oak.

1            There is a fine view from this point to the former house site.

**4.8.20** The views from this point on the approach road are very fine, particularly to the west across the rest of the park.

**4.8.21** This former clump, on the site of an old quarry, is survived by an area of self-seeded Ash, Willow, Oak and Elm. One field boundary Oak (girth c200cm) survives at its lower edge. It is an important feature in the landscape and should be replanted. Oak is an appropriate species.

1            Field archaeology in this area (the eastern approach road descending the hillside) was mapped as part of the previous study.

**4.8.22** The former belt here shown by the Tithe map is survived by two areas of woodland. The first, to the south, contains Beech, Oak and Hazel coppice. The latter requires regular coppicing, while the Oak and Beech here should be supplemented by new plantings.

**4.8.23** This is a waterlogged area at the edge of the deer farm to the north, contains Alder, Ash and Hazel, with Oak (girth 320cm) on the field boundary. It should be replanted with Oak, retaining the Hazel understorey, although the waterlogging will need to be corrected first.

**4.8.24** The remains of the paths shown here on the Tithe map are still clearly visible descending the hill.

**4.8.25** The clump shown here by the Tithe map is no longer extant. It is likely that a clear view of the house would have been possible as the track emerged from behind this clump. It will therefore be a major feature in the view from the house and should therefore be replanted. In the absence of firm evidence, it is suggested that Beech and Oak be used.

**4.8.26** The remains of an area of Birch woodland shown here by the modern OS plan has been removed, apparently very recently.

**4.8.27** This clump shown on the Tithe map is still extant. It is composed of Scots Pine (4 trees, 1 alive, girth 250cm), with self-seeded Beech (girth to 180cm) and Willow. The most likely cause for the deaths of trees here is waterlogging, which should be rectified before replanting, with Scots Pine, is carried out.

**4.8.28** This area, containing Birch and Alder, was mapped as part of the previous study. It seems formerly to have been a pond, perhaps a fish pond, but

appears to have been wooded since the early part of the 19th century (it is shown as such on the Tithe map). In the context of the designed landscape, therefore, it would be inappropriate to do anything with it other than leave it alone.

**4.8.29** Large Beech in this area, surviving from a clump marked on the Tithe map, were mapped as part of the previous study, as was the field archaeology, remnants of the drive also shown here. The clump here should be replanted with Beech. There is no point at present in attempting to reinstate the drive, as it crosses areas to the north now occupied by the Deer farm.

**4.8.30** This is the site of the former Manor house, part of which was mapped as part of the previous study. Much still remains to be found here, but until a thorough archaeological survey is carried out in this area, no development of any kind should take place, beyond the replanting of the woodland at its western edge (see 4.2.31 above)

**4.8.31** This former clump, shown on the Tithe map, is survived by large Chestnut mapped as part of the previous study. To the south and west of it is a hanging Beech wood shown on the OS 2nd Ed.25"plan (girths to 340cm) and also mapped previously. Both of these areas should be replanted. It is also recommended that the physical distinction between them, now blurred by self-seeded trees and scrub, be reinstated.

1        Trees here mark an escarpment, the visual boundary of the park as viewed from the former house site. They are therefore of great importance in the landscape.



## **The deer farm areas.**

**4.9.1** Access to these areas was not practical in the time available, as areas are subdivided into pens surrounded by high fences. It was clear, however, that all or most of the trees shown here by the Tithe map, and indeed by the OS 2nd Edition 25" plan, are no longer extant. Tracks shown on the Tithe map were visible as field archaeology, however, even though in general these are no longer used.

**4.9.2** It is clear from the number and disposition of clumps shown on the Tithe map, that these areas were of great visual significance in the landscape of Middleton. No proposals will currently be made for these areas apart from those contained in other sections of this report (suggested car parking areas in the north and east of the site and the proposed woodland belt replanting to the east of Pond-du).

## **Appendix A: Reports and other documents concerning the rebuilding of structures at Middleton.**

**5.1** The following are copies of Archaeological reports and photographs concerning the various structures at Middleton, taken prior to and during their rebuilding. Also included are copies of various sections dealing with the use of Lime-based mortars, from the book "Practical Building Conservation Volume 3: Mortars, Plasters & Renders" by John & Nicola Ashurst, published by English Heritage.

# THE BATH HOUSE. MIDDLETON HALL ESTATE.

INTERIM REPORT. 6th July 1987.

Using both documentary and field research, the location of one of the two bath houses at Middleton Hall was discovered in Spring 1987.

All that remained above ground was the upper surface of a red brick, being the top most portion of the main E-W wall.

The site was located by checking the 1825 sales map, where a black blob representing a rectangular building was noted at the approximate location, ie. on the west bank of Pond Du, at the extreme south end of the lake.

Clearance around the E-W wall revealed fragments of plaster remaining in situ on the walls. The remains suggest a plaster lined oblong pit, presumably the plunge bath, measuring 5ft (1.5m) in width. No other part of the building remains as intact or as prominent as this wall fragment. Excavations to a depth of less than 1ft uncovered numerous large fragments of bricks, and bricks bonded together by a crumbling white mortar. The south end of the building has not yet been located.

The most numerous finds have been pieces of plaster, which originally appear to have been painted grey(? Pink), then repainted in buff or fawn. The reverse of many of these fragments are indented with horizontal lines, suggesting that the upper part of the building was half-timbered with horizontal struts of wood, spaced in places as much as 6mm apart, and 4-5mm thick and 3-4mm wide. The length cannot now be determined.

The next most numerous finds are pieces of blue glazed ceramic tile, which probably lined the floor and walls of the plunge bath below water level (cf. Bath house in 'Life in the English Country House'). A few of the tiles are fairly intact, giving a measurement of 6cm, by about 9.5-10cm.

A few other decorated fragments of plaster have also come to light; lengths of string course projecting from a raised band, one piece appears to be the cornice from the top part of the wall.

Several stone slates have also been recovered along with fragments of timber. One fairly well preserved slate minus the top  $\frac{1}{4}$  measures 8cm x 16cm.

Also found a length of lead frame and small piece of window glass suggesting that the bath house had some windows.

## SUMMARY.

The excavated part of the bath house suggests it to be a rectangular brick line pit, at least 3.8m/14ft long by 1.5m/5ft wide.

Probably the lower walls and floor were lined with blue tiles, while the upper part was half-timbered, perhaps presenting a timber face to the exterior, with delicate mouldings on the interior plaster surface. It had a slate roof.

The remains of the ancillary buildings (which undoubtedly

MIDDLETON HALL. ICE HOUSE.

LLANARTHNE. DYFED (O.S.REF.

)

An M.S.C. project is currently in progress on the Middleton Hall Estate, which is owned and sponsored by Dyfed County Council. During renovation and clearance work, an ice house was uncovered. This ice house was mentioned in the sale catalogue of the estate in 1824. Many of the other building mentioned have subsequently been destroyed, it was presumed that a similar fate had befallen this ice house.

The structure was covered by a thick, dense growth of brambles and trees. 1930's R.A.F. aerial photographs of this area show thick woodland.

The Middleton Hall ice house is approached from the south - east along a barrel vaulted brick passage, originally containing wooden doors (3), of which only the recesses for the lintels and frames are now remaining. The ice chamber is partly sunk into the hillside and is domed and lined with brick.

The entrance approach consisted of a sloping gravelled path, flanked by retaining walls of stone. These walls are in a ruinous state and it is difficult to accurately deduce their original profile. It would appear that they sloped upwards from ground level to the vault entrance. The floor of the passage is paved with stones set on edge up to the second door recess. Beyond that point, there is a raised kerb to the entrance of the third door. The floor in this area is of beaten earth. Excavation in front of the entrance passage way revealed the base of the first door lintel recess and also a brick kerb which partly underlies the stone cobbled floor. The inference is that the entrance passage way originally had a beaten earth floor, with a kerb at the front, later modified by the addition of a stone floor laid to the second door. To continue the level of the stone floor beyond this point would necessitate a new door, much shorter, being installed. As this is not the case then it must be assumed that the original function of the ice house had been abandoned by this time.

Cont....

At the end of the entrance passage which measures 12ft 8ins x 3ft 7ins x 6ft 3ins, a lower vaulted passage 2ft 2ins x 3ft 7ins x 4ft 8ins leads at right angles to the ice chamber, 9ft 9ins deep from the level of the second passage floor. The interior total height is 15ft 7ins and the diameter of the funnel shaped base is 6ft 3ins. The gently curved inner face of the dome has been breached a little to the north of centre.

In the brick floor of the ice chamber is a circular basin, adjoining this to the south east is a rectangular drain leading out of the chamber. This drain was originally covered with a stone slab and meltwater may have filled the basin before overflowing into the drain, via the narrow gap between the edge of the basin and the edge of the covering slab.

The lowest course of bricks in the chamber wall are turned on end, instead of forming an unbroken surface, a number of rectangular recesses approximately 6ins deep are formed. The purpose of this is not clear but one hypothesis is that it may have helped drain excess meltwater another is that it served some insulating function.

Both the ice chamber and the passage have an outer shell of brick (particularly noticable at the entrance arch) but it does appear to serve as an insulating gap between the layers. The lining of the layers consisted of mortar, with clay piled around both the passage and chamber to increase insulation.

We have no way of accurately dating the building, it was certainly in use prior to 1824 (as mentioned in sale catalogue). It is presumed that it dates from the time of the construction of the mansion circa 1776/95.

A similar but larger ice house remains at Glynhir mansion, near Ammanford.

A dog leg passage closed off by four doors, leads to the impressive ice chamber, approximately 15ft across by 14ft deep. The Glynhir ice house differs in that it has a central aperture in the dome and is provided with iron rungs for climbing down into the chamber.

Only the chamber itself is constructed from brick, the walled, vaulted passage is constructed from stone.

This ice house is in a very derelict condition and is totally unsafe.

Susan Lloyd - Fern &

Paul R Davis.

Llanarthne Woodland Project



The Holy Well at Pont Felin-gat: photographs taken during and after rebuilding. In the upper photograph, the lower two steps and the stone wall were as found.



The stone bridge above the Waterfall prior to rebuilding.

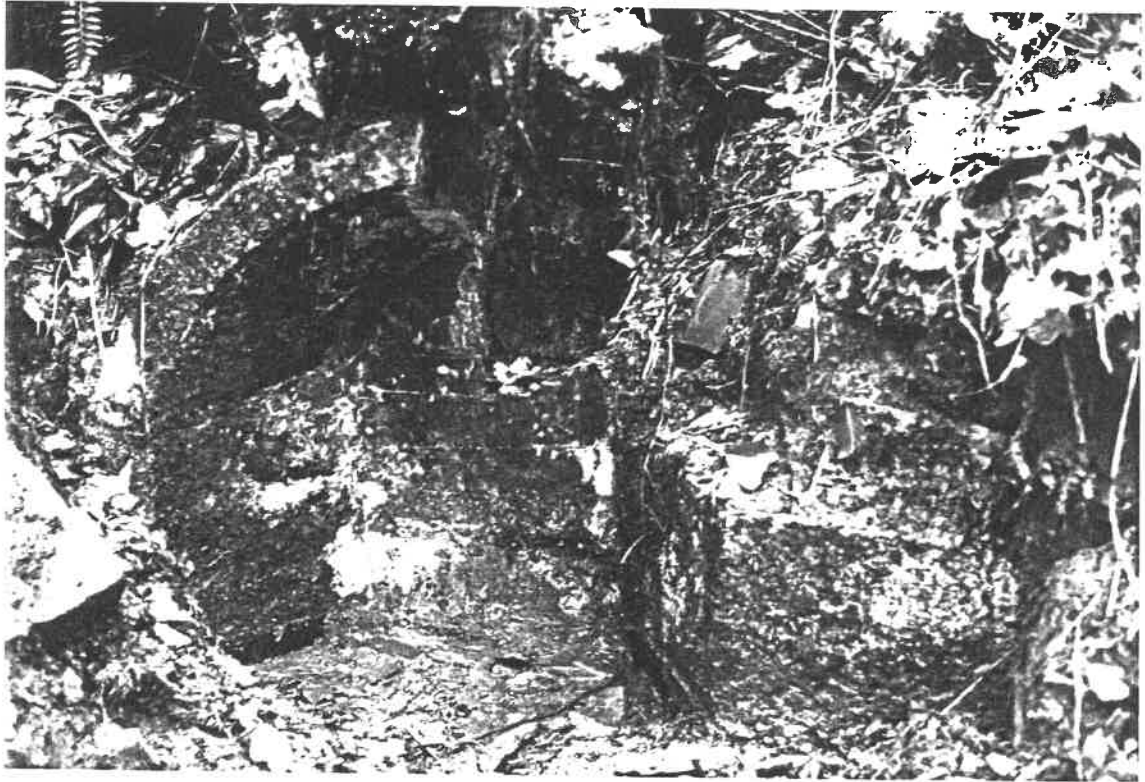




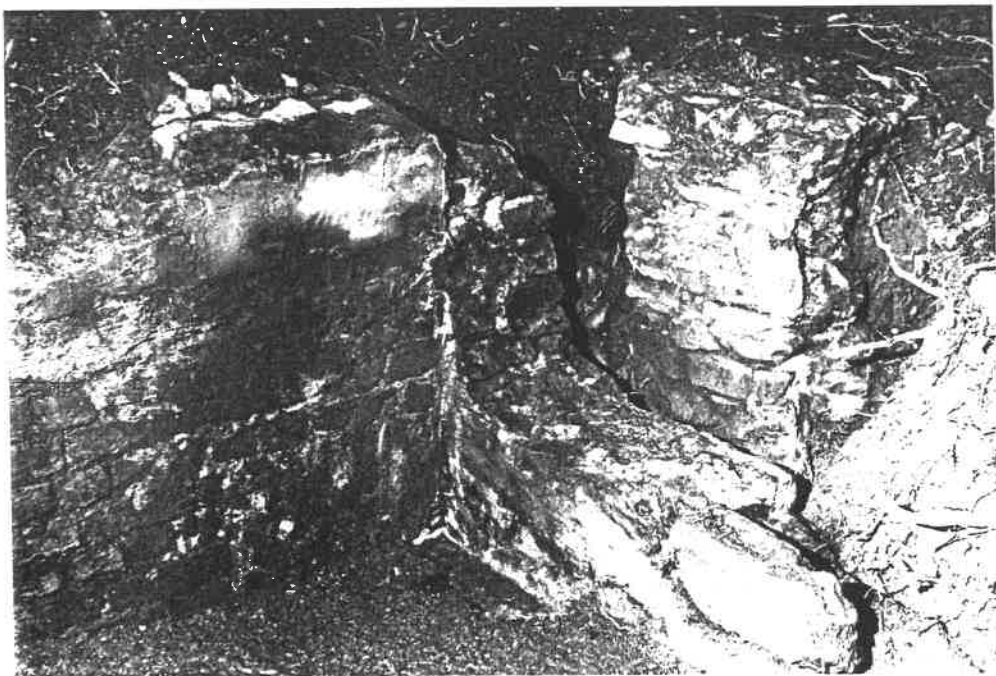
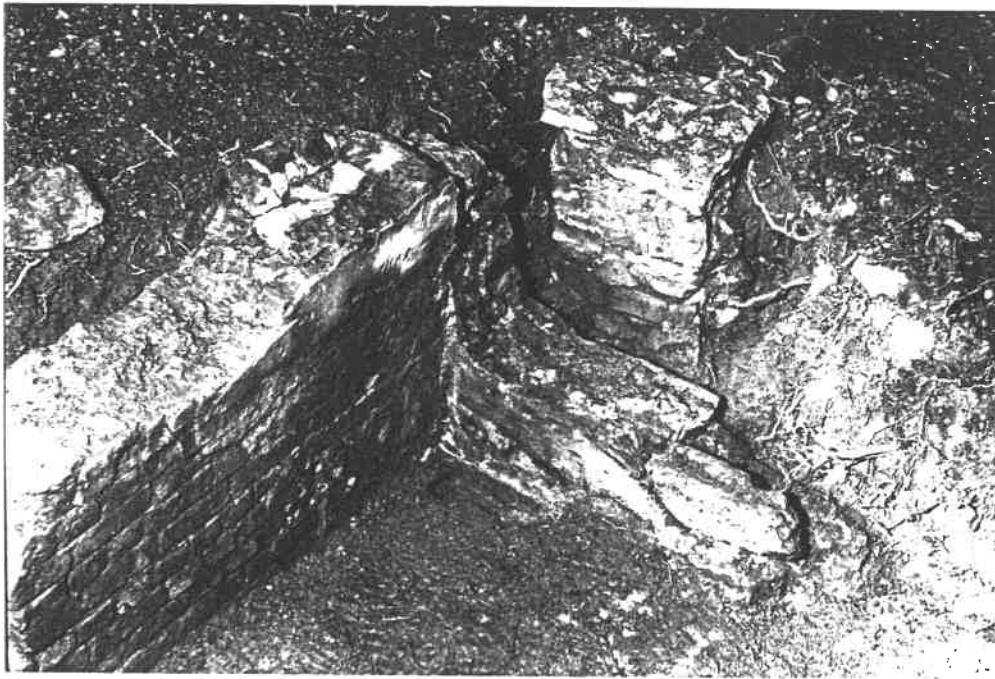
The Cascade prior to rebuilding.



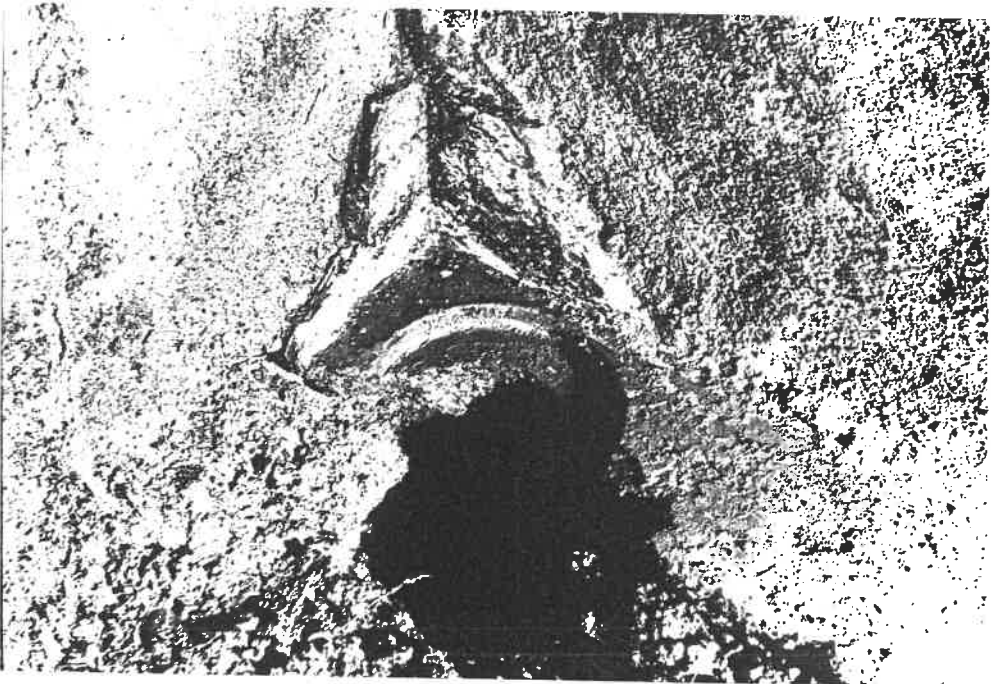
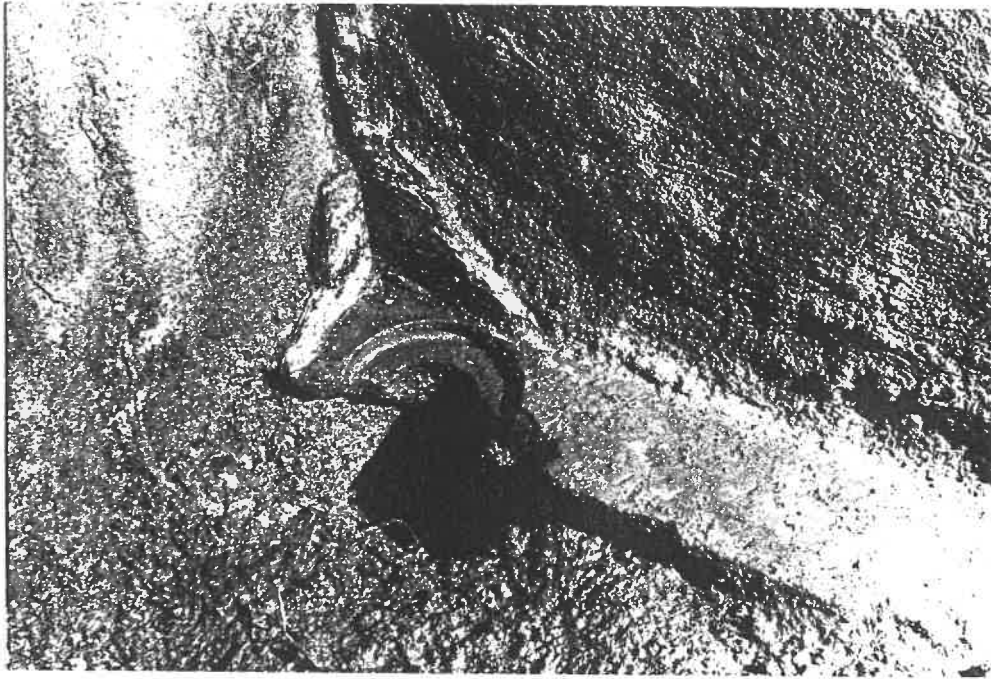
The Fish Pond Cascade: photographs taken during and after rebuilding. The upper photographs clearly shows damage caused by floodwaters at this site. The double-weir arrangement of this feature is visible in the lower photograph.



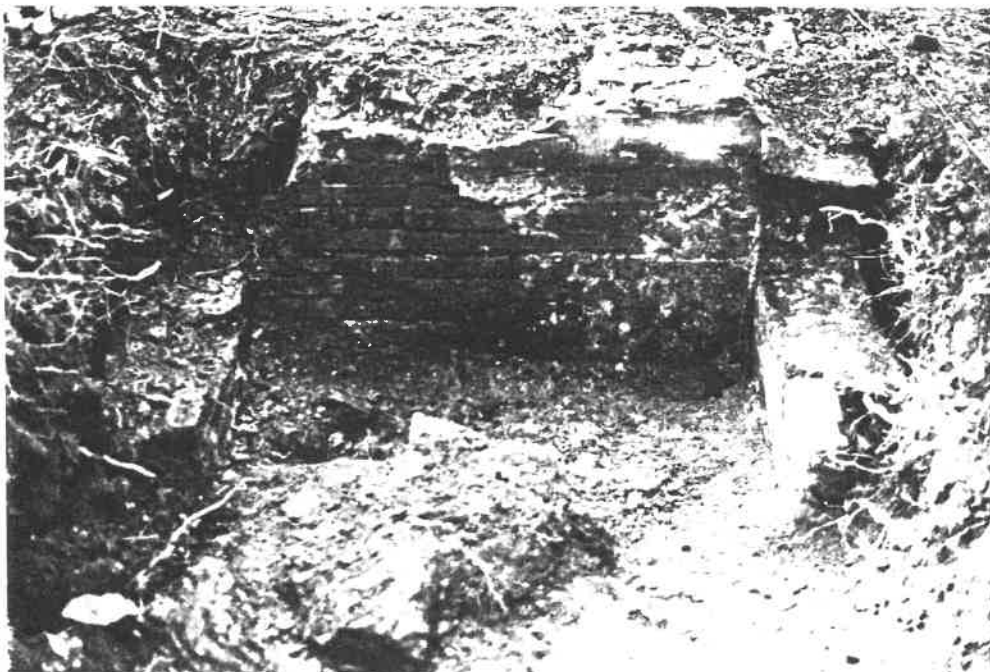
Ornamental spring at Pont Felin-gat site (as found).

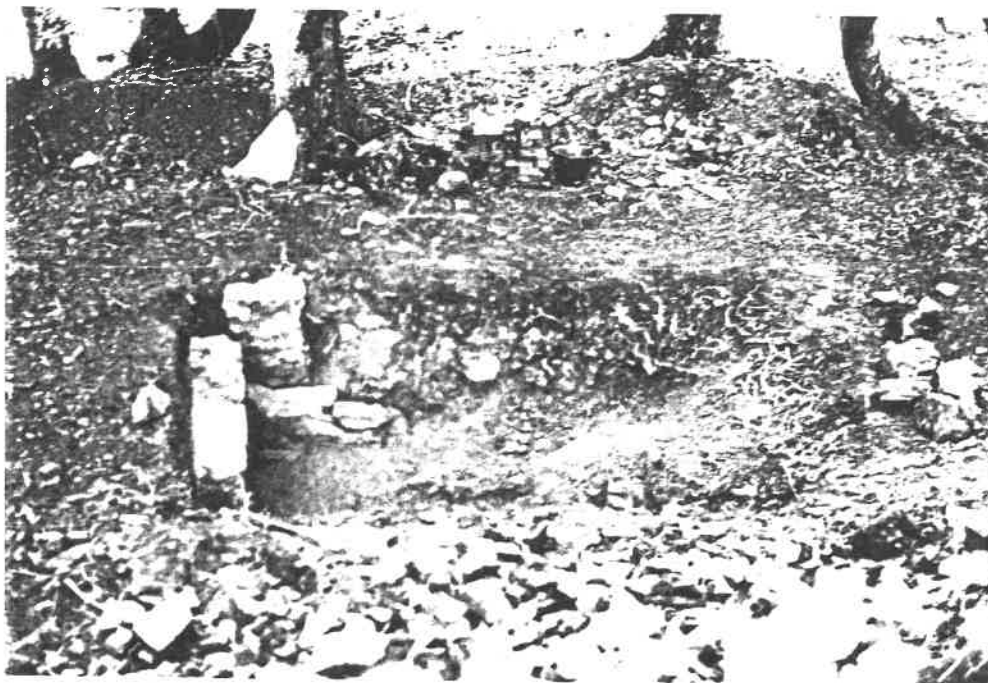


(This page and following) The Bath House: photographs taken during excavation. See also the accompanying report.









*Practical Building Conservation Series:*

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# PRACTICAL BUILDING CONSERVATION



English Heritage Technical Handbook

VOLUME 3

## MORTARS, PLASTERS AND RENDERS

John Ashurst  
Nicola Ashurst

Photographs by Nicola Ashurst  
Graphics by Iain McCaig

Gower Technical Press



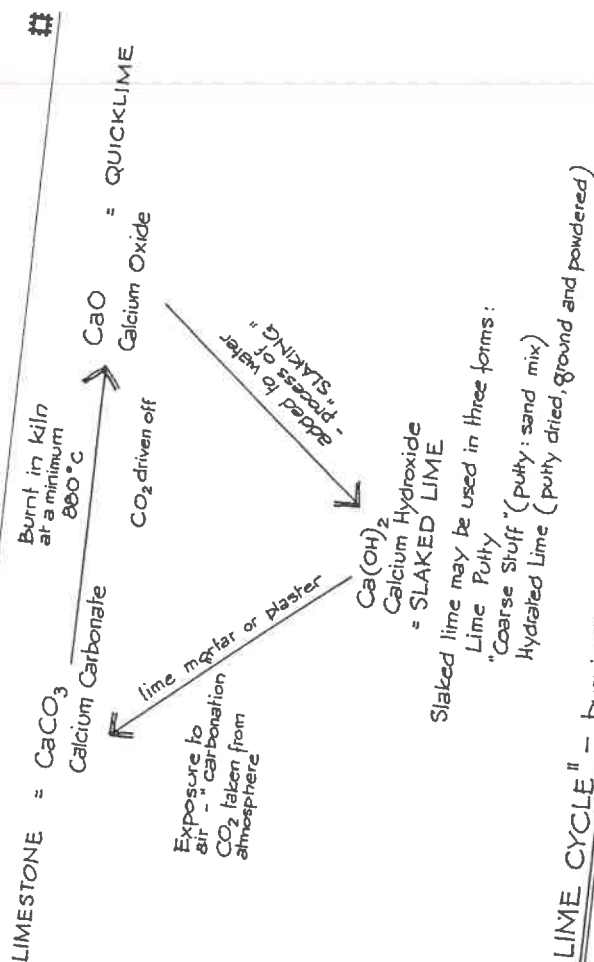


Figure 1.1 The lime cycle

## Slaking

Quicklime (unslaked lime) in lump or ground form can be delivered by a number of suppliers while others allow collection of smaller amounts of lump from their works. For site slaking the lime should be delivered as fresh as possible and kept in dry conditions.

Slaking is the reaction of the quicklime with water. If quicklime is left exposed to the air it will absorb water from it and 'air-slake', or 'wind-slake', the calcined lumps gradually reducing to powder with an increase in volume. On site, slaking usually occurs under water.

During the process of slaking, hydroxides of calcium (and magnesium) are formed by the action of water on the oxides. Traditionally, this process was carried out in pits and the slaked lime was left to mature for several months, or even years. Today slaking on site for repair work is most conveniently carried out in a galvanized steel cold water storage cistern. Clean, potable water is run into the tank to a depth of approximately 300 mm and the quicklime is added by shovel (NB: the water is not added to the quicklime - this is extremely dangerous); because the violent reaction which can occur between water and fresh quicklime frequently raises the water temperature to boiling point, this

## NON-HYDRAULIC LIME

operation must be carried out slowly and carefully. Eyes must be protected by goggles and hands by suitable gloves, and anyone unprotected in this way must be kept away from the slaking tank. The initial slaking process may be carried out more quickly by first breaking the lumps of quicklime down to a large aggregate size and by using hot water in the tank.

The slaking lime must be hoed and raked and stirred until the visible reaction has ceased; enough water must be used to avoid the coagulation of particles which significantly reduces the plasticity of the lime. Experience will dictate the correct amount of water required, which can be adjusted as the process demands; it is always better to have an excess of water than not enough. The addition of water and quicklime continues until the desired quantity has been slaked. Using an excess of water without 'drowning' the lime results in the formation of a soft, rather greasy mass of material, described as *lime putty*.

Sieving the putty through a 5 mm screen will remove unburnt lumps and the larger coagulations. The screened putty should be left under a few centimetres of slaking water. This 'linewater' may be siphoned off for use in limewater consolidation of friable lime plasters and limestone. (See Volume 1, Chapter 8, 'The cleaning and treatment of limestone by the "lime method"'.)

The lime putty, with a shallow covering of water, should be kept for a minimum period of two weeks before use. Two months is a better period if practicable and there is no upper limit of time. The minimum period is to ensure that the entire mass is thoroughly slaked. After this time, plasticity and workability go on increasing. Old lime putty, which is protected from the air in a pit or bin, acquires a rigidity which is rather like that of gelatin. When the rigid mass is worked through and 'knocked up', it becomes workable and plastic again. This property is peculiar to non-hydraulic lime putty. Any material which has a hydraulic set must not be knocked up after it begins to stiffen.

## Slaking lime with sand

A variation on the slaking procedure, which has a long tradition behind it, is to slake the quicklime in a pit, already mixed with the sand which is to be combined as mortar or plaster. The lime needs to be in small lumps so it can be accurately batched by volume against the sand. The process requires time and space and is really only practicable in long programmes of repair or restoration, where it is intended to lay up quantities of lime putty and sand for a long time. The technique has, however, a distinct advantage over more familiar mixing procedures in that this early marriage between binder material and aggregate encourages the covering of all the aggregate particles with a lime paste in a way and to a degree which can never be matched by conventional modern mixing.

## Storing 'coarse stuff'

A recommended procedure is to mix the slaked putty with the sand and other aggregates and to store the constituents together, protected from the air as wet 'coarse stuff' for as long as possible to mature. Again, little or no extra water needs to be added as the lime putty contains sufficient to enable it to be worked back to a plastic state. The coarse stuff is the best possible base for mortar and

lime plaster, whether or not it is to be gauged later with any pozzolanic additives. Storage (not slaking) is best arranged in plastic bins with airtight lids, with an additional covering inside the bin of wet underlay felt, or wet sacks. Another advantage of storing wet coarse stuff is that all the mixing for a large job can be carried out in one or two operations and a consistent mortar or plaster will be available for use as required.

#### The mixing of coarse stuff

Initial mixing of the coarse stuff and final mixing, or knocking up, must be thorough. But mixing, in the familiar sense of turning over with a shovel, was not considered sufficient in ancient times, nor is it sufficient now, if the best possible performance is to be obtained from the lime mortar. The old practice of chopping, beating and ramming the mortar has largely been forgotten. However, recent field work has confirmed that coarse stuff rammed and beaten with a simply made wooden rammer and paddle or a pick handle, interspersed with chopping with a shovel, significantly improves workability and performance. The value of impact is to increase the overall lime-aggregate contact and to remove surplus water by compaction of the mass.

#### Alternative sources of lime putty

Some lime suppliers will supply lime putty in plastic sacks by request. If there is no supply available and site slaking is impossible, use hydrated lime and soak it for a minimum period of twenty-four hours in enough clean water to produce a thick cream. For many ordinary building situations, especially if the lime mortar is to be gauged with cement, this practice is quite satisfactory.

#### Hardening of lime mortar and plaster

When coarse stuff is left exposed to the air, it stiffens and hardens, with a contraction in volume. Lime putty alone undergoes a far greater contraction, and hence is used only to butter very fine joints. Only the minimum amount of water should be added to mature coarse stuff to achieve workability, so that volume changes during drying can be kept to a minimum.

'Carbonation' describes the reaction of the calcium hydroxide with the carbon dioxide in the air, forming calcium carbonate; it is a delicate process dependent on temperature, moisture, the thickness and pore structure of the material with which the mortar or plaster is associated and, of course, the presence of carbon dioxide. There is no chemical 'set' like that of hydraulic limes and cements.

Rapid drying out, which sometimes takes place in hot weather on unprotected work, limits the carbonation process and mortar or plaster in this situation can take little stress and is vulnerable to rain washing. Carbonation should begin while the mortar is still drying out, that is before all drying shrinkage has taken place, and will continue for many years. Soft mortar isolated from the air can remain soft indefinitely.

A chemical indicator is the only sure way of knowing whether carbonation has taken place. In laboratory tests, phenolphthalein can be used for this purpose since it reacts with a sharp red colour to alkaline materials (calcium hydroxide,

slaked lime) and is colourless in a neutral or acid environment (calcium carbonate, carbonated lime).

Drying control is normally effected by making sure the joints or wall surfaces are damp before mortar or plaster is applied and by screening the work against strong draughts or heat. In special circumstances carbonation may be significantly accelerated by periodic wetting of the work. This is most conveniently carried out using a hand spray with a fine nozzle which can create a fine mist (not a jet of water). This process is a refinement which has rather a limited application, but it is simple enough to execute for a day or two after the mortar has been placed. Local conditions will dictate the frequency of wetting, but it may be as often as every hour initially if drying out of the face is likely to be rapid, increasing to three or four hours. Water containing carbon dioxide (soda water) has also been used to good effect for this purpose. An experiment use carbon dioxide to advance carbonation is described in section 9.6 of this volume, 'carbonation experiment', p. 73.

## REFERENCES

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See also the Technical Bibliography, Volume 5.

# 2 HYDRAULIC LIMES AND CEMENTS

## 2.1

### HYDRAULIC SET

Hydraulic mortars harden (set) by chemical reaction with water. No air is needed. Pozzolanic materials produce a hydraulic reaction with slaked lime ( $\text{Ca}(\text{OH})_2$ ) due to their reactive silica ( $\text{SiO}_2$ ) and alumina ( $\text{Al}_2\text{O}_3$ ). Calcium silicate hydrate, a product of this reaction, forms a network of fibrous crystals or gel which is the main cause of hardening of the mortar (hydraulic set).

This chapter deals with hydraulic lime, to which this setting property is inherent, and with natural cements, artificial cements and other additives which can produce a set when added to non-hydraulic lime. These materials are:

- PFA (pulverized fuel ash)
- Finely powdered brick dust
- HTI powder, prepared from refractory bricks ('HTI'-high temperature insulation)
- Hydraulic lime
- White cement
- Masonry cement
- Ordinary Portland cement

(See also Chapter 3, 'Mortar additives'.)

The phenomenon of 'hydraulic set' seems to have been appreciated first in Mediterranean countries under Roman influence, where there was an abundance of natural materials ejected from volcanoes. These were in the form of rocks such as tuff, trachyte and pumice, or deposits of volcanic ash or earth, such as pozzolana, or trass. Large deposits of ash in the region of Pozzuoli near Naples, used from early times with lime for mortar and later, for Roman concrete and described as 'pozzolana' are still used extensively in Italian and other Mediterranean building industries. Materials similar to pozzolana which produce a hydraulic set are usually described as pozzolanic additives. Roman builders used bricks, tiles and pottery crushed to dust and ground iron slag as pozzolanic additives. All such materials contain reactive silicates which, in the presence of water, react with lime.

## #

### HYDRAULIC LIMES AND CEMENTS

Modern practice in Britain makes use of crushed brick dust, HTI powder and PFA of low sulphate content as pozzolanic additives mixed with lime. Yellow brick dust, HTI powder and PFA in the form of light coloured cenospheres (minute glassy bubbles) do not significantly affect the colour of lime mortars, but, of course, red brick dust and grey fuel ash have somewhat limited applications.

While it is still common practice to gauge lime mortar with cement when an initial set is required, other pozzolanic additives are particularly useful where a strong set is not required, as is often the case in the fabric of ancient monuments and historic buildings.

### PFA

PFA is a waste product from power stations. Pulverized coal is blown into combustion in a stream of air and burnt. A high percentage of the resultant ash is in the form of minute separate spheres. Seventy-five per cent of this ash is carried away in flue gases and is extracted as pulverized fuel ash ('fly ash' or 'PFA'). Some PFA will react with lime in the presence of water to form a cement-like material (pozzolanic PFA). Mixed with cement, PFA will react with the lime liberated during hydration. Colour, grading and pozzolanicity vary between power stations producing the ash, and even the same station will produce different ash from time to time. Some of the ash is mixed with cement or lime with various other additives for grouting. When ordering PFA it is as well to specify what the ash is to be used for, and to ensure that a low sulphate ash is supplied. A typical sulphate content (as  $\text{SO}_3$ ) of ordinary ash is 1.2 per cent, but for low sulphate ash the amount can be as low as 0.5 per cent and this is preferable by far.

### HTI powder

Fireclays are used in the production of ceramic products which are required to withstand high temperatures ('refractories') such as furnace and flue linings. Finely ground material of this kind can be obtained which will react with lime to produce hydraulic properties in mortars. HTI ('high temperature insulation') is most conveniently purchased as a fine powder, rather than a coarse granular material which must be crushed on site.

## 2.2

### HYDRAULIC LIMES AND NATURAL CEMENTS

#### Hydraulic limes

The source of hydraulic limes is limestone, but limestone which naturally contains a proportion of clay in addition to calcium and magnesium carbonates. Such limestones will yield 'hydraulic' lime after calcination. Other impurities, such as iron and sulphur, may also be present in these limestones. Kilning procedures are the same as for non-hydraulic lime, but the chemical actions are much more complex during the calcination process. As the temperature reaches 900°C, pozzolanic compounds are formed as decomposition of the carbonates and reaction with clay materials proceeds. Over 1000°C calcium aluminates and silicates are formed and sintering will take place, producing a clinker which is

somewhat inactive until finely ground. Changes in the firing temperature, as well as in the constituents, can produce hydraulic limes of very different characteristics.

Although many famous hydraulic limes were produced in the UK before the last war and the raw material is still plentiful, no significant quantity of hydraulic lime is now made here. Hydraulic limes are imported from France and are in use on many sites.

The French limes available are pale buff, light grey or white. Not all colours are available at all times. They are delivered in sacks as a finely ground powder. The sacks should be delivered sealed and must be kept dry. The lime must be mixed very thoroughly with the selected aggregates and with the minimum amount of water to make the coarse stuff workable, the mixed material being able to take a 'polish' from the back of a shovel. Mixing should take place on a clean boarded platform before any water is added and then again after watering. This coarse stuff must be used within four hours and must not be knocked up after stiffening has taken place. Correct judgement on the quantity required for each working phase is, therefore, important.

#### Natural ('Roman') cements

Natural cements are really eminently hydraulic limes. In the eighteenth century various experiments were taking place mixing different limes with volcanic earths. John Smeaton found that Aberthaw (Glamorgan) lime gave better results than others and concluded that the best limes for mortar were those fired from limestones containing a considerable quantity of clayey matter. In the 1790s, the discovery that a useful, quick-setting hydraulic cement could be made by calcining nodules of argillaceous limestone (septarian nodules) resulted in a patent being taken out in 1794 by James Parker of Northfleet. Similar, brown-coloured natural cements were made from the septaria of Harwich and the Solent ('Sheppey' and 'Medina' cements) and Weymouth, Calderwood, Rugby and Whitby. These cements were characterized by their colour and their quick set, which might be as little as half an hour. They were mixed with sand in a 1:1 proportion, sometimes 1:2 and sometimes, for fine moulded work, almost neat. The name 'Roman cement' seems to have been adopted about 1800 and arose from the distinctive pinky-brown colour and hydraulic properties.

Being a strong, durable material it was welcomed as an external rendering and it is in this form that Roman cement is usually found, lined out in imitation of masonry, sometimes coloured with copperas in lime, sometimes painted, rarely left uncoloured. Unfortunately, it was also used extensively for plastic repairs of masonry and for pointing, roles for which it is too impermeable and too strong, and the removal of Roman cement from medieval masonry, especially architectural detail and carving, is one of the most familiar and taxing jobs for the conservator.

A form of Roman cement was available until the 1960s but is no longer made. Repairs seeking to imitate its colour must be of pigmented cement, or lime or, much better, must be based on a plasticized cement relying on carefully selected red and yellow sands to provide the colour.

## ARTIFICIAL CEMENTS

During the production of artificial cements, the essential ingredients of limestone and clay are combined mechanically.

### Portland cement (OPC)

In 1811, James Frost took out a patent for an artificial cement obtained by lightly calcining ground chalk and clay together, anticipating the principle which later led to the establishment of many similar 'artificial' hydraulic cements, the most famous of which became known as 'Portland', from its supposed appearance and similarity to the limestone of that name. The beginning of the nineteenth century saw much experiment and investigation into these materials, notably by Vicat in France.

The first Portland cement type in this country was patented by Joseph Aspdin of Leeds, whose plant at Wakefield crushed and calcined a 'hard limestone', mixed the lime with clay and ground the mix into a fine slurry with water. The mixture was fired, broken into lumps and fired a second time. As low temperatures were used, the quality of the cement cannot have been high. By 1838, however, Aspdin's son William was producing the cement at Gateshead and at sites along the River Thames. Brunel used it for his Thames Tunnel in spite of the price being twice that of Roman cement, so that it may be assumed that results were satisfactory and perhaps the calcination was taking place at higher temperatures. To Isaac Johnson belongs the credit, however, of observing that overburnt lumps in the old Aspdin kilns at Gateshead, which he had taken over, made a better final product and were slower setting. At Johnson's works at Rochester, the results of his observations were produced as Johnson's cement. Along the Thames and Medway, a number of cement works opened up, making use of the chalk and the Thames mud and firing at a temperature high enough to produce vitrification.

The cements produced by the late 1850s were close to those produced by modern methods, grinding chalk and clay together in a wet mill and firing the screened slurry at temperatures of 1300° to 1500°C (2372°–2732°F). The chalk is converted into quicklime, which unites chemically with the clay to form a clinker of Portland cement. After regrinding and firing, the white hot clinker is allowed to cool and a small amount of gypsum is added to lengthen the setting time.

Objections to the use of hydraulic limes, natural cements and especially Portland cement are based on their high strength, their rather impermeable character and the risk of transferring soluble salts, especially sodium salts, to vulnerable masonry materials.

### Other modern artificial cements

#### White Portland cement

This cement is produced from chalk and china clay and is burnt using oil fuel instead of coal. The strength of white cement is rather less than the strength of

ordinary Portland cement, but as long as that is recognized, this factor is of no importance in the conservation context and may even be an advantage. White cement is useful in gauging white lime mortars and pale mortar repairs and occasionally in rendering, where the colour of OPC would be wrong. The cement should comply with the requirements of BS 12: 1971; it is about twice the cost of OPC.

#### Masonry cement

Masonry cements have the advantage over OPC of greater plasticity and greater water retention. They are based on OPC, but have fine inert fillers and plasticizers incorporated. Their principal use is in rendering, where lime might overpower the colour of natural aggregates, or in sandstone repairs, especially 'plastic repairs' where lime has played a role in the decay of the sandstone. The cement should comply with the requirements of BS 5224.

#### Sulphate-resisting cement

Some situations require the use of a cement which will resist sulphate attack. Some industrial monuments, such as kilns and masonry associated with flue condensates, or sulphate concentration in ground water, are common examples. Sulphate-resisting cement has a reduced tricalcium aluminate content and has good resistance to chemical attack from sulphates. Mixes for mortars and rendering are the same as those based on OPC. Sulphate-resisting cement should comply with the requirements of BS 4027: 1972.

#### High alumina cement (HAC) ('ciment fondue')

This cement is produced by fusing limestone and bauxite together; it is grey-black in colour and has different properties from OPC. Setting is slow (up to 6 hours for the initial set as against 45 minutes for OPC), workability is good and rapid heat evolution, coupled with early strength development at low temperatures, makes cold weather working less hazardous. Resistance to sulphate attack is good, but to caustic alkalis is poor. The use of antifreeze additives, lime and water-proofer should be avoided. Crushed chalk may be added in place of lime.

High alumina cement is sometimes recommended for repairing Roman or Portland cement stuccos, because, it is claimed, such repairs can be painted at an early stage without the use of special primers, unlike repairs based on OPC, which require special alkali-resistant primers and a long period of waiting to avoid alkali attack on paint. However, it should be realized that the early alkalinity of HAC is not likely to be much less than the alkalinity of OPC (HAC ph 12, OPC ph 12-13) so that special primers are still recommended if early painting is necessary.

The distinctive colour of HAC can be useful in matching black ash mortar. HAC should comply with the requirements of BS 915: 1972. HAC is about three times the cost of OPC.

#### Pozzolan cements

Pozzolan cements in this country are principally mixtures of OPC and pulverized fuel ash. The PFA reacts with lime liberated during the hydration of OPC, to give a slow hardening, low heat cement, with good resistance to sulphates.

## THE USE OF HYDRAULIC LIMES AND CEMENTS IN BUILDING CONSERVATION

The frequent misuse of cements and, less commonly, hydraulic lime should not prejudice against their sensible use in historic building repair and maintenance work. Quite small quantities which should always be specified accurately, will protect lime mortar and rendering against failure during frost. But they are by no means needed in many of the situations where they are habitually employed and should positively be excluded in the vicinity of old lime plaster, wall painting or stone sculpture.

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See also the Technical Bibliography, Volume 5.