AN ARCHÆOLOGICAL ASSESSMENT

OF THE

ROMANO-BRITISH IRONWORKS

ON THE

BEAUPORT PARK ESTATE

BATTLE, EAST SUSSEX

Jeremy S. Hodgkinson, M.A.
Reginald G. Houghton, A.R.I.B.A.

33, Burleigh Way
Crawley Down
CRAWLEY
West Sussex
RH10 4UA

CONTENTS

1. INTRODUCTION

1.1 This Assessment was undertaken by the Wealden Iron Research Group, at the request of Messrs. R.H. & R.W. Clutton on behalf of clients.

1.2 The Assessment was carried out between the 5th September and 28th October 1993.

1.3 The assistance of Dr. A.G.Brodribb, Prof. J.Stringer, and of members of the staff of East Sussex County Council Planning Department is gratefully acknowledged.

1.4 The site of the ironworks is a Scheduled Ancient Monument; East Sussex No. 383 (see map). In 1972 a proposal by the Department of the Environment to take the site into guardianship was subsequently withdrawn.

1.5 The site lies within the area covered by British Geological Survey sheet 320, and is identified as lying on the Wadhurst Clay geological formation of the Hastings Beds; this formation is known to contain the richest iron ore seams in the Weald.

1.6 The site is under mixed woodland, with some ornamental trees and areas of bracken. The area around the bath-house has been cleared of trees.

2. SITES AND MONUMENTS RECORD, EAST SUSSEX COUNTY COUNCIL

2.1 The Sites and Monuments Record (S.M.R.), held by East Sussex County Council, was consulted to determine the existence of previously known archæological sites in the area.

2.2 The sites recorded on the S.M.R. are located on the appended map, numbered as follows:

1. Site No. 364; TQ 7867 1445: Romano-British ironworking site. This is the site referred to in the literature noted in section 4 (below), which includes a slag heap, remains of an iron smelting works, bath-house, and occupation debris.

2. Site No. 4818; TQ 786 147: An earthwork, believed to be largely natural but possibly raised in height. Undated.

3. Site No. 4819; TQ 7872 1465: Twenty-five sherds of Romano-British pottery.

4. Site No. 4820; TQ 789 143: Old pit (?); slag and post-mediæval pottery in adjacent topsoil.

5. Site No.4821; TQ 789 140: Ore pits. Undated.

3. AERIAL PHOTOGRAPHIC SURVEY

3.1 Because of the predominating tree cover, aerial surveys of the area disclose no archæological features which are not apparent from the ground.

4. HISTORICAL SURVEY

4.1 The existence of the cinder heaps in Beauport Park was first noted by Rev S.Arnott in 1862, and possibly as a result of this Mr J.Byner, the local Highways' Surveyor, commenced removing the cinder for use on the roads.[1]

4.2 In 1879, James Rock, drew attention to the imminent disappearance of the evidence of early ironworking to which Mr Byner's excavations would lead.[2] Rock noted finds of Roman pottery, including Samian ware, and coins of Hadrian and Trajan, and the substantial mound of "scoriæ" or slag. He reported no evidence of buildings.

4.3 The next published account of the site is that of Ernest Straker, who quoted extensively from Rock's article, and mentioned the investigations carried out by Herbert Blackman in the first quarter of the 20th century (notes of which are in the library of the Sussex Archaeological Society at Lewes).[3]

4.4 A summary of information to date was included by H.F.Cleere in his survey of the Roman iron industry in the Weald.[4] He mentions the fieldwork carried out by A.G.Brodribb and the discovery of the bath-house. He commented on the general correspondence between the dating of pottery and of coins found at the site, indicating a working life for the site of some 140 years, and on the large number of tiles stamped with the "CLBR" of the *Classis Britannica*, the British-based Roman maritime support flotilla which is associated with a number of sites in the area.

4.5 In a further article Cleere has estimated the production for the ironworks at Beauport Park for the period AD100-240 at 30,000 tonnes.[5]

4.6 Cleere has argued elsewhere that iron production at Beauport Park, together with a small number of large contemporary ironworking sites in the same area, would have been greater than the demand within Roman Britain, and that, as the largest iron producing area in the Roman Empire north of Austria (with

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[1] S.Arnott, "Contributions towards a Parochial History of Hollington," *Sussex Archæological Collections*, XXI (1869), 138-58.
[2] J.Rock, "Ancient cinder-heaps in east Sussex," *Sussex Archæological Collections*, XXIX (1879), 167-75.
[3] E.Straker, *Wealden Iron* (London 1931), 330-7.
[4] H.F.Cleere, "The Roman Iron Industry of the Weald and its Connexions with the *Classis Britannica*," *Archæological Journal*, CXXXI (1974), 191-2.
[5] H.F.Cleere, "Some operating parameters for Roman ironworks," *Bulletin of the Institute of Archæology*, XIII (1976), 238.

Beauport Park the largest site in the area), an important export rôle can be assumed.[6]

4.7 During field walking, in 1982-3, along the route prior to the laying of a water pipeline from Mountfield to Hastings, the sites recorded in 2.2 nos. 2-5 (above) were noted.[7]

4.8 The excavation of the bath-house is the subject of a detailed report by Gerald Brodribb and Henry Cleere.[8] This report comprises a history of the site, drawing on the works of Arnott, Rock, Straker and Blackman (above), and recording the steps taken to preserve the remains subsequent to the discovery of the bath-house in 1969; also included is the topography of the site and the surrounding area.

The bath-house, which was excavated from beneath iron slag, comprises ten rooms, and its walls remain in a good state of preservation, showing little sign of intentional demolition. It has been dated to the early-2nd century AD, but is considered to have been abandoned in the mid-3rd century. The excavated remains have been protected, under the supervision of English Heritage, in sand under a wooden-framed and corrugated iron-roofed structure (see *Figs 1 & 2*).

The report includes the description of a structure interpreted as a wooden tank which had previously been lined with lead. Also discussed is the substantial slag heap, much of which may have been removed in the 19th century by Mr Byner. Its area is calculated at 6223m^2.

Finds from the site from the Roman period of occupation, apart from those discovered by earlier investigators and those recovered when the slag-heap was exploited in the nineteenth century, include an important fragment of an inscription, fragments of glass from windows and vessels, portions of five shoes, fifteen coins, and three *intaglii*, including one set in a silver ring. The inscription is thought to have recorded the enlargement of the bath-house under the orders of a *vilicus* or supervisor (see Fig.3).

The conclusions of the report draw attention to the 12.8 tons of brick and tile, and the 1300+ fragments stamped with the "CLBR" of the *Classis Britannica*, found at the site; clear evidence of the fleet's involvement with the ironworks. Fieldwork evidence of probable areas of settlement to the north -east of the slag heap is cited. Coin evidence points to the occupation of the site between the last quarter of the first century AD and the second quarter of the third.

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[6] H.F.Cleere & D.W.Crossley, *The iron industry of the Weald* (1985), 80-4.

[7] G.Jones, "Archæological Observation of the Mountfield to Hastings Water Pumping Main Pipeline, East Sussex," *Sussex Archæological Collections*, CXXIII (1985), 244-5.

[8] G.Brodribb & H.Cleere, "The *Classis Britannica* Bath-house at Beauport Park, East Sussex," *Britannia*, XIX (1988), 217-74.

4.9 A note of a visit to Beauport Park by the Field Section of the Wealden Iron Research Group includes a sketch map of the area of ironworks showing the probable former extent of the slag heap before Mr Byner's excavations, and the result of a resistivity survey of an area of suspected habitation to the north-east of the slag heap.[9]

[9] *Wealden Iron*, second ser. 11 (1991), 2-4.

5. GROUND SURVEY

5.1 Unpublished fieldwork undertaken by Dr A.G.Brodribb over the last twenty-eight years is the best source of information on the area immediately adjacent to the visible remains of the iron-smelting site.

5.2 Features observed during fieldwork are recorded on the appended map, and numbered as follows:

6. Site of a former quarry; possibly a source of the stone used to construct the bath-house

7. Scatter of Romano-British tile fragments.

8. Sites of iron smelting furnaces, destroyed during construction of the golf course.

9. Scatter of Romano-British tile and pottery fragments.

10. Scatter of Romano-British tile fragments, including *tegula*.

11. Scatter of Romano-British tile fragments.

12. Well; origin and date unknown.

13. Slag-metalled track lying in an approximate ENE-WSW direction, exposed by a fallen tree in 1987.

14. Area of metalled trackways and surfaces suggestive of paths and accessways between buildings; associated Romano-British pottery. The main track (located between TQ 78701458 and TQ 78691461) appears to turn from a SSE-NNW to a WSW-ENE direction and, Dr Brodribb suggests, may have provided access to a water transport facility to the NE, along the stream which flows away from the site towards the River Brede north of Westfield. An area of metalled surfacing is centred on TQ 78781460.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 The ironworking site at Beauport Park was probably the largest such site in Roman Britain. The limited excavation undertaken so far has revealed a bath-house in a very good state of preservation. Given the estimated output of the site, the area necessary for the accommodation of personnel and for ancillary uses must be presumed to extend well beyond the excavated area.

6.2 The distribution of the locations both of artefact finds and of other indications of activity believed to be contemporary with the ironworks suggests that the area of archæological sensitivity is greater than that Scheduled as an Ancient Monument.

6.3 The following areas are suggested as appropriate for further investigation, either by geophysical survey or by trial trenching, to enable the approximate bounds of the ironworking site to be better defined:

6.3.1 An area centred on TQ 78851452, adjacent to no. 11 on the attached map, where there have been finds of tile, should be further explored to establish whether the tile is evidence of a structure.

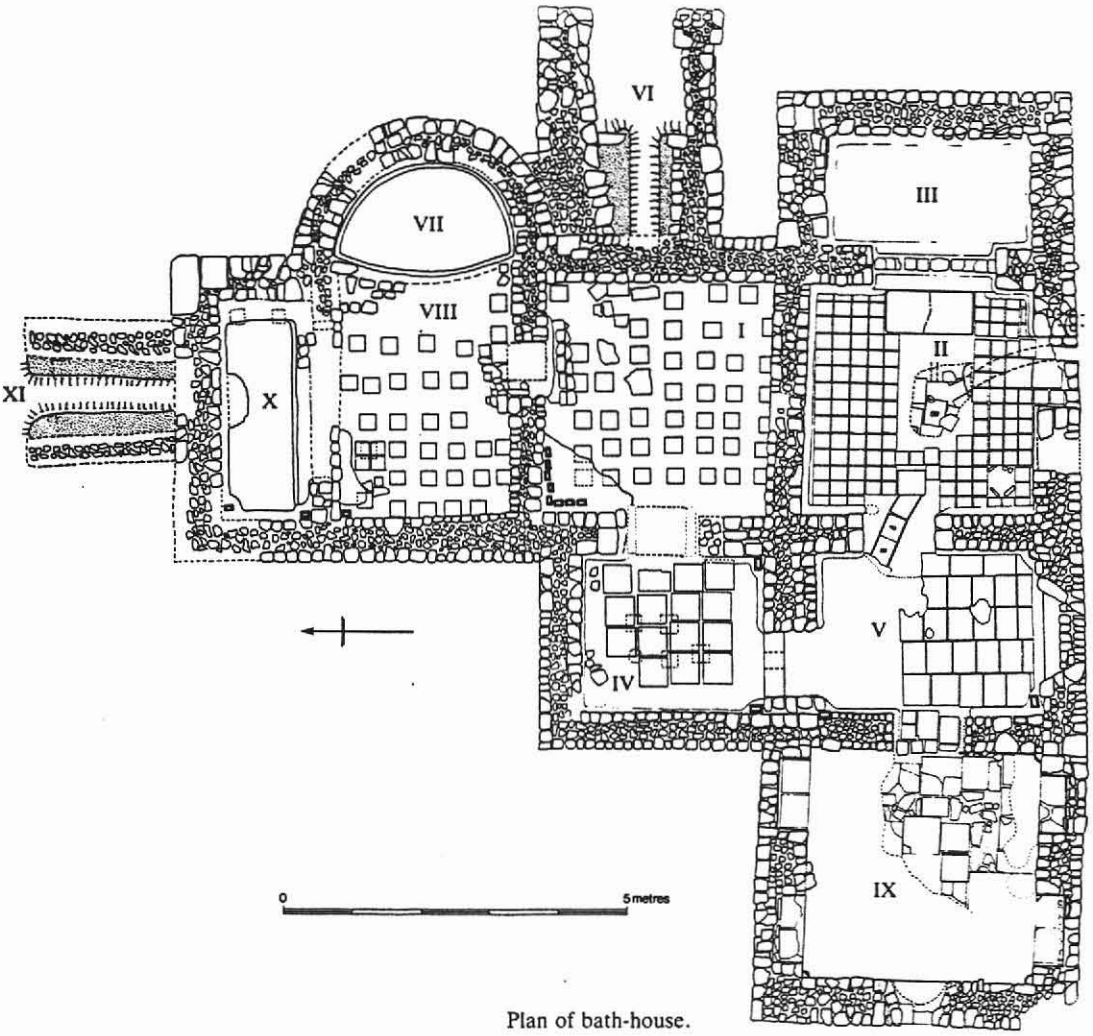
6.3.2 An area centred on TQ 78751465, NE of no. 3 on the attached map, should be further explored to investigate whether the trackways suggested by previous fieldwork extend further to the NE.

6.3.3 The area numbered 9 on the attached map should be further investigated to establish whether the tile and pottery found there is evidence of a structure.

6.4 Results from the exploratory work suggested in 6.3 may itself suggest further work.

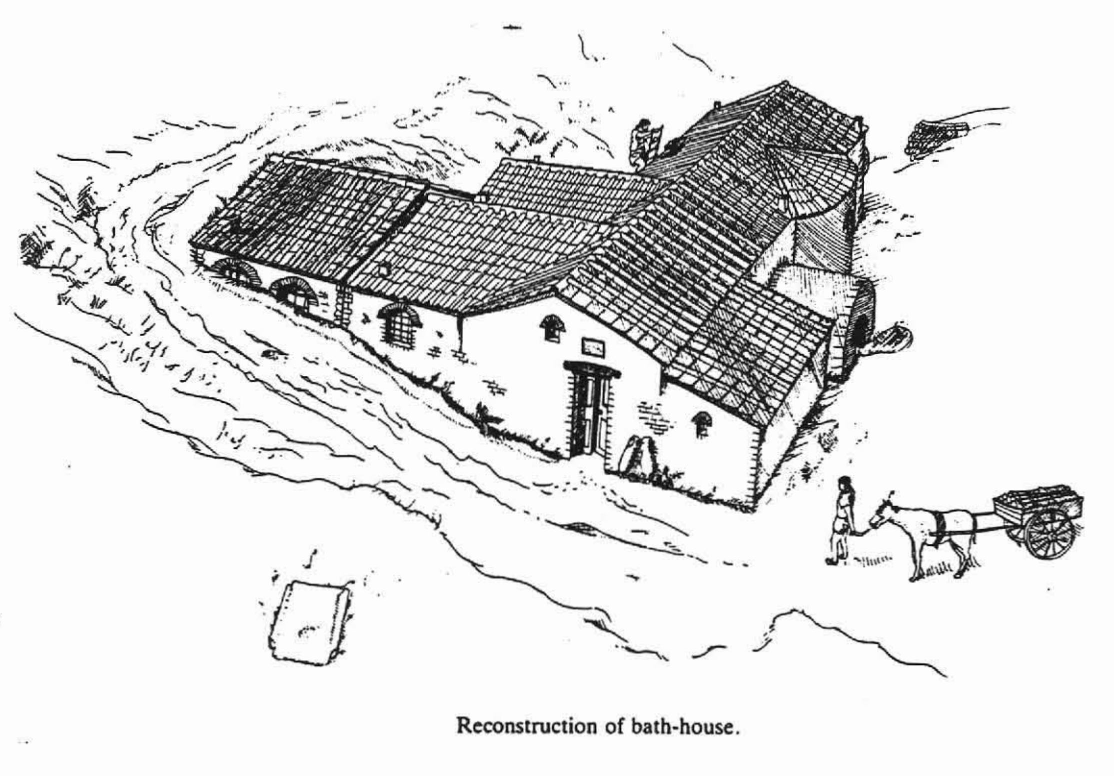
6.5 It is recommended that the area bounded by the red line on the attached map be initially considered as archæologically sensitive. It is recognised that part of this area, to the south and west of the bath-house, lies outside the boundaries of the Beauport Park Estate.

1.



Plan of bath-house.

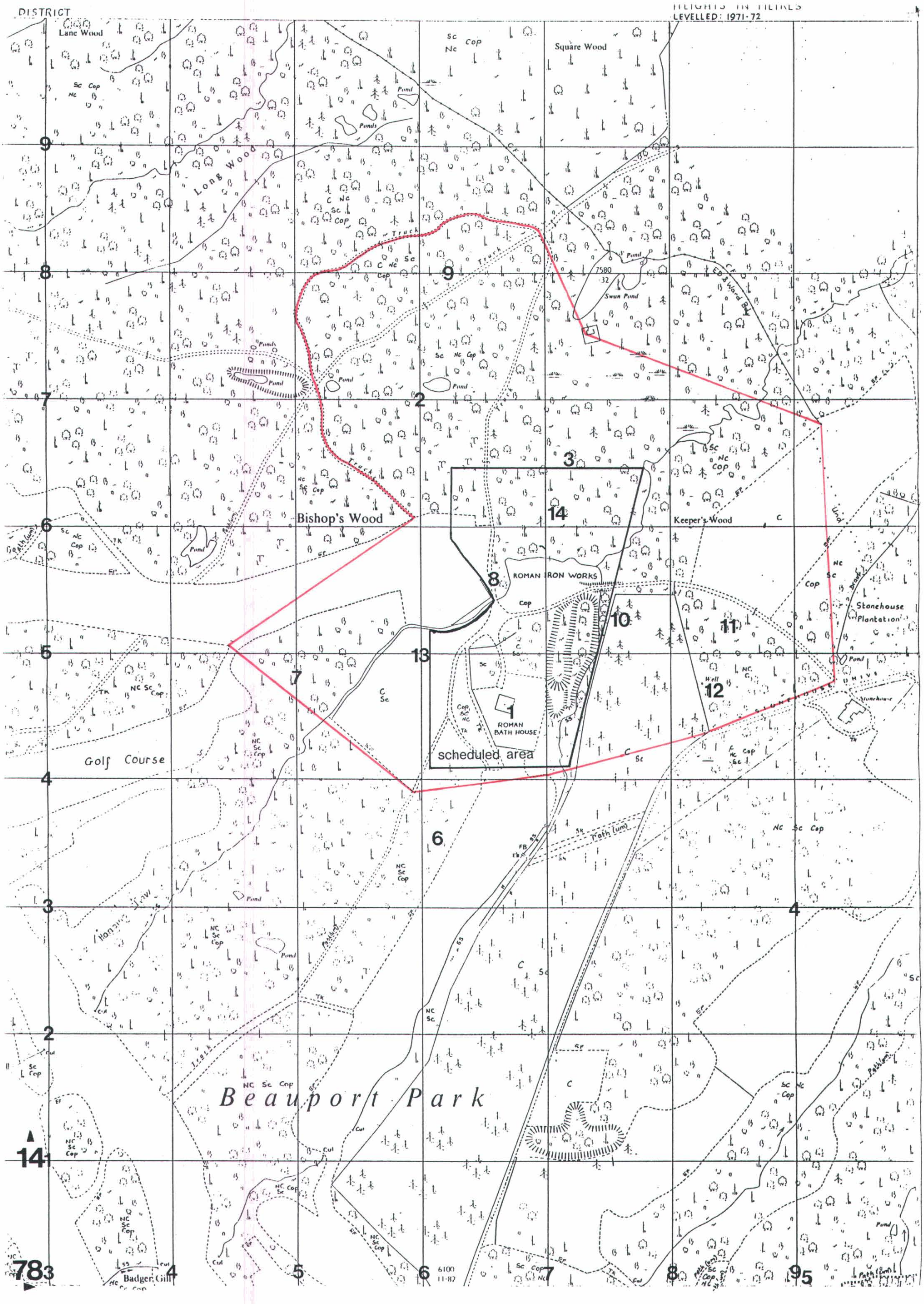
2.

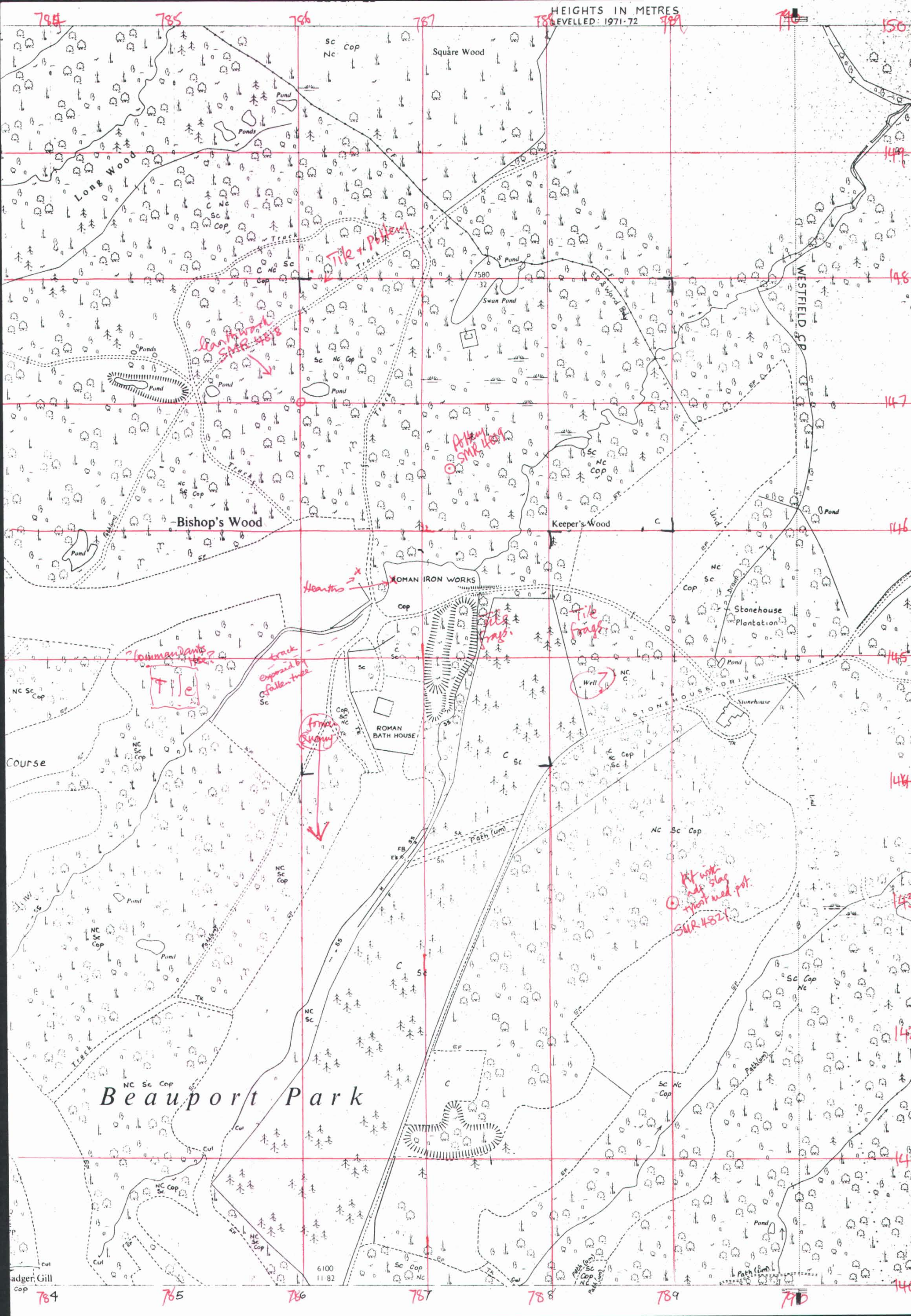


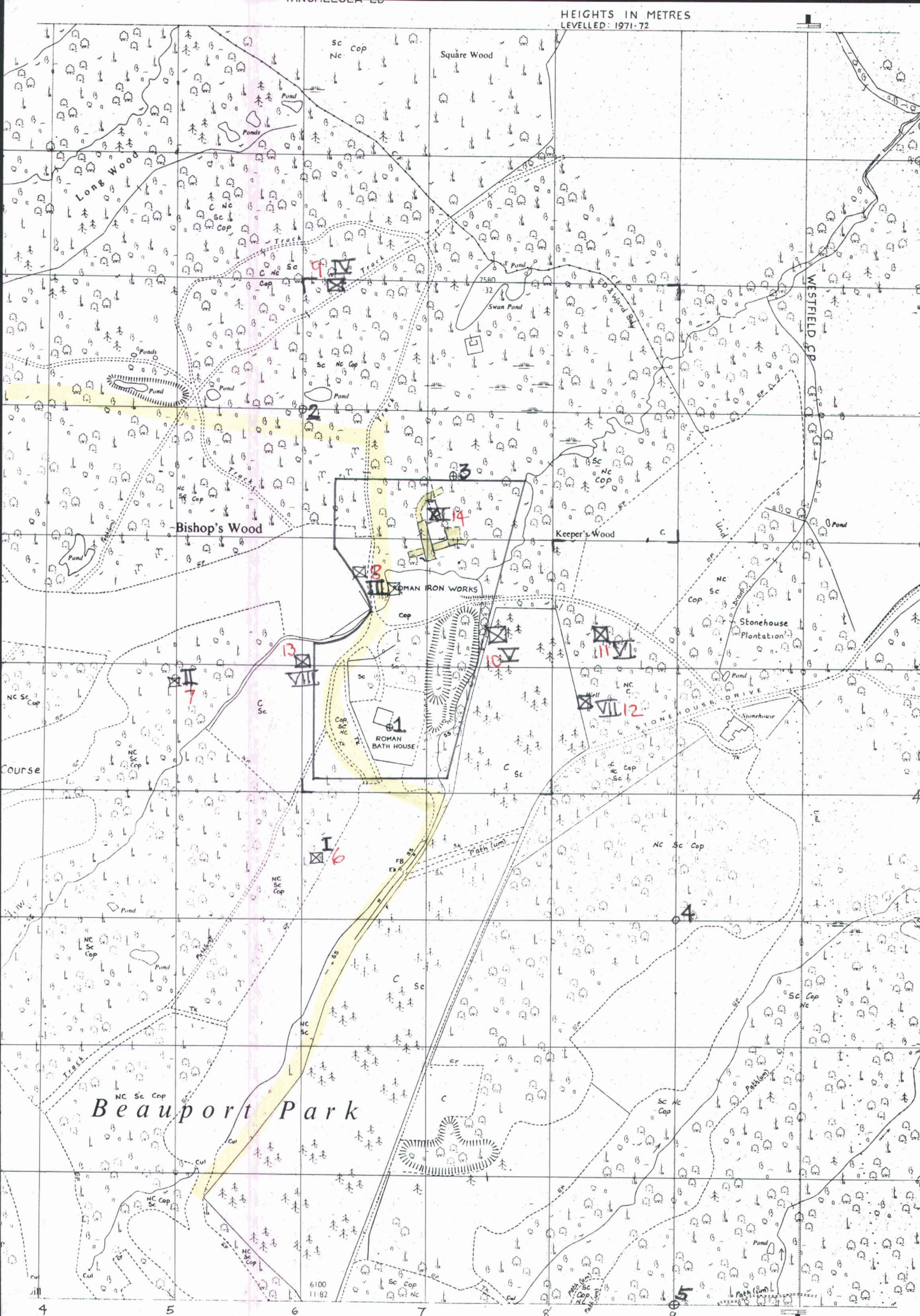
Reconstruction of bath-house.

3.

Inscription.


DISTRICT
LEVELLED: 1971-72
Lane Wood
Square Wood
Long Wood
Swan Pond
Bishop's Wood
Keeper's Wood
ROMAN IRON WORKS
Stonehouse Plantation
ROMAN BATH HOUSE
scheduled area
Golf Course
Beauport Park
Stonehouse
Badger Gill
1
2
3
6
7
8
9
10
11
12
13
14
6100
11-82
78
14


HEIGHTS IN METRES
LEVELLED: 1971-72
Square Wood
Long Wood
Pond
Ponds
Track
Tile + Pottery
Swan Pond
WESTFIELD CP
Bishop's Wood
Keeper's Wood
ROMAN IRON WORKS
Hearths
ROMAN BATH HOUSE
Stonehouse Plantation
STONEHOUSE DRIVE
Stonehouse
Well
Tile frags
Course
Path (um)
SMR 4821
Beaupo rt Park
Badger Gill
6100
11·82
784
785
786
787
788
789
790


HEIGHTS IN METRES
LEVELLED: 1971-72
Square Wood
Long Wood
Ponds
Pond
Track
Tracks
Swan Pond
7580
32
WESTFIELD CP
Bishop's Wood
Keeper's Wood
ROMAN IRON WORKS
ROMAN BATH HOUSE
Stonehouse Plantation
STONEHOUSE DRIVE
Stonehouse
Course
Path (um)
Beauport Park
6100
11·82
1
2
3
4
5
I
II
III
IV
V
VI
VII
VIII
IX
X
XI
6
7
8
9
10
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14
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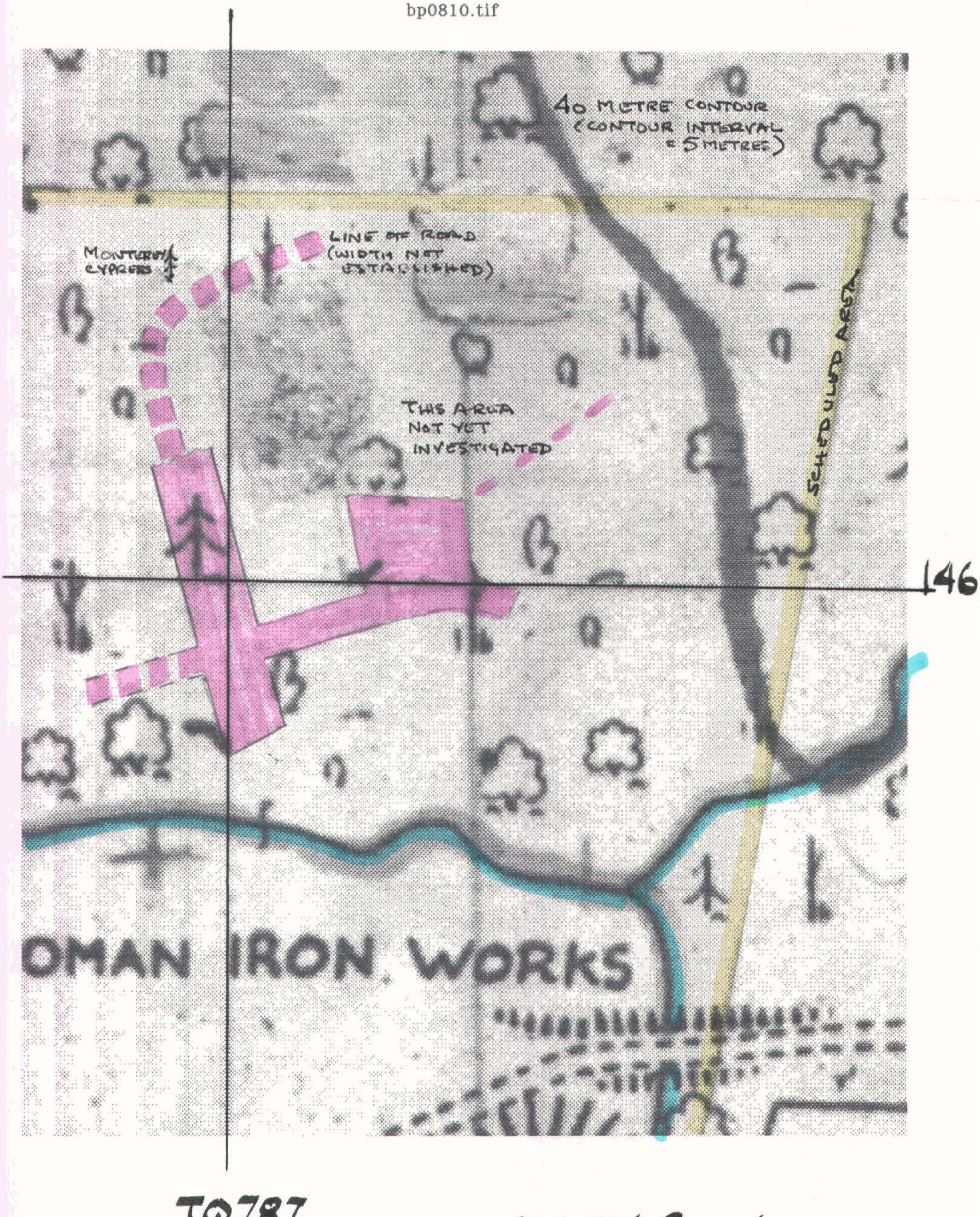
9

78..

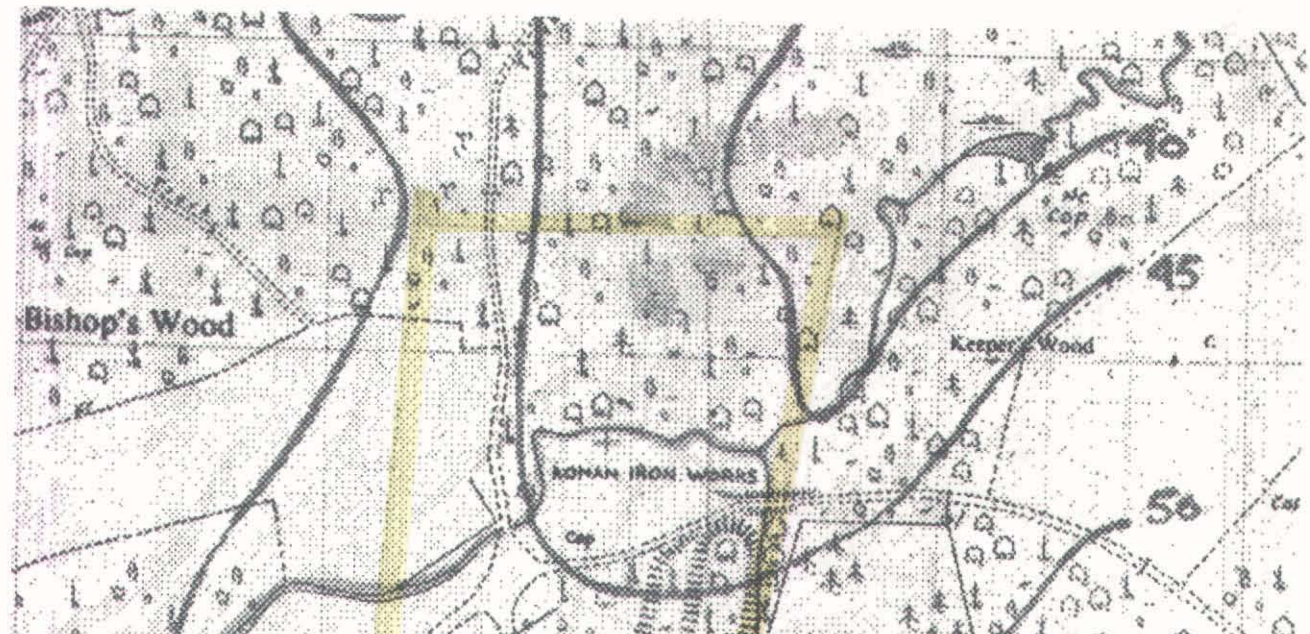
'HABITATION AREA' - PAVED ROADS & AREAS

bp0810.tif

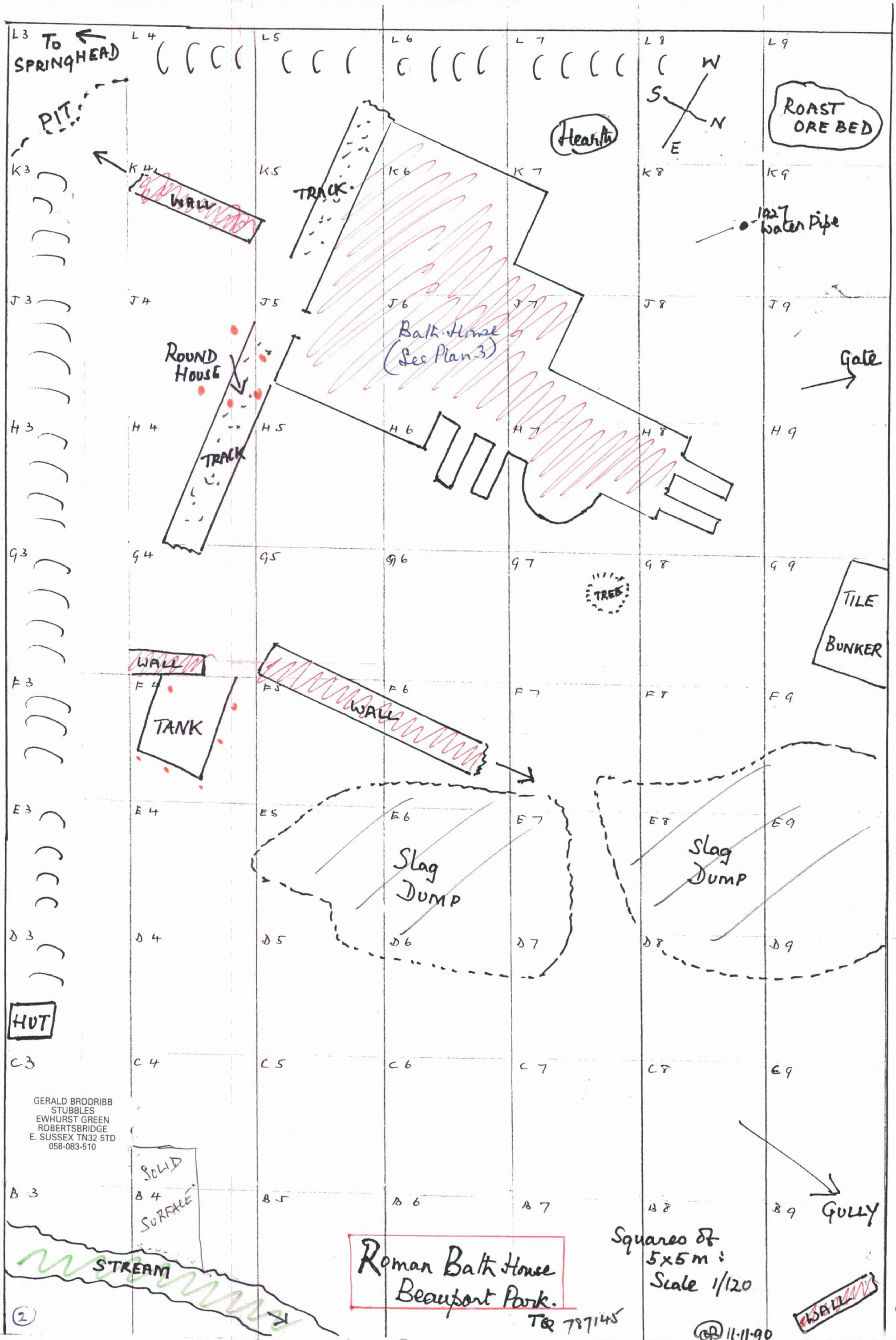


SCALE 1:500 (1cm = 5 metres)

bp0710.tif



Bishop's Wood
Keepers Wood
ROMAN IRON WORKS
ROMAN BATH HOUSE
40
45
50
55
60
65
70



TO SPRINGHEAD
PIT
ROAST ORE BED
Hearth
W
S
N
E
WALL
TRACK
1927 Water Pipe
Bath House (See Plan 3)
ROUND HOUSE
Gate
TRACK
TREE
TILE BUNKER
WALL
TANK
WALL
Slag Dump
Slag Dump
HUT
GERALD BRODRIBB
STUBBLES
EWHURST GREEN
ROBERTSBRIDGE
E. SUSSEX TN32 5TD
058-083-510
SOLID SURFACE
GULLY
STREAM
Roman Bath House Beauport Park.
Squares of 5x5m: Scale 1/120
TQ 787145
WALL
GB 11.11.90
2
9

JOHN STRINGER

Staplecross (0580) 830419

WELL HOUSE
EWHURST GREEN
ROBERTSBRIDGE
EAST SUSSEX TN32 5TD

9 October 1993

Jeremy Hodgkinson Esq.
33 Burleigh Way
Crawley Down,
CRAWLEY
West Sussex RH10 4UA

Dear Jeremy,

Beauport Park Archaeological Trust

I hope your return journey on Wednesday evening was a great deal better than your miserable experience in getting here.

Gerald and I yesterday made some further measurements on the ground in order to establish the position of the network of roads in relation to the 1:2500 map. There is some discrepancy, we found, between the course of the stream as shown on the map and what now exists on the ground, so I have made the best estimate I can, using the junction of the two streams as reference point. This has caused me to revise the Northing from that used in the map in the prospectus document.

I have plotted the roads and paved areas on a 1:500 blow-up from the 1:2500 map, and enclose two copies. I am also enclosing two copies at 1:2500 scale on which I have added contours traced from a blow-up of the 1:25000 map.

I hope you will find these useful, but please let me know if you need further copies, or anything else which I can get by the scanning and re-scaling process.

With best regards,

Yours sincerely,

RH & RW CLUTTON

T.M.M. RAIKES, F.R.I.C.S.
C.J. SCHOOLING, F.R.I.C.S.
T.J.B. HUTCHINGS, F.R.I.C.S.
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Our Ref: TMMR/VAH/49

R. G. Houghton, Esq.,
17 Woodlands Close,
Crawley Down,
Crawley,
W. Sussex.

2 July 1993

Dear Reg,

BEAUPORT PARK ESTATE - ROMANO BATH WORKS

As you know from our previous discussions, it is our client's intention to look towards the opening of the Romano British Bath House to the public, as part of larger development proposals.

As part of any planning application for the above, we are going to need to arrange for an archaeological field evaluation.

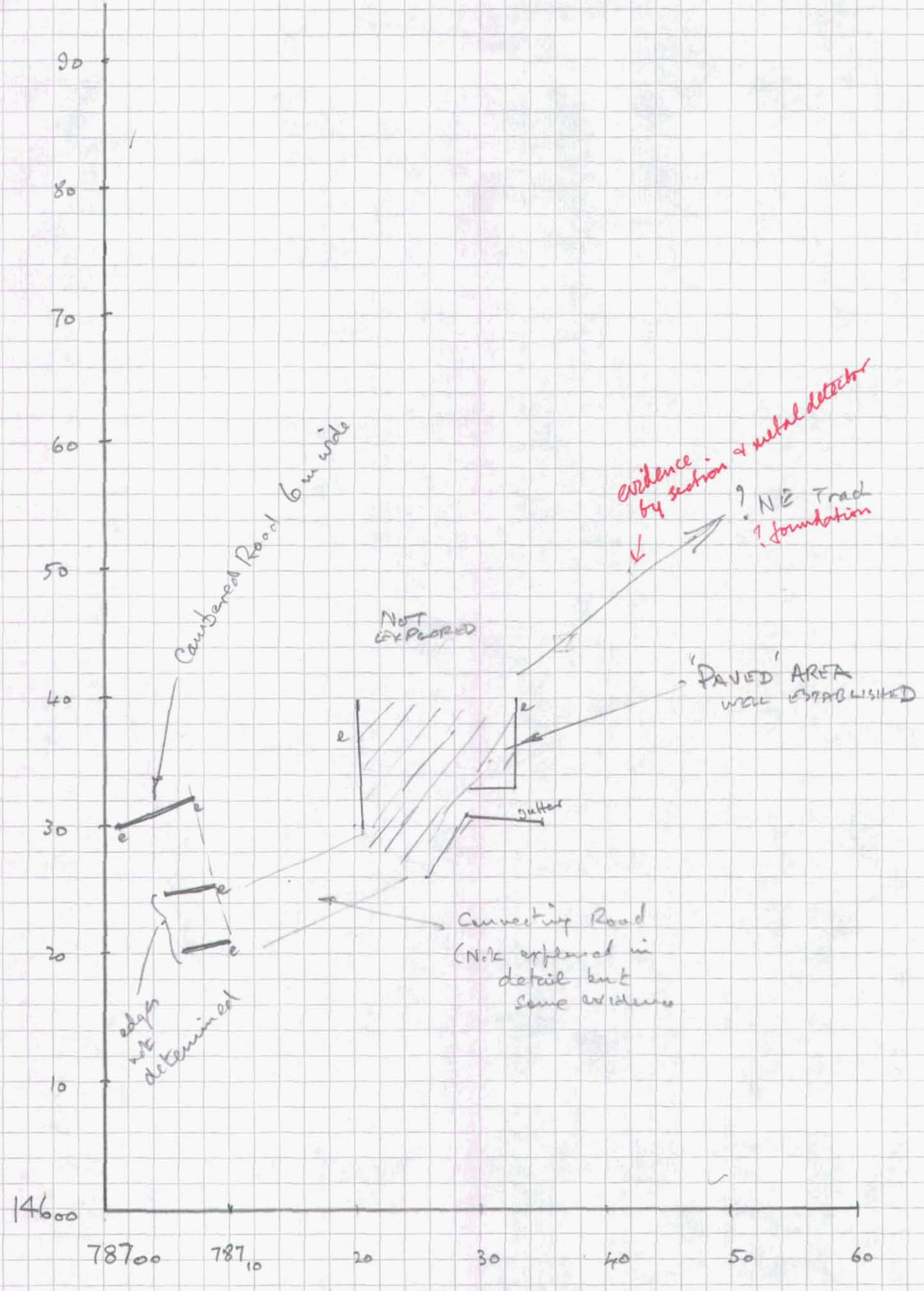
I understand that the above evaluation is quite distinct from a full archaeological excavation. The purpose of the evaluation is to define the character and extent of any archaeological remains that may survive and thus indicate the weight which ought to be attached to their preservation. I believe that it also provides information which is useful for identifying potential options for minimising or avoiding damage to any archaeological remains that survive. With all this information, the planning authority can take an informed and reasonable planning decision.

The purpose of this letter is to find out whether your Society would be able and interested in carrying out the evaluation required and if so, on what basis.

I shall look forward to hearing from you on this in due course.

Yours sincerely,

Richard Atkins



Cambered Road 6m wide
evidence by section & metal detector
? NE Track
? foundation
NOT EXPLORED
'PAVED' AREA
WELL ESTABLISHED
gutter
Connecting Road
(Not explored in detail but some evidence
edges not determined
90
80
70
60
50
40
30
20
10
14600
78700
78710
20
30
40
50
60

DRAFT

Prospectus

for the proposed

Beauport Park Archaeological Trust

to be formed with the objects of conserving and making available for public access, education, and archaeological investigation, the important

Roman Iron-working Site at Beauport Park, near Battle, East Sussex

August 1993

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Contents

Introductory Summary

a couple of paragraphs, making clear the purpose and circulation of the document

The Roman Ironworks at Beauport Park -

Background

When Julius Caesar made his official report on his two brief and unsatisfactory invasions of Britain in BC 55 and 54, he reported that iron was being produced in small quantities near the South East coast. When a more successful invasion was made on Britain a hundred years later, Roman prospectors set about developing to its full potential the iron-working already being semi-practised by the natives. The most promising area was that near Battle and Sedlescombe in East Sussex, as proved later by the discovery there of huge mounds made of slag, the residue left behind after the iron had been extracted: because of the relatively primitive nature of the iron-working process in use at that time much iron still remained in the slag. The extraction of the iron was a simple process: a mixture of ore and charcoal was heated by bellows in a small clay furnace until, at a temperature of about 1200 degrees, the iron collected in a spongy mass and the slag could flow out of the furnace in a thick treacle-like form.

An immense slag heap was found in the early 1860s at Beauport Park near Battle, a very extensive wild and wooded estate that once formed part of the primeval forest; it still remains one of the least cultivated areas in the whole of the south-east of England. The Roman site covers some 8-10 ha, and though soon after its discovery the slag heap was mostly removed for road-making after some ten years' digging, it is estimated that the heap once had a volume of 30,000 cubic metres, with a weight of 100,000 tonnes, representing a production of some 30,000 tonnes of iron. These figures well exceed those of any other known Roman iron site in Britain, and there is every reason to believe that the site at Beauport Park was the headquarters of the whole complex, which inlcuded other large sites at Footlands, Crowhurst Park, Oaklands Park and several other smaller satellites. Iron-working in this area was steadily developed to its height at between 80 AD and 250 AD, and the iron it produced must have supplied much of the requirements of Britain, and probably other provinces of the Roman empire in north-west Europe in tools, implements, weapons, nails, fittings and other items. The production at the Beauport Park ironworks was exceeded elsewhere in the Roman empire only by establishments in Etruria, south-western Gaul, and Noricum (Austria).

Evidence from Beauport Park and other neighbouring sites shows that, though the whole undertaking probably formed part of an Imperial estate, administered by officials of the emperor, the actual direction was under the officers of the Romano-British fleet (The Classis Britannica), and over 1,600 complete or partial tiles found at Beauport Park carry the stamp 'C L ...B R', with the purpose of a modern Royal Navy or 'broad arrow' authority marking.

The transport of the iron from the sites was by means of roads metalled with iron slag to the nearest river harbour, though small water courses, now no more than streams, may have been used. From Beauport Park, for example, there would have been a short journey by water to join the nearby Roman road that leads to the presumed harbour at Sedlescombe. The fleet, largely freed from campaigning duties, would have acted as a supply and transport service.

The Bathhouse

discovery in 1970 by GB; uniquely high walls preserved by landslide; documented in Britanica; biggest find so far and evidence of size and importance of the complex

Significance and Extent of the Site

refer to and explain map

The importance of the site at Beauport Park is very considerable. Its outstanding feature is the bathhouse built for the naval personnel with at least 60% of the walls standing up to a height of over 2m. The size of the slag heap establishes it as a major site, and some of that heap remains still to be investigated. Further excavation of the settlement area, in which several Roman tracks have been noted, could reveal the lay-out of a whole village, including occupation relics and a cemetery. Somewhere not far away there must be the Commandant's house, a manager's office, and barracks for the personnel. The present stream could be shown by excavation to have once been navigable, and its loading bays discovered. All these vital items remain undisturbed ready for future discovery.

Such exciting and valuable excavation could continue for may years, steadily revealing the whole complex with its workings and living quarters. The whole area, which has hardly been touched since Roman times, could turn into a unique open display of a Roman settlement unparallelled anywhere else in Britain.

The scheduled area

shown on the appended map; any exploration or development requires consent; needs a body to look after it; does not cover significant parts of the complex

Adjacent areas

shown on the appended map; based on surface evidence and reasonable surmise as to the facilities the iron works would have required; future significant discoveries would affect any new developments in the park; therefore extent of site needs to be assessed

Need for public access and interpretation

The potential of the site at Beauport Park is enormous, and it could easily become one of the most visited Roman sites in the whole country.

for public information/education, interpretive material is needed, relating Beauport to other sites (Sedlescombe etc); to the history of the Roman occupation; to iron-working in the Weald beforehand and up to the Industrial Revolution. Questions of the buildings, access tracks and facilities for visitors.

Development of Beauport Park

Park is private but has been undisturbed for centuries; present or future owner may wish to develop; this would be constrained by the existence of the ironworks site; on the other hand, mutually beneficial developments are possible.

The Proposed Trust

Objects

Organisation

There is a **Society** (to be called The Beauport Park Archaeological Trust) with the objects set out in section 2. Membership of the society is open to anyone interested, subject to payment of an annual subscription.

Management of the Society is in the hands of a **Committee** of 14 members, seven to be elected annually by the Society's membership to serve for one year and seven to be representatives nominated by local government and relevant learned bodies (see the second schedule) who serve for four years.

The Committee has power (indeed a duty) to appoint one or more **Trustees** whose function is to hold any money and ensure that it is only used for legitimate purposes and in accordance with the society's powers as properly exercised by the committee. Trustees hold office indefinitely (i.e. so long as they are willing to serve). They are separate from the committee although as individuals they might happen to be committee members from time to time.

Future Developments

Conservation and security
Bathhouse building
Physical access
Arrangements for public access
Museum
Archaeological exploration

Next Steps

Appendices

Plan of the site
Constitution of the Trust

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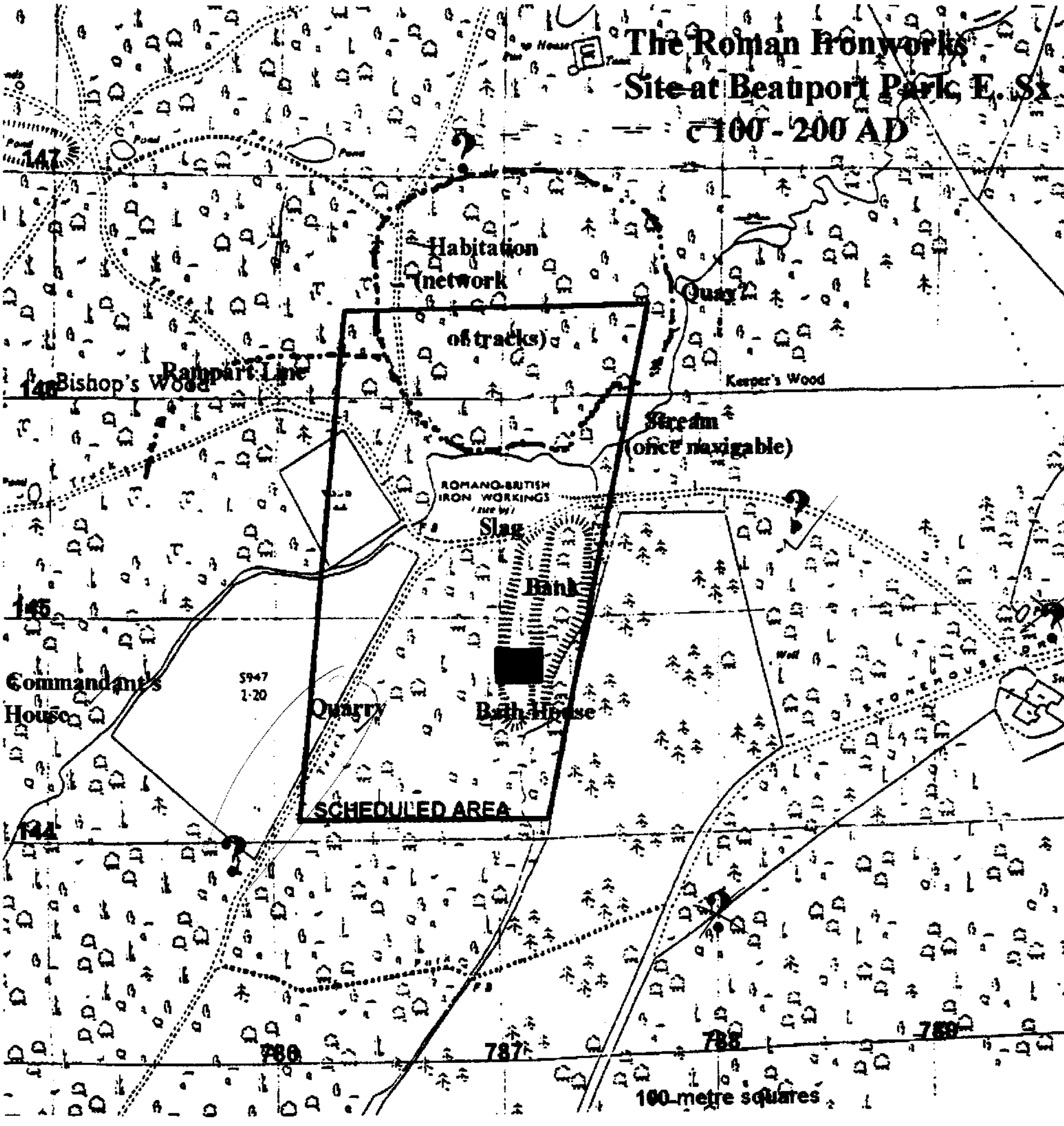


The Roman Ironworks
Site at Beatport Park, E. Sx
c 100 - 200 AD
Habitation
(network
of tracks)
Quay?
Rampart Line
Bishop's Wood
Keeper's Wood
Stream
(once navigable)
ROMANO-BRITISH
IRON WORKINGS
Slag
Bank
Commandant's
House
Quarry
Bath House
SCHEDULED AREA
147
146
145
144
786
787
788
789
100 metre squares

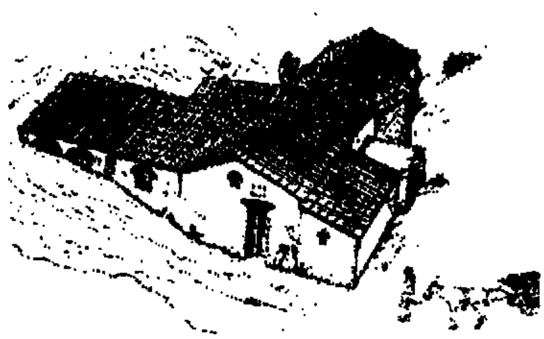
Beauport Park Archaeological Trust

The Romano-British iron works in Beauport Park, East Sussex, with its remarkably complete bath house building, is widely considered to be of great significance and interest, but it has not been readily accessible. This leaflet gives preliminary information about a Trust which it is hoped to form in order to preserve the site and to open it for public viewing.

The Roman Ironworks

Around 50AD the Romans began exploiting the iron making process which, a century earlier, Julius Caesar had found the natives to be using, on a small scale, near the South East coast. The process was simple: a mixture of ore and charcoal was heated by bellows in a small clay furnace until, at about 1200°C, iron collected in a spongy mass and the slag flowed out of the furnace like a thick treacle.

An immense heap of slag was found in the early 1860s at Beauport Park, an extensive wooded estate, which still remains one of the least cultivated areas in the south-east. Much of the slag was used for road-making but the estimated size of the heap indicates production of some 30,000 tonnes of iron, much more than any other known Roman iron site in Britain.



There is good reason to believe that the site at Beauport Park was the headquarters of a complex of sites in the area which, between 80 AD and 250 AD, must have met the needs of Britain, and probably provinces in north-west Europe too, for iron for tools, weapons, nails, and other items. Production at Beauport Park was exceeded only at Etruria, in Gaul, and Noricum (Austria).

Direction of the iron works was under officers of the Romano-British fleet (The *Classis Britannica*), and over 1,600 complete or partial tiles found at Beauport Park carry the stamp 'C L...B R'. The fleet, largely freed from campaigning duties, would have acted as a supply and transport service.

The Bath House

An outstanding feature is the bath house, built for the naval personnel, which lay hidden under a landslide from soon after its abandonment by the Romans until 1970 when Dr Gerald Brodribb discovered it. At least 60% of the walls are still standing up to a height of over 2m, making the bath house one of the best. preserved buildings of its kind in Britain.

An Important Site

The presence of the bath house and the size of the slag heap establish Beauport Park as an important centre in Roman times and there is clearly much waiting for archaeological investigation. Apart from the bath house excavation in recent years and removal of slag in the last century, the area has hardly been touched since the Romans left it.

From the educational and public interest points of view, there is scope for creating a unique open display of a Roman settlement. Sensitively developed, with interpretation provided in an imaginative manner, it could attract many visitors.

But that is for the future. The Roman site is situated in the middle of a large private estate, 1km from public roads, and a great deal will have to be done, in legal and administrative terms as well as physically, before it can be opened up for public access.

Visits to the site will have to be carefully controlled until such time as the present temporary cover over the bath house can be replaced by a permanent building.

The Proposed Trust

The first object of the charitable Trust which it is hoped to establish, will be to ensure that the site is protected and properly cared for. It will look after artifacts found on the site, and arrange for them to be displayed in a permanent museum and, as conditions permit, will conduct tours of the site for members of the public.

It will also be responsible for supervising archaeological excavations; for providing access for research, and seeing that the findings are published.

To make all these things possible, the Trust will need to be able raise funds and to work in collaboration with other bodies and agencies.

Management will be in the hands of a Committee, partly elected by the Trust's ordinary membership and partly representing the owners of Beauport Park, local government, and relevant learned bodies.

In accordance with the Charities Acts, the committee members will act as trustees.

The Trust's Work

It will be for the Trust, once it is established, to decide what is to be done, but the following notes show that there is plenty of scope.

As already mentioned, access must be limited until a permanent building can be erected over the bath house. This will present a considerable architectural challenge, not to mention a financial one, if it is to provide for security and display without detracting from the character of the ironworks complex to which the bath house itself is, in a sense, incidental.

A museum will be needed, to house the finds at the site and provide interpretation. There will be opportunities for providing interpretive and educational material about the production of iron; the role of iron in the military and civil economy of the Roman period; and the relationship of Beauport to other iron-working sites in the area. It would be interesting to show the importance of iron to the history, economy and landscape of the Weald.

The way of life of the *Classis Britannica* personnel, and that of the workmen, in a place so distant from other Roman settlements will be of interest to visitors. In time there should be further discoveries which will increase our understanding of the community at Beauport and how it functioned.

Provision will have to be made for further archaeological research. Some of the slag heap, and the iron working associated with it, remain to be investigated. Further excavation of the settlement area, in which Roman tracks have been noted, could reveal the lay-out of a village, including occupation relics and a cemetery. Not far away there must be the Commandant's house, a manager's office, and a barracks. There is work to be done on the means of transport of blooms of iron from the site.

Trust Membership

Membership of the Trust will be open to anyone interested, on payment of a modest annual subscription.

There will be many ways in which members can support the work of the Trust, for example in fund-raising; organising site visits; assisting with administration; site maintenance; preparing displays for exhibition; and research.

Members will also have priority in the necessarily limited number of places available on visits to the site in the early years.

Until the legalities of setting up the Trust are completed it will not, of course, be posible to enrol members, but if you are interested in supporting the Trust's work, we would like to hear from you now. We can then keep you informed of developments. It will also help us to get a measure of the support that will be available, and thus help us to plan.

Let us have a letter, or a 'phone call, giving your name, address and telephone number. If you would like to play an active part, then please also mention any special experience, professional skills etc. you could offer, or other ways in which you feel you could help.

Write to:

Professor John Stringer, Well House, Ewhurst Green, East Sussex TN32 5TD

or ring:

Staplecross (0580) 830419

September 1993

JOHN STRINGER

Staplecross (0580) 830419

WELL HOUSE
EWHURST GREEN
ROBERTSBRIDGE
EAST SUSSEX TN32 5TD

8 September 1993

Jeremy Hodgkinson Esq.
33 Burleigh Way
Crawley Down,
CRAWLEY
West Sussex RH10 4UA

Dear Jeremy,

Beauport Park Archaeological Trust

Gerald Brodribb has shown me your letter of 24 August, for which many thanks. I have been unable to reply until now because my printer broke down, but it has now been fixed.

I entirely agree that it would be wasteful to make it obligatory to have professionally prepared accounts, where the Charities Commission's rules do not require it, and will amend the draft accordingly. We would, of course, be able to take professional advice about the accounting system should the finances get at all complicated.

Regarding your point about the two kinds of Committee members appearing to have different powers, I am sure there is no intention that this should be the case in general, but a problem does arise about amendments to the Constitution. It would, as you say, be the normal thing for these to be decided by resolution at a General Meeting, often requiring more than a simple majority. In this case, however, a General Meeting only gives expression to the interests of ordinary members of the Trust, whom the First Schedule members represent. It was, as I see it, to provide a proper balance with the interests of the Local Authorities and Societies represented in the Second Schedule that a *requirement* for their specific agreement to constitutional changes was written in. As drafted, however, it does seem to give a power of veto to each of the Second Schedule members, which could lead to an awkward situation at some stage.

Perhaps what we should be looking for is a procedure under which any necessary constitutional changes are worked out by the Committee as a whole, *with no distinction between kinds* of members, and subsequently ratified by sufficient majorities of General Meeting on the one hand and of the bodies represented in the Second Schedule on the other. I don't at the moment see what the proper wording would have to be to produce this effect, but we will keep it in mind when finalising the document with the legal people.

Things are moving along, even if it is a case of 'make haste slowly'. I gather that Cluttons have cleared up the semantics and have now asked you to go ahead with the 'assessment', and we have a meeting fixed with them. Henry Cleere has agreed to be on the Committee and we are now looking for suitable people to fill the remaining couple of places. I look forward to your formal confirmation of WIRG's involvement.

With best regards,

Yours sincerely,

cc: GB

33, Burleigh Way,
Crawley Down,
CRAWLEY,
Sussex,
RH10 4UA.
0342 713544

Dr Gerald Brodribb,
"Stubbles,"
Ewhurst Green,
ROBERTSBRIDGE,
Sussex,
TN32 5TD.

24th August 1993

Dear Gerald,

PROPOSED BEAUPORT PARK ARCHAEOLOGICAL TRUST

Thank you very much for sending me the prospectus, and for formally inviting WIRG to be represented on the Committee. I have no doubt that we will accept but I will put it to my committee when it meets at the end of September and let you know officially soon after.

I have not heard from Cluttons whether they wish us to proceed with an assessment; they are consulting Andrew. If they do, I shall be in touch with a few queries.

I have looked through the proposed Trust constitution and there are one or two points which might be worth reconsideration. The first is the relationship between the First Schedule members of the Committee and the Second Schedule members of the Committee. According to section 6, the Committee is composed of all fourteen, yet under section 11 the implication is that Second Schedule members are not considered full members of the Committee, their assent only being required in matters concerning the objects of the Trust. This, in effect, allows the First Schedule members a free hand to alter most of the Constitution without reference to anybody else. This does not seem right. In my view, the normal course is for alterations to the Constitution to be a matter for a General Meeting of the members of the Trust, and not merely the Committee, and that references to the Committee should always mean all fourteen (even if the First Schedule members will probably be more active).

The second point is merely one which may save the Trust some money in its early stages at least. The requirement in section 9 that the accounts should be prepared by an Independent Qualified Accountant is, in my view, unnecessary. The Charity Commission does not require a properly qualified auditor unless the turnover of the charity concerned is over £100,000 a year. An accountant could easily cost the Trust a sizeable sum in auditing charges, so it would be safer simply to make it a requirement that the accounts be audited by some responsible independent person, and leave the necessity for employing a qualified auditor until the size of the Trust's funds make it obligatory under the Charities Act, and are large enough to afford it.

I hope you do not mind me expressing these opinions, but I have been involved in the affairs of a number of charities and so have some relevant experience. The idea of the Trust and the potential development of the ironworks is very exciting, and everything should be done to get it right.

With best wishes

Yours sincerely

Jeremy Hodgkinson

33, Burleigh Way,
Crawley Down,
CRAWLEY,
Sussex,
RH10 4UA.
0342 713544

Messrs. R.H. & R.W. Clutton,
92, High Street,
EAST GRINSTEAD,
Sussex,
RH19 3DF.

9th August 1993

Your Ref: TMMR/VAH/49

Dear Sirs,

<u>BEAUPORT PARK ESTATE - ROMANO-BRITISH IRONWORKS</u>

Thank you for your letter of the 2nd July, addressed to Reg Houghton, and apologies for the delay in replying.

As a voluntary group, we regret that we are unable to call upon the manpower/time necessary to undertake an Archaeological Field Evaluation, which would include fieldwalking, geophysical surveys and trial trenching. For this work, which carries a substantial cost commitment on a site of the extent of Beauport Park, you would need to employ the services of a professional archaeological unit such as South Eastern Archaeological Services (26, North End, Ditchling, HASSOCKS, Sussex, BN6 8TF).

I suspect, however, that at this early stage an Archaeological Assessment may be sufficient for your requirements. This entails the summary of the available evidence from published and unpublished sources, including the results of fieldwork already undertaken. It places this evidence in the context of its importance locally and regionally, and helps to focus on those areas where a Field Evaluation may be appropriate subsequently.

The Wealden Iron Research Group would be willing to undertake an Archaeological Assessment on the Beauport Park site. As a voluntary, charitable organisation, we are not able to ask a fee, but would ask for the payment of expenses (estimated at £50), together with an *ex gratia* payment of £250 to the Group. I would estimate that the work could be completed within a month.

I look forward to hearing from you.

Yours faithfully

J.S.Hodgkinson (Chairman)

JOHN STRINGER

WELL HOUSE
EWHURST GREEN
ROBERTSBRIDGE
EAST SUSSEX TN32 5TD

☎ Staplecross (0580) 830419

12 August 1993

Jeremy Hodgkinson Esq.
33 Burleigh Way
Crawley Down
CRAWLEY
West Sussex
RH10 4UA

Dear Mr Hodgkinson,

Many thanks for sending me the Charities booklet. It is very clear and helpful and I have sent off for some of their other leaflets which promise to be useful.

Our meeting the other day was most encouraging, and has helped to get us moving. I was very pleased to have the opportunity to meet you and look forward, in due course, to hearing more about the Wealden Iron Research Group.

With best regards,

Yours sincerely,

John Stringer
Emeritus Professor

AN EVALUATION OF THE EXTENT OF THE ROMAN IRONWORKS SITE AT BEAUPORT PARK, EAST SUSSEX

The full official report by Dr. Henry Cleere and myself (Britannia, XIX, 1988 p.217-274) and other written statements given to you have been mainly concerned with the Bath House building, but evidence collected over 25 years has confirmed that the site was the hub of a large complex of iron-working that may well have been, for a certain period, the largest in the Roman empire, not just in Britain.

There is a great deal more to be discovered at Beauport. Untouched beneath the surface there must be evidence of the actual iron-workings, the dwelling of the Commandant and his executive, of other buildings and of offices and stores, as well as the habitation area of the workers (including some burial ground). With the use of divining rods some slight survey of the habitation area has already been made showing a network of tracks, lying quite near the surface.

Among other features to be investigated are the main tracks linking up the whole site, the considerable remains of the huge slag heap that was mainly robbed a hundred years ago, the solving of the width of the stream, believed to be once navigable as the main access to the site from the roman road near Sedlescombe, the line of a perimeter rampart that may have encircled part of the works, and the springhead area from which resulted the landslide that was to cover the bath house completely until I found it in 1970.

So there is an unlimited amount of work to be done on this unique site which could provide such vital evidence, and the work could go on for may years and become an important research centre. The report of 1980 prepared by Andrew Thorburn, then chief planning officer for East Sussex, suggests at full length the possibilities of the development of the site.

Mr Jeremy Hodgkinson, of the Wealden Iron Research Group, whom you contacted recently, is well known to me, and not long ago he brought a party (including Mr. Houghton) to visit Beauport Park. No doubt at the right time of year his society, of which I am a member, could do some useful field-walking, if they could afford the time with their many other commitments: it is a task that could become lengthy.

We already know something of the likely extent of the Roman area, and I enclose a map of what is already known or surmised: it is likely that the area will prove to be far more extensive. In years to come a whole Roman village and ironworking settlement could be revealed. There can be few places in Britian where such an important site lies in an area completely undisturbed over the 1800 years since it was once such a hive of activity. The Roman occupation seems to extend from c.100 AD to c.250 AD.

Any full investigation and excavation can of course be made only with the consent of English Heritage, since the site is under schedule. Such consent they would be likely to give more readily to some reputable official body such as the Trust we have in mind. You will remember that as a result of a recent visit to Beauport by their inspector, Mr Ian Stuart, we received a letter from English Heritage expressing their realisation of the extreme importance of the site, and of its conservation and future development through the means of a Trust, without which nothing at all can be done.

Gerald Brodribb
14.7.93

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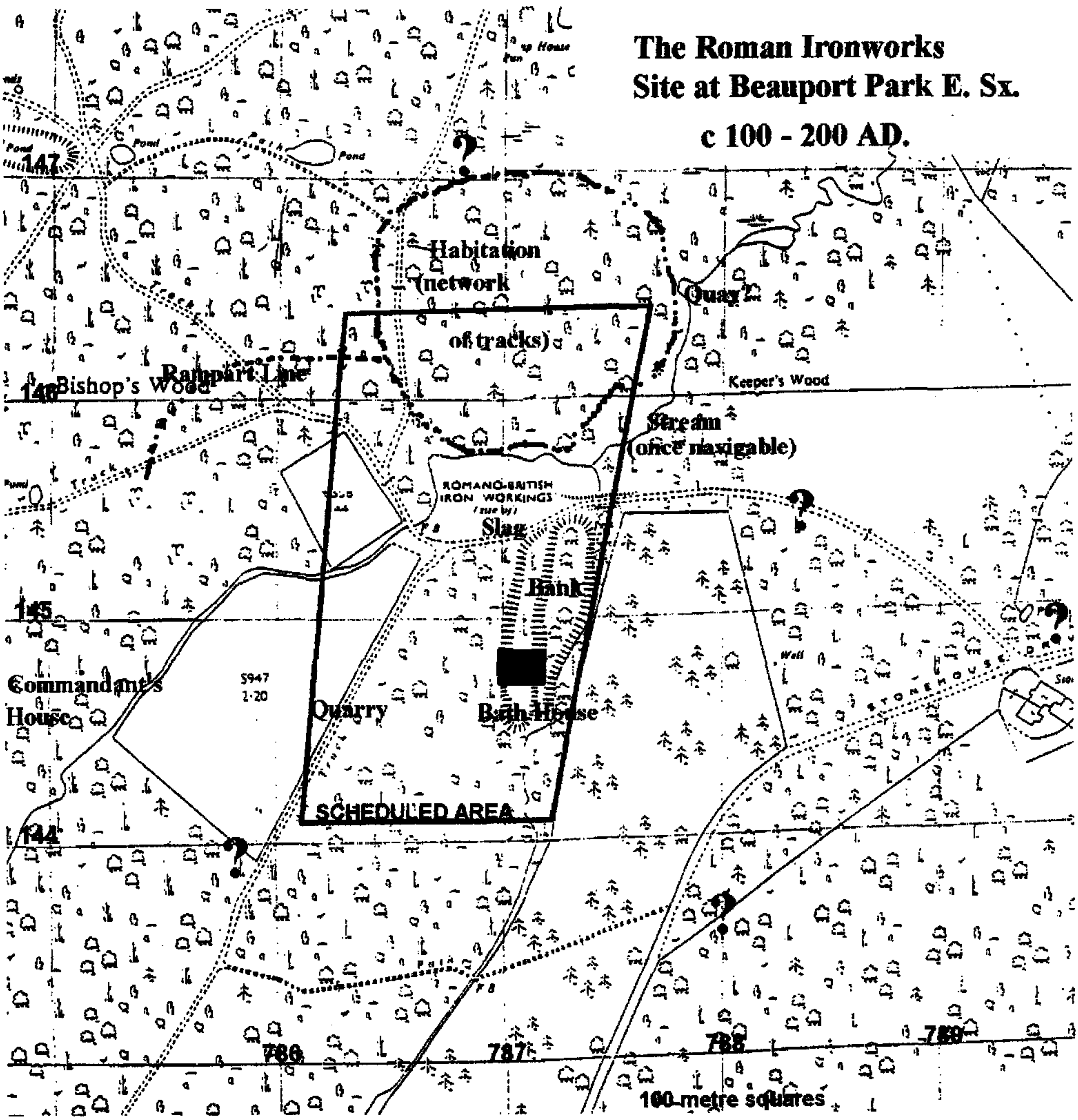
The Roman Ironworks
Site at Beauport Park E. Sx.
c 100 - 200 AD.
147
Pond
Pond
Habitation
(network
of tracks)
Quay?
Keeper's Wood
Bishop's Wood
Rampart Line
146
Stream
(once navigable)
ROMANO-BRITISH
IRON WORKINGS
Slag
Bank
145
Commandant's
House
5947
2·20
Quarry
Bath House
Well
SCHEDULED AREA
144
786
787
788
789
100 metre squares

Stubbles, Ewhurst Green, Robertsbridge, E. Sussex, TN32 5TD
Staplecross 510

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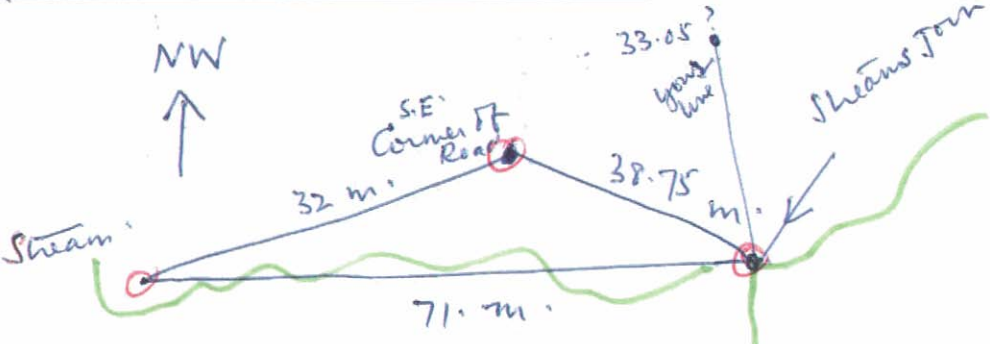

Hope this is clear.
So glad to see you all
yesterday Gerald Brodribb

HASTINGS
2 15PM
23 APR
1990
EAST SUSSEX

HASTINGS EXHIBITIONS
COMPETITIONS
& EVENTS
NATIONAL
ENVIRONMENT WEEK

Jeremy Hodgkinson
7 Kiln Road
Crawley Down
CRAWLEY
W.Sx. RH10 4JY

21.4.90

WEALDEN IRON RESEARCH GROUP

Hugh Sawyer

BEAUPORT PARK

21.4.90

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WEALDEN IRON RESEARCH GROUP

Hugh Sawyer

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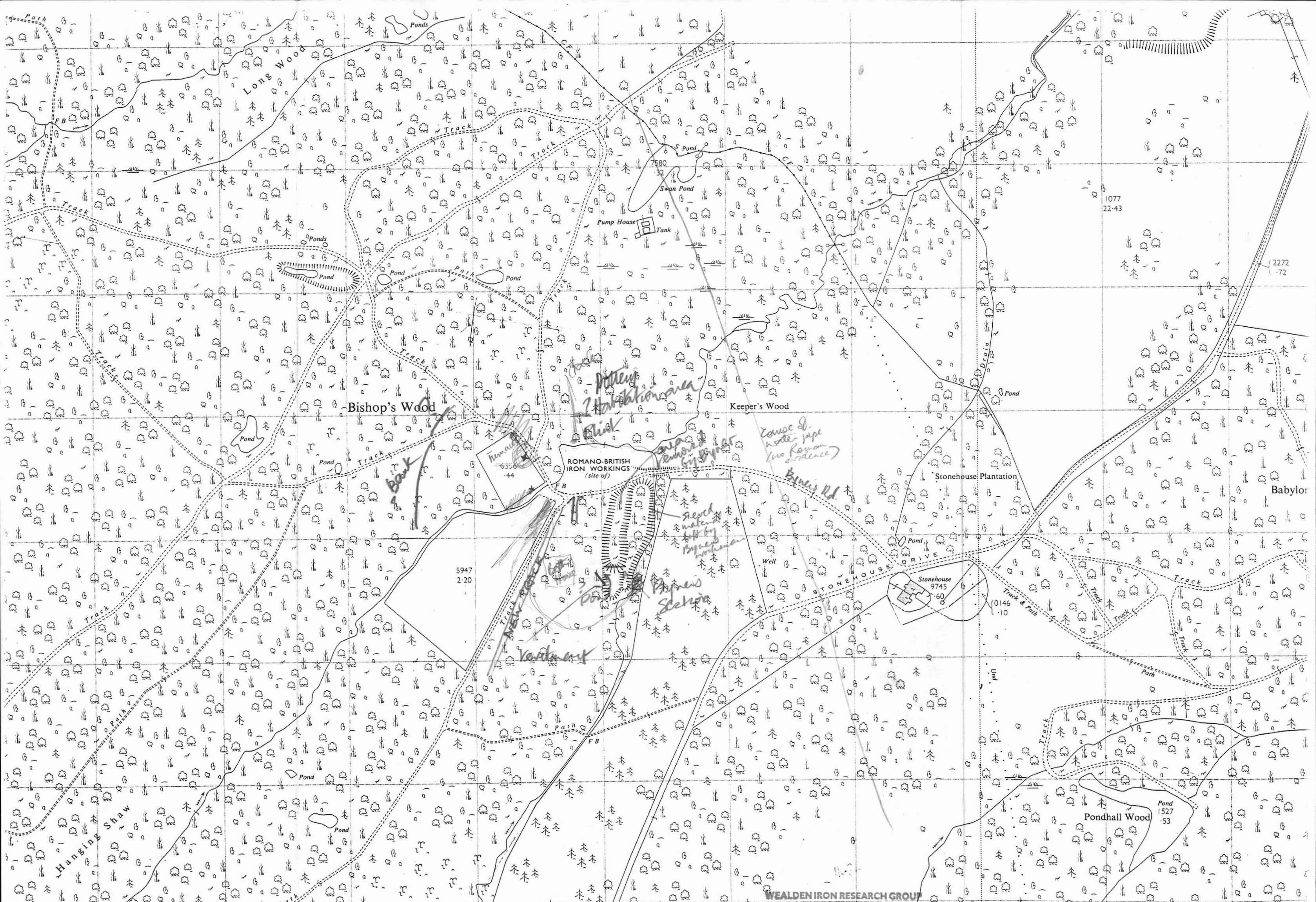
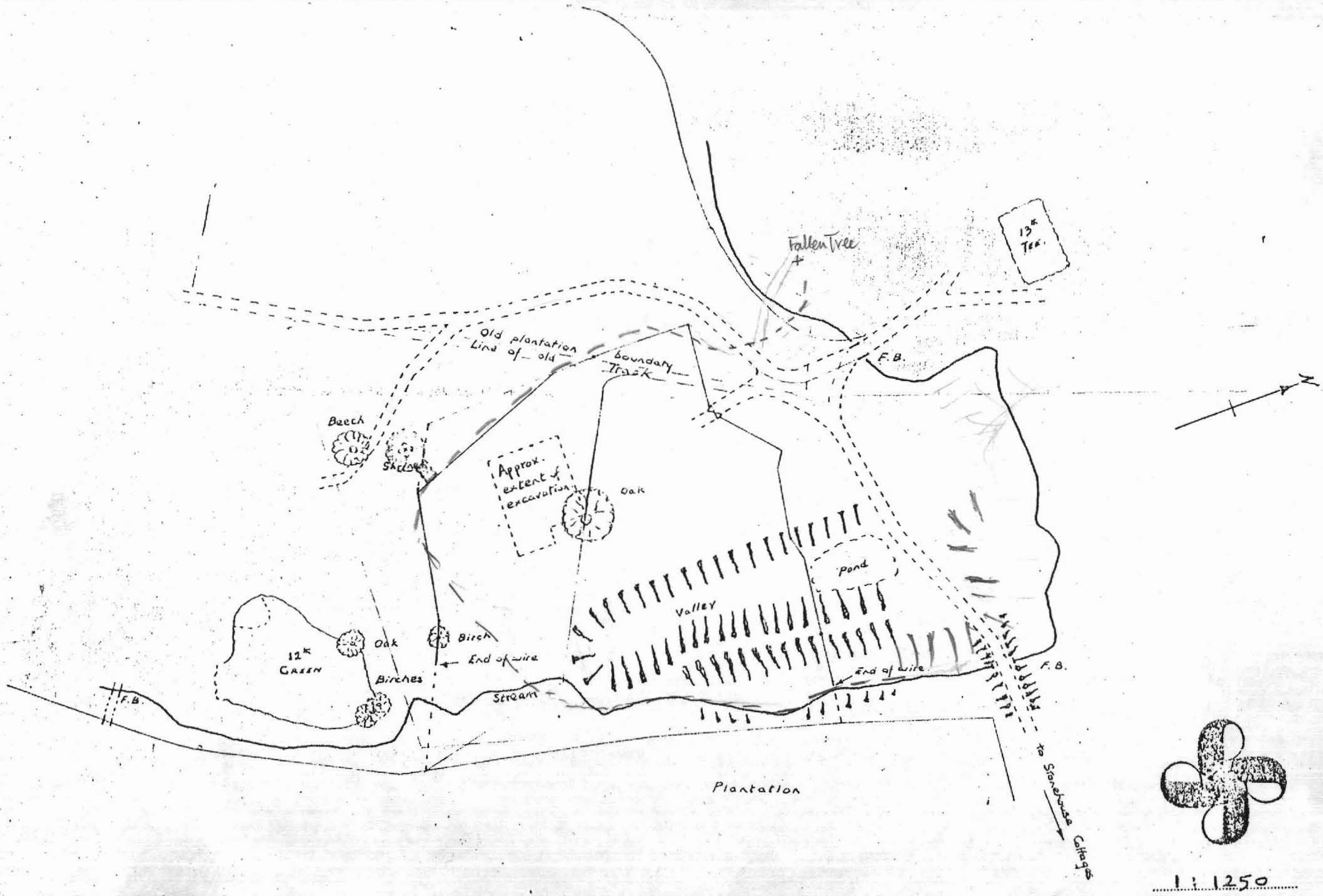
WEALDEN IRON RESEARCH GROUP

Hugh Sawyer



WEALDEN IRON RESEARCH GROUP

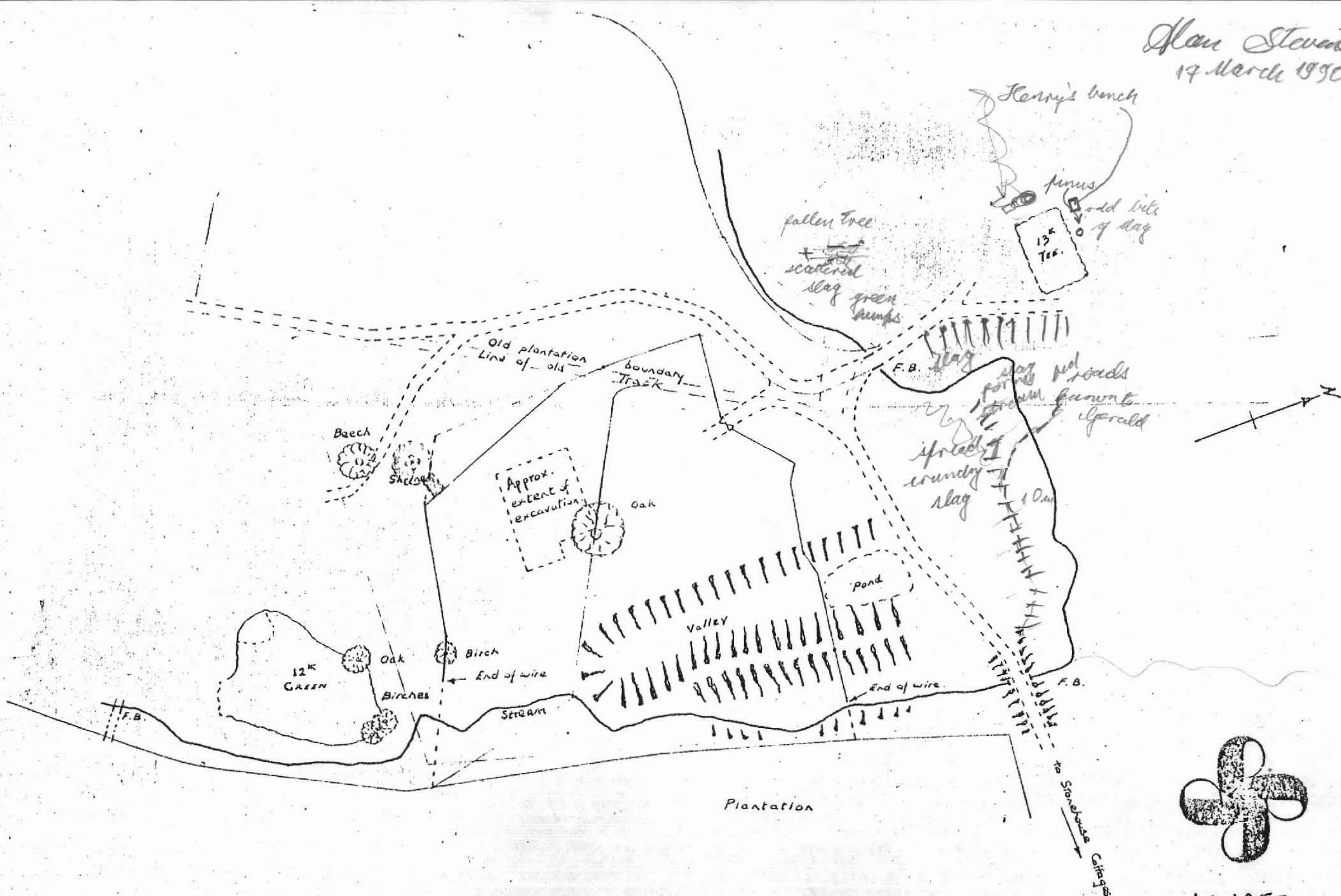
Jeremy Hodgkinson 17.3.90



Beauport Park Estate
Site of Romano-British Ironworks

1 : 1250
STRUTT & PARKER
201, HIGH ST., LEWES.
DATE - 3 AUG 1973

WEALDEN IRON RESEARCH GROUP
Jeremy Hodgkinson 17.3.90



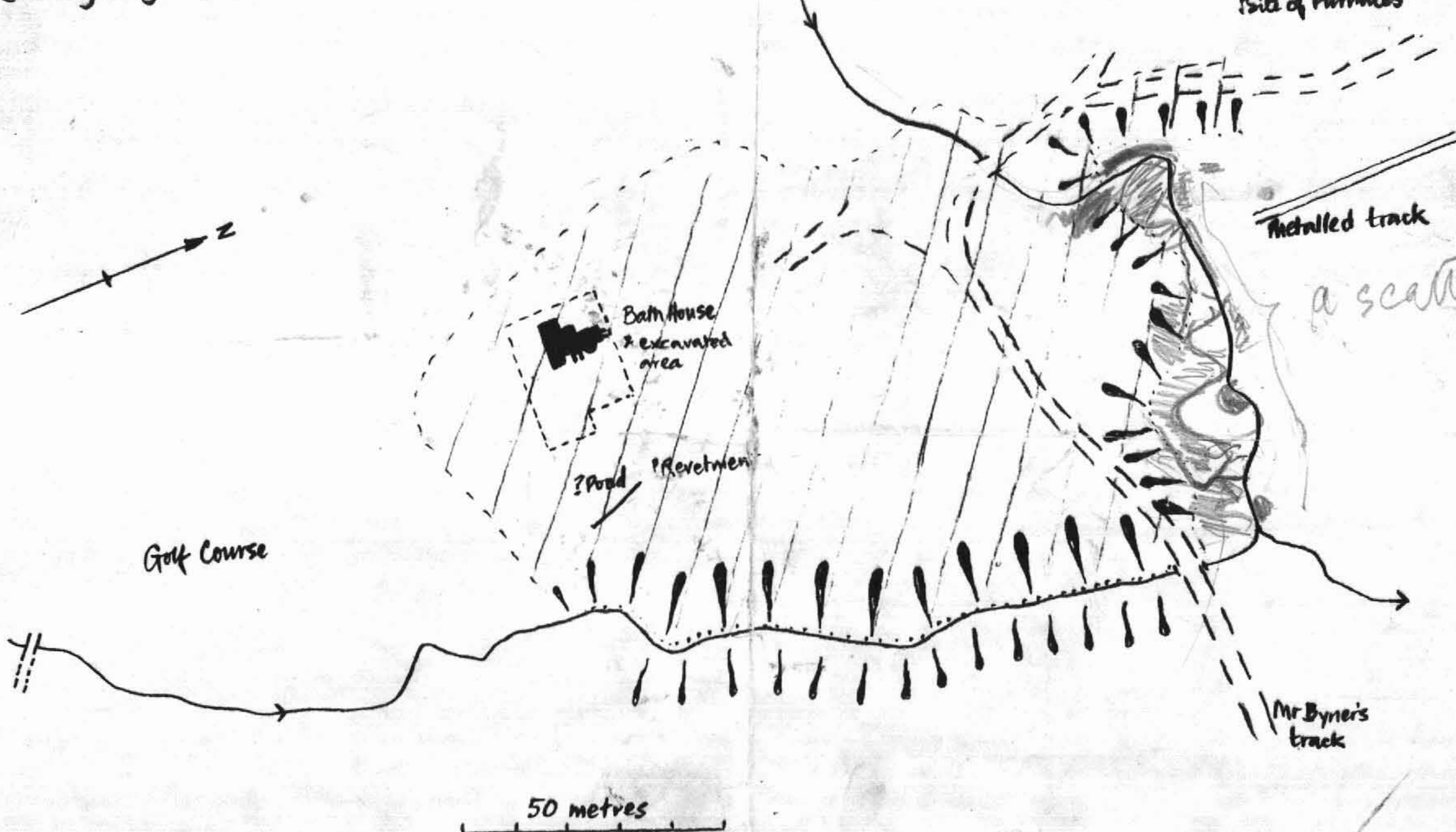
Beauport Park Estate
Site of Romano-British Ironworks

1 : 1250
STRUTT & PARKER
201, HIGH ST., LEWES.
DATE 3 AUG 1973

WEALDEN IRON RESEARCH GROUP
Alan Stevens 17.3.90

Beauport Park Ironworks

(showing slag heap pre.1869, as conjectured)



Elizabeth Gibb & Roma Ogilvy-Watson
WEALDEN IRON RESEARCH GROUP
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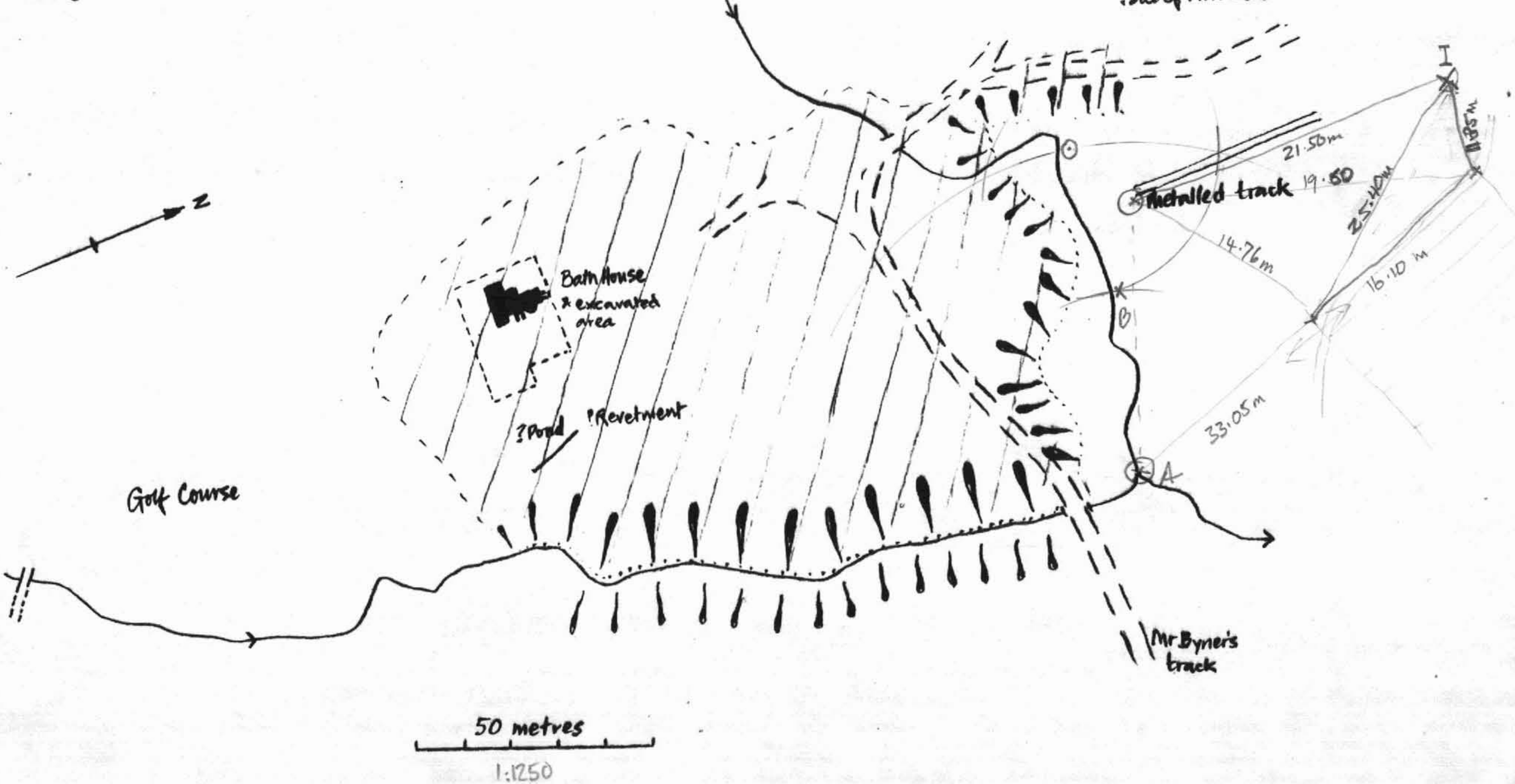
Beauport Park Ironworks

(showing slag heap pre.1869, as conjectured)



J.B.H

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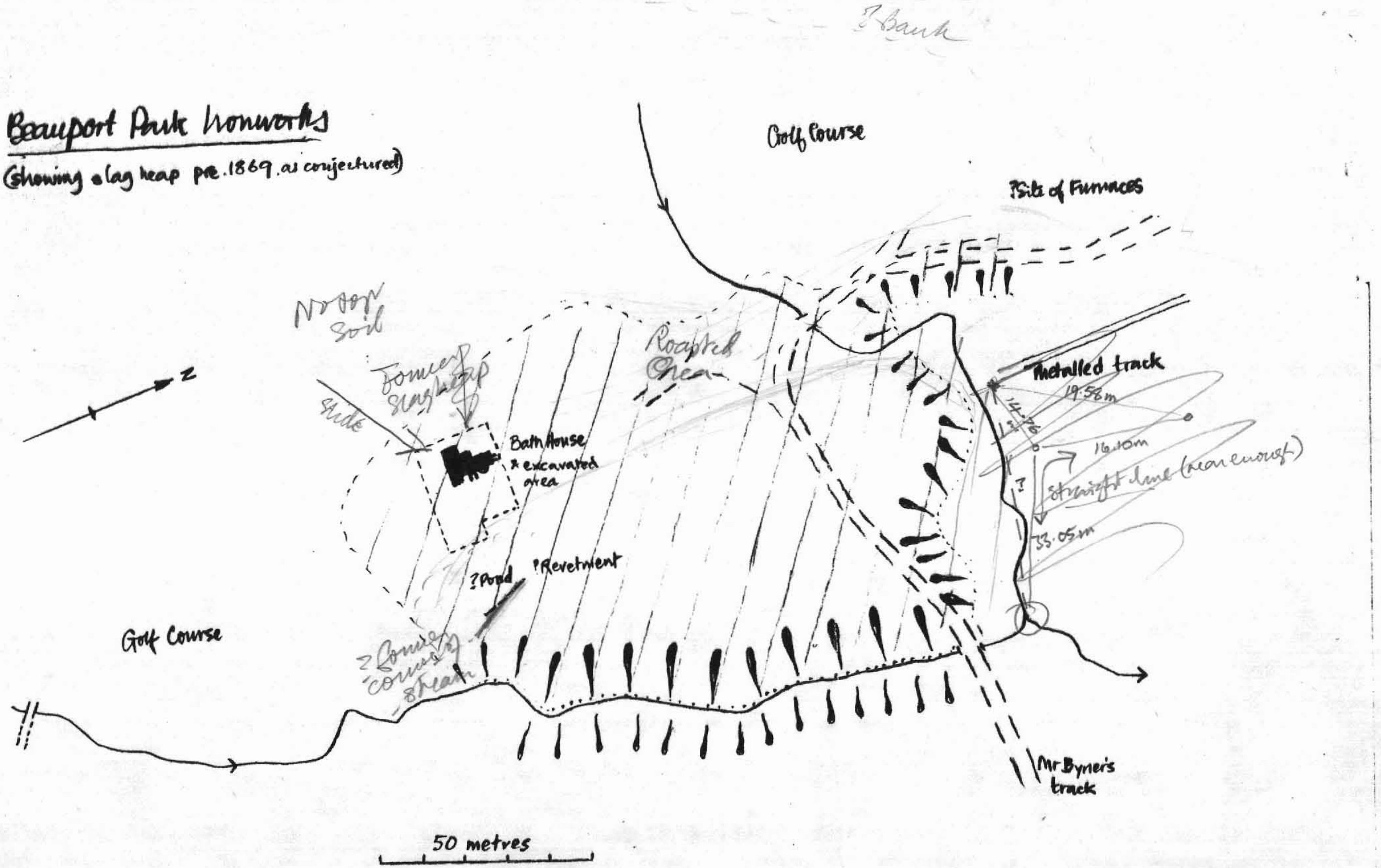
Beauport Park Ironworks

(Showing slag heap pre.1869 as conjectured)



B.H.

21.4.90

BH.17.3.90

BEAUPORT PARK ROMAN BATH HOUSE

Appraisal of Conservation Options

Prepared for Beauport Park Archaeological Trust

Report version-02 April 2002

Project 21007

Ingram Consultancy Limited
Netley House
Gomshall
Guildford
Surrey
GU5 9QA
Tel: 01483 205 170
Fax: 01483 205 175
E-mail: enquiries@ingram-consultancy.co.uk

CONTENTS

SUMMARY

Excavated in 1970-71 Beauport Park Roman bath house was covered soon after by a protective structure which has served its purpose of protecting the masonry in the short term very well. There is little question that without this structure the bath house would have suffered significant additional losses in the thirty years since its excavation. The roof is, however, at the end of its life through the degradation of timber. Temporary propping of decayed timber sections, particularly on the north section of the roof, is required now to prevent collapse. Unstable sections of bath house masonry, notably in rooms I and V, also urgently require support to prevent collapse of facing stones; buttresses formed of sandbags are recommended in these areas. These are, however, short term measures and in the longer term an alternative to the present protective structure must be found.

Proposals for protection of the bath house have been considered according to the principles of preventive conservation; as far as possible remedial work should be kept to a minimum to retain the authenticity of the fabric and precedence given to the creation of a stable environment which reduces risks to the masonry remains.

The bath house walls consist of two faces of Wealden sandstone bedded in clay (earth) mortar with a core also based on clay. After the site was abandoned its protective roofs and lime plaster began to be lost to the weather. The remains of the bath house were saved from further loss by collapse of a rubbish heap to the west, which accounts for the considerable height of the surviving walls. Masonry bonded with clay mortar is very susceptible to various agents of decay - moisture, frost, microbiological growth, and plants with their invasive root systems.

This report concludes that two options should be seriously considered for long term protection of the bath house: careful re-burial or protection under a permanent enclosed structure. Re-burial is in several ways the easiest option presenting the least uncertainties and potential risks to the fabric of the bath house, with full reversibility. The option of a permanent, ventilated building needs to be further considered and a detailed design produced. The internal environment, temperature and relative humidity in such a building would be difficult to control in any more than a very basic way, without constructing a very sophisticated and expensive building. In any case, drastically altering the environment could cause rapid drying to the detriment of weakened plaster and mortar. Installation of a perimeter drain around the shelter is recommended to remove surface water and would have a relatively modest impact on the moisture content of the masonry posing less of a threat to mortar and plaster. On the other hand, ongoing microbiological growth on masonry faces must be expected as long as the environment remains damp. Effective control of organic growth is problematic since the prolonged use of masonry biocides is inadvisable.

All options, other than re-burial present will entail masonry consolidation, the exact extent of which needs to be determined by further site survey when all present coverings over the walls can safely be removed.

The permanent building is the more expensive measure and requires a long term commitment of financial and other resources. Without other, related attractions it is difficult to see how the bath house could sustain visitor numbers sufficiently to warrant a cover building that could be open to the public on a full or even part-time basis. If the bath house is to be protected and open by appointment, the question of whether the

expense could be met and justified needs to be discussed in a wider forum by the Beauport Park Archaeological Trust and other parties involved, including English Heritage and the Local Planning Authority.

BRIEF

Ingram Consultancy was commissioned by Beauport Park Archaeological Trust to carry out an appraisal of the conservation needs of the Beauport Park Roman Bath House, near Hastings, East Sussex, and to assess the various schemes for its protection and presentation.

The Trust's brief noted the objectives of the report as follows

- Identify and characterise building materials – the various elements of the building

- Assess the relative significance of the elements of the Roman building and artifacts discovered during the excavation

- Assess the causes and rates of decay of the various building elements, including: water ingress, humidity, thermal regimes, biological and micro-biological activity, soil movement, existing sand fill, mechanical damage and vandalism

- Recommend and prioritise any measures urgently required for stabilisation of the bath house

- *Past protective measures.* Assess the effectiveness of measures taken to date to protect the masonry, principally the sand fill over floors and the roofed enclosure over the bath house

- Identify, assess and prioritise all options for presentation and protection of the bath, including: exposure without protective building, cover building with roof only, enclosed cover building with full protection from wind and rain, enclosed cover building with environmental control, and reburial or partial re-burial

Site Inspection

Professor John Ashurst, Catherine Woolfitt of Ingram Consultancy and archaeological conservation consultant John Stewart carried out a site inspection on 12 July 2001. Inspection was limited to areas where the protective plastic sheeting covering wall surfaces could be removed without displacing water and stones. The floors are covered in sand as a protective measure and could not be inspected. The excavation report in *Britannia*[1] was heavily relied upon for descriptions of the floors and inaccessible areas of masonry.

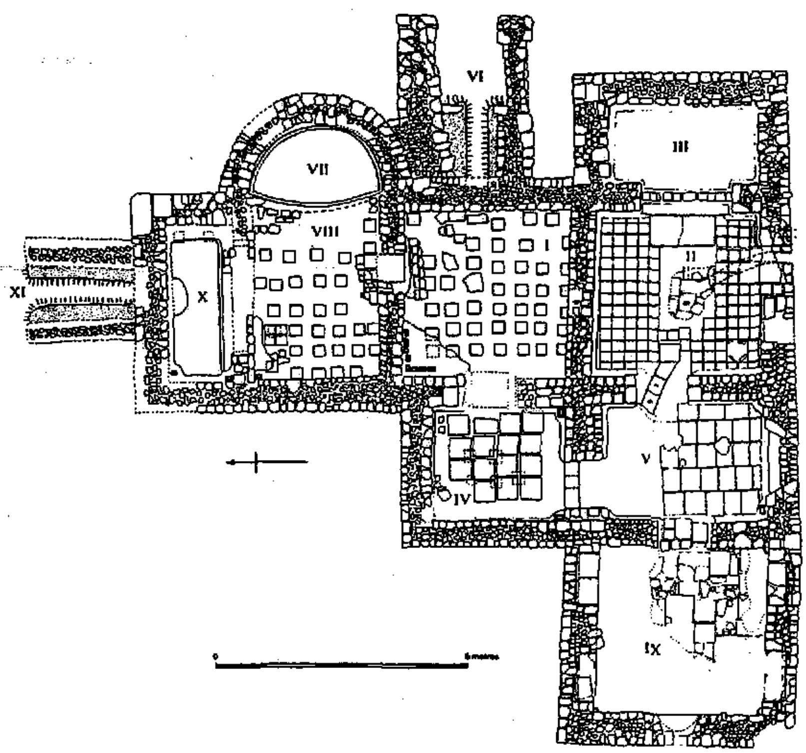
[1] Gerald Brodribb and Henry Cleere (1988) "The *Classis Britannica* Bath-house at Beauport Park, East Sussex, *Britannia*, vol XIX, pages 218-273

INTRODUCTION

The Beauport Park bath house is a scheduled ancient monument East Sussex number 383. It was built as part of a Roman ironworking site and it is estimated that it was in use from roughly AD 85 to 235, some 150 years. The site was excavated in 1970 and 1971, and covered with a roof structure soon after, at which time the floors were also protected with sand. The possibility of the Department of the Environment assuming guardianship of the site was discussed but did not materialise. The Beauport Park Archaeological Trust formed in the early 1990's and the bath house remains in its care, although the site is privately owned. Various schemes have been discussed for the preservation and presentation of the bath house. A 1997 feasibility study by the Trust to create an outdoor museum and activity centre on the Beauport Park site included a proposal for a protective "umbrella" or canopy suspended above the bath house from pylons on surrounding high ground.

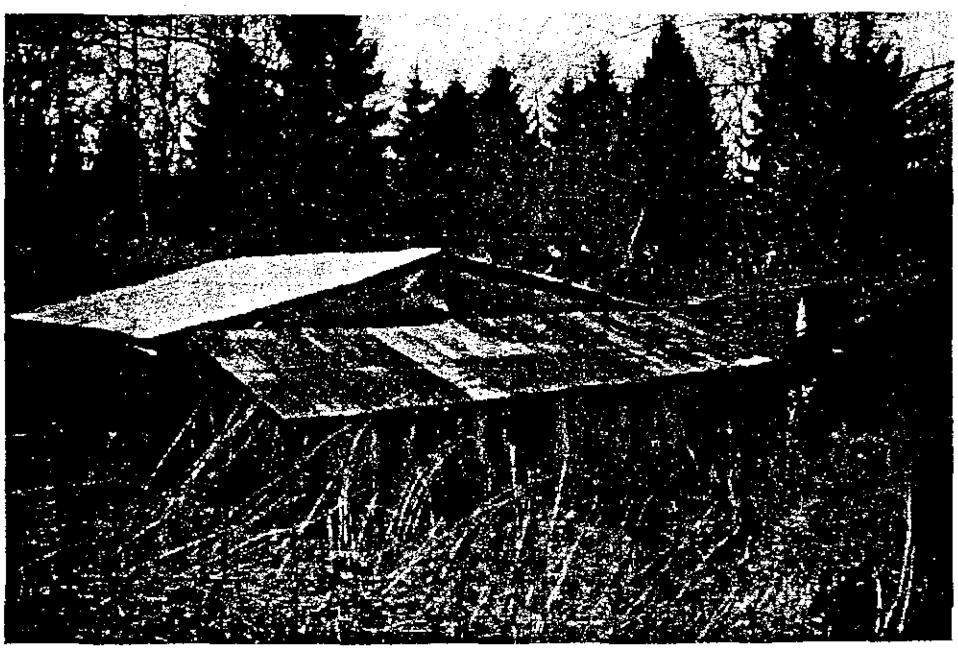
The roof structure protecting the bath house consists of a series of trusses covered with corrugated metal and plastic sheet. The roof trusses rest on concrete blocks located at the junctions of masonry walls where the masonry mass is greatest. The perimeter gap between the roof and the ground level is filled with corrugated metal sheet. Light is admitted through the transparent plastic sheet covering the roof on the south side of the bath house and through a gable on the east side formed by the roof structure and covered with plastic netting.

The accessible areas of the bath house where wall coverings could be removed and fabric inspected were rooms I, II, IV, V, VIII, and IX, as well as some external walls. The sheets covering the cold plunge III, the hot baths VII and X were weighed down by pools of water and could not be removed, making inspection of these baths impossible. Access to the praefurnia VI and XI was also impeded. Floors remain covered under approximately 350mm of sand and could not be examined.



The excavation report concluded that exposure to the weather after abandonment of the site and a brief squatter occupation resulted first in loss of plaster, some silting-up, collapse of the tiled roofs, and finally a slip of the domestic and industrial refuse heap to the west (into which the bath house had been cut). The barrel vaults over rooms IV and V collapsed under this slide.

Photograph 1 View of protective roof over the bath house from the south showing its location within a depression in the landscape (March 2001)



Photograph 2 The protective roof from the south east, the lower end of the site. The ground level rises at the other three sides of the building

Photograph 3 Internal view looking west from room II. Plastic sheeting has been removed from the walls for inspection

SIGNIFICANCE OF THE SITE

The significance of the Beauport Park bath house lies in the extent of the surviving masonry, the intact and legible plan, and the height of the walls, some of which retain original plaster. Such extensive and intact Roman building remains are unusual in Britain. Perhaps even more unusual is the absence of a major intervention in the form of masonry conolidation. Few Roman buildings have totally escaped intervention at some stage, which in past decades would have typically included, at least for monuments exposed to the weather, rebuilding of structurally unstable areas and often repointing and capping in relatively hard, durable and impermeable mortars.

Examination of the mortars used in construction of the bath house, for building and finishing the walls reveals Roman confidence and economy in the use of lime and clay. The tiles of Beauport Park Roman Bath House have already been published.[2] The plaster remains from Beauport Park, including the painted fragments and the finishes *in situ* merit further investigation and publication.

It must be conceded, however, that whilst the bath house is part of a Roman industrial site of national importance and holds considerable interest for specialists in the field of archaeology and historic buildings, the site may hold less interest for visitors in general due the absence of decorative elements. The substantial interest in other Roman sites, such as the nearby Fishbourne and Bignor Villas, is due in considerable part to their mosaics. This factor needs to be considered in proposals for protection of the bath house.

The measures to be taken in protecting and preserving the bath house must reflect to some extent its significance. Significance needs to be judged in the wider context of Roman bath house sites within industrial complexes across the country. English Heritage recently published a policy statement on archaeological sites reinforcing the need for understanding the significance of a site in advance of proposals and for retaining significance.[3] The question of significance will inevitably arise in discussions with the Local Planning Authority and English Heritage who must be consulted on any work to the Beauport Park bath house due to its scheduled ancient monument status.

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2 G Brodribb, Britannia, X, 1979, 139-56

[3] *English Heritage Policy Statement on Restoration, Reconstruction, and Speculative Recreation of Archaeological Sites Including Ruins*, February 2001

RISK ASSESSMENT OF THE BUILDING FABRIC

The bath house remains include the following materials:

1. Stone

The masonry walls are faced externally and internally with roughly dressed local sandstone blocks built to regular courses. The sandstone may be described as a fine to medium grained sandstone of the Wealden series buff to brown in colour and often slightly calcareous.[4]

A large Purbeck stone was also found in front of the cold plunge (Rm III). This remains buried under sand and was not inspected.

Risks/Susceptibility
The sandstone is relatively durable, compared to the mortar in which it is bedded and the more porous and permeable clay tiles and plaster finishes. The susceptibility of the sandstone to agents of decay such as damp and organic growth is relatively low although porous stones are susceptible to frost. The stone does support organic growth, notably in damp locations and where exposed to light. This may have a long term deleterious effect on the stone but the rate of decay would be much slower and, possibly negligible, when compared with ongoing decay of mortar, and plaster.

Photograph 4 A typical section of facing stones with plaster undercoats at the base of the wall

2. Bedding and Core Mortar

The mortar used for bedding of the sandstone facing stones and construction of the rubble wall core is based on a clay binder (also known as an earth mortar). Although the mortar has not been subject to scientific analysis, the excavators identified the mortar as a "greyish puddled clay" and our examination of samples removed from site confirms this. Mortar taken from joints between the sandstone facing stones and from the core was completely unreactive to dilute hydrochloric acid and was readily dispersed in water, indicating that no, or at least very little, lime binder is present.

[4] J Ashurst and F G Dimes, *Conservation of Building and Decorative Stone*, vol 1, Butterworth-Heinemann, 1990, page 78

Visual examination found the aggregate to be composed principally of sandstone fragments of various sizes with smaller amounts of crushed tile, rounded pebbles and angular flint.

The small samples collected were damp and smelled strongly of mould growth when removed from sample bags for examination. Greyish white and green microbiological growth was readily visible on the samples.

Risks/Susceptibility

Clay mortars are not designed for exposure to weather since clay particles disperse readily in water. In Roman construction and in traditional construction generally, clay bedding mortars or undercoat plasters are always given a protective lime covering, especially in a damp environment. If the present roof structure had not been built, erosion of mortar from the wall faces and exposed wall tops would have been extensive and a significant proportion of the bath house fabric would have been lost.

There is a potential risk of invertebrates tunnelling into clay-based mortars, although this was not noted on site.

Photograph 5 With the photograph above this picture illustrates the nature of the bedding mortar which has eroded to varying degrees. This view is of the north east corner of room IX with its niche

3. Plaster finishes

Although the excavation report used several different terms for plaster, including concrete (for example, for pool lining) and cement (which seems to have denoted undercoat plaster)[5], the term plaster is used here for any earth/lime coating on the masonry, whether applied to walls, floors or as lining for pools.

A distinction should be made, however, between undercoats of plaster which appear, at least in some places, to contain only clay as a binder (particularly the first layer of undercoat plaster), and finish coat plaster which needed to be waterproof and, therefore, contained lime in combination with crushed tile to give a pozzolanic set.

The only decorative plaster found in situ in the bath house was a quarter round fillet moulding at the base of the walls in rooms I, II, IV, V, and VII. This was not noted during the site inspection and the extent to which it has survived is uncertain.

Plaster visible on the walls of rooms II, IV and V is undercoat plaster which is in a very weak condition. This plaster contains a substantial proportion of crushed tile as its aggregate but appears to have a relatively low or negligible lime content.

A water-proof plaster, *opus signinum*, which is readily identifiable by its pinkish colour was typically used for lining baths. *Opus signinum is* composed of lime mixed with crushed tile. The excavation report notes that this plaster was badly decayed in places and disintegrated when wet into "a reddish, gritty slurry known to the excavators as red porridge"[6].

Risks/susceptibility

The undercoat plaster is badly deteriorated and weakened, and friable to the touch. In some places it supports organic growth, which often appears green or greyish-white in colour. The *opus signinum* is inherently stronger than undercoat plaster based on clay, but it is suffering in places with cracking, friable surfaces and ongoing loss. In addition, its survival *in situ* may depend on the stability of its undercoat plaster and the bond between undercoat and finish coat and between undercoat and the masonry substrate.

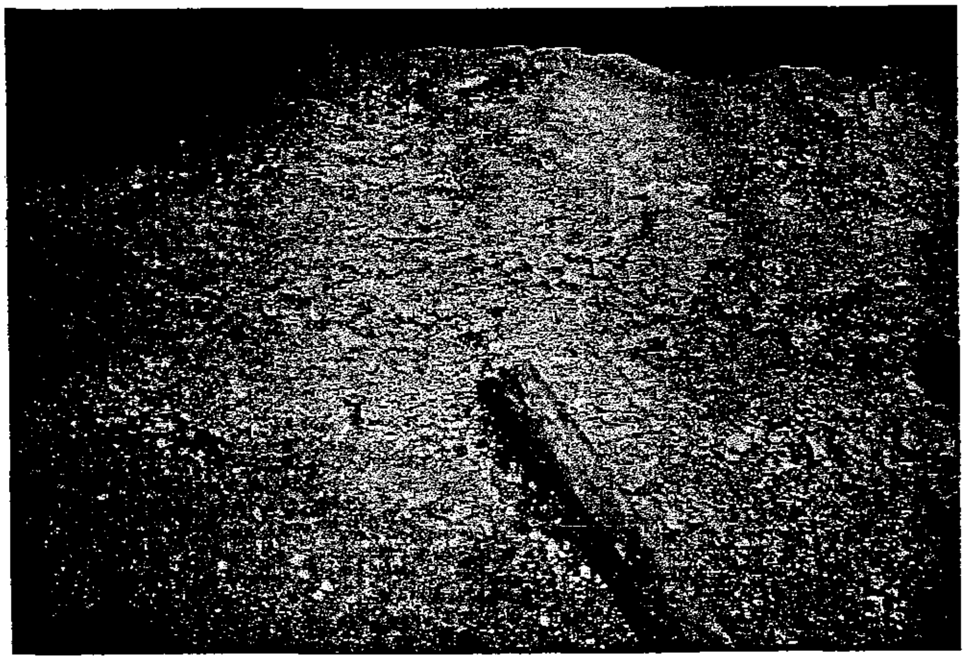
How much the condition of plasters has deteriorated since excavation is difficult to determine. Ongoing surface loss is evident from deposits of disintegrated plaster at the base of walls. In this weakened state both undercoat and finish coats are very susceptible to all agents of decay - moisture penetration, organic growth (on a micro and macro scale), salt crystallisation (if salts are present) and frost. Frost or rapid drying could cause sudden detachment of substantial areas of plaster.

Painted plaster

According to the excavation report painted plaster had survived in situ in isolated locations in rooms II, III and IV. A substantial quantity of plaster fragments (38.6kg) was also found in the fill. A total of eleven different colours were identified including maroon, white, cream, yellow, rose, pale green, black and blue colours. Decoration included stripes superimposed on white or maroon surfaces,

[5] G Brodribb and H Cleere, *op cit*, pages 225-226
[6] *Ibid*, page 221

brushed sweeps and spotted patterns in imitation of marble. Although this subject is to some extent outside the scope of this study, it is worth noting the importance of these painted fragments, both those surviving in situ and those removed from the excavated fill. Any remains of painted decoration merit further analysis, including pigment types. The excavated fragments should be stored so that they are protected from deterioration.



Photograph 6 Disintegrating *opus signinum* plaster in room II, at the opening into the cold plunge room III

Photograph 7 Small section of painted plaster in the south east corner of room *II*

Finish Coats of Plaster

In a few cases the excavation report identified finishes on plaster, as distinct from paint on plaster. For example the five niches in room V (two rectangular niches on the north and south walls and the semi-circular niche in the west wall) were "covered with cement [plaster undercoat?], and in the case of the semi-circular niche, further rendered with plaster [given a finish coat?]."[7] The lining of the hot bath (room X) was described as *opus signinum* with a "fine slip" over it, presumably a fine plaster finish. No plaster finishes (other than the painted plaster noted above) were found during our site ~~inspection and it appears~~ that deterioration has occurred since excavation.

The risks to the plaster outlined above apply also to the remains of painted and fine finish coats of plaster.

4. Clay Tiles

Box flue tiles were found *in situ* in rooms I, II, IV, V, VIII and X. With the exception of those in room X, it was possible to inspect the box flues in these rooms. Floor tiles (sometimes underlying *opus signinum*) were found in situ in rooms I, II, IV, V and IX. Drainage channels were exposed in rooms II, IV and V. Since the floors are now covered with sand only the box flue tiles (or *tubuli*) were accessible for inspection.

The term clay tiles is used here to indicate all types of tile found on the site including those for floors (bessales, sesquipedales), box flues and drainage channels.

Risks/Susceptibility

Tile is, in general, porous and permeable and therefore susceptible to moisture movement and damage from crystallisation of soluble salts and from frost, albeit to a lesser extent than the mortar and plaster. Box flue tiles in the south west corner of V exhibit delamination and spalling typical of frost damage.

It is understood that tiles found in the course of excavation are stored in a separate shelter on the site; these include roof tiles (*tegula* and *imbrex* types), box flues, and brick of various dimensions. If stored in conditions similar to those of the bath house they are also at risk from damp, salts[8] and frost. Others in the north west corner of room I may have been damaged by intruders.

[7] Ibid, page 230

[8] Potential sources of salt contamination in the tiles are the soil in which they were buried (unlikely in this case to be significant) and any acid used to remove accretions during the process of cleaning the tiles after excavation. It is uncertain whether this was done at Beauport Park but it is common practice in processing of ceramic material to remove accretions which are insoluble in water with acid. The ceramic must then be rinsed in successive baths of clean water to remove the salts, which will otherwise remain in the body of the ceramic, a potential source of damage.

Photograph 8 South west corner of room V showing damaged box flue tiles and unstable masonry which urgently requires temporary support

PRESENT CONDITION AND CAUSES OF DECAY

Some factors that could potentially contribute to decay of the fabric were mentioned above under the 'Materials' section. Potential agents of decay, which currently pose a threat and could pose a threat in future, depending on how the environment is altered, are discussed below. Although presented separately, the factors at play in deterioration of the bath house masonry typically work in concert with one another.

1. Environment –Temperature And Relative Humidity

The humidity in air is normally discussed in terms of *relative humidity*. Relative humidity (RH) is a value normally expressed as a percentage and is defined as follows:[9]

$$RH = \frac{\text{Amount of water in a given quantity of air}}{\text{Maximum amount of water which the air can hold at that temperature}} \times 100\ \%$$

It should be noted that RH varies with temperature; the higher the temperature the greater the capacity of air to hold moisture vapour. Air at 100% RH is holding the maximum amount of water it can at a given temperature.

The environment within the cover building will fluctuate in temperature and RH, following the pattern of the outdoor environment, although it may experience higher temperatures in strong sunlight due to air trapped within the structure. The RH likewise generally fluctuates in line with the weather, but overall it is anticipated that the relative humidity would be higher at certain periods within the protective structure. It is difficult to comment extensively on the internal environment of the present cover building as this has not been monitored and assessment is based on brief inspection during the summer period. More severe, colder conditions have not been observed but the demands of much colder and much wetter conditions are considered in this report.

2. Water / Moisture Content of Masonry

Primary sources of water are:

a) rain and atmospheric humidity currently penetrating the protective roof via various openings, and holes and joints in the sheeted roof,
b) moisture rising through the ground into the masonry by capillary action, and
c) surface water which can run into the bath house from the slope of the hill after prolonged heavy rain

Although no moisture content analysis of masonry materials was carried out, it is obvious that the masonry is damp. Plaster and stone surfaces were damp to the touch and in many locations support abundant green microbiological growth. Whilst a consistently high moisture content has the disadvantage of encouraging some types of microbiological growth, it also contributes to the stability of mortar and plaster, in particular those based on clay. A high but constant moisture content sustained over a long period will not in itself pose a threat to the condition

[9] Gary Thomson, *The Museum Environment*, Butterworths, second edition, 1986, page 68

of the mortar. A sudden drop in moisture content, i.e. rapid drying, caused for example by a rapid and substantial drop in RH may, however, result in damage by loss of cohesion. Mortars and plasters may become even more friable or detach in fragments.

Moisture within masonry can be problematic in combination with freezing temperatures as ice crystals expand in the pores of mortar, plaster, clay and stone, rupturing and shattering surfaces.

Control of Moisture – Ground Water and Surface Water

It is possible to prevent rain ingress by improving the protective structure and to divert surface water but it is difficult to substantially alter or reduce the moisture vapour content in the air (RH). It is practically impossible to prevent ground water from rising through the masonry walls; the combination of underlying clay and topography contribute to the rising damp. The building was cut into a pre-existing slag and rubbish heap on the west side, but sits on natural clay level on its east side. The bath house is located within a depression in a hillside into which water will naturally run. Whilst insertion of a damp proof course may be considered for historic buildings, such an intervention would mean unacceptable disruption of already weakened masonry. Attempting to install a damp proof course through such a thickness of weakened masonry (0.75m), which may have a voided core, is inadvisable and impractical and is, in any case, against good principles of ancient monuments consolidation.

Surface water from the surrounding slopes around the bath house could be diverted by installation of a drain to the north, west and east sides of the bath house to prevent water accumulating around the external masonry.

Creating a drier environment, a lower relative humidity, within any protective structure, presents a challenge. Even if the building shell were designed to exclude atmospheric moisture, the exposed soil and clay around the external bath house walls would continue to feed moisture into the air, unless measures were taken to cover these surfaces. In this case ground water may rise at an increased rate through the other available outlet within the building – the bath house masonry.

3. Salts

No white crystalline deposits (the usual visible form of salts on masonry surfaces) were noted, but it is probable, given the proximity of slag heaps, that salts exist within the masonry and plasters. Water soluble salts are a common problem in historic masonry, especially when subject to rising damp. Hygroscopic salts absorb moisture from the air so that if substantial quantities are present they can increase the amount of water vapour the masonry will absorb from the atmosphere.

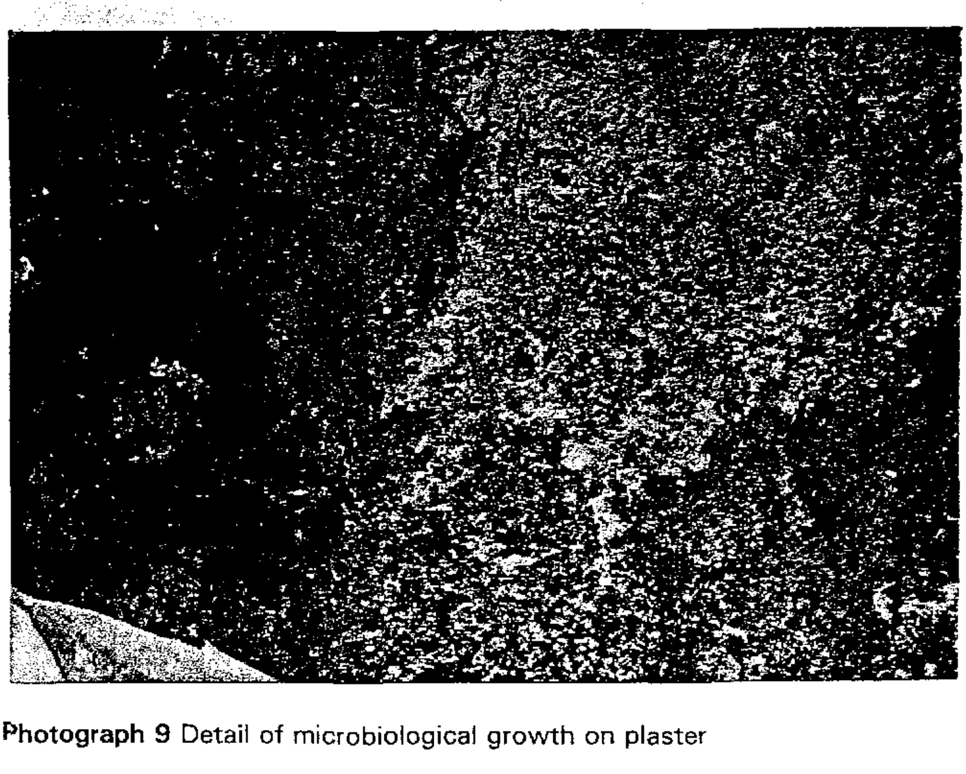
Salts would typically become evident with drying of masonry, at which stage they migrate to masonry surfaces and crystallise within the pores of the stone or plaster or just behind the surface (cryptofluorescence). At Beauport Park any salts present are more likely to damage the porous and weakened mortar and plaster than the stone.

Any proposal that entails a risk of drying out masonry should incorporate salt analysis. Mortar and plaster samples should be taken from a minimum of two or three locations representing the content near ground level and at higher level. Analysis would be necessary to identify any salts present and the quantity (qualitative and quantitative); results are typically expressed as concentrations of ions of which salts are composed. Common anions include chlorides, nitrates and sulphates and cations sodium, potassium and calcium.

4. Organic growth (micro and macro scale)

Microbiological growth was discussed above in relation to moisture content. Another important factor in microbiological growth is the presence of natural light. The black protective sheet appears to have afforded better protection against organic growth than the transparent plastic sheeting by excluding day light. Green organic growth tends to occur under the transpartent sheeting or in areas not covered by sheet whilst masonry under the black sheet tended to be free of obvious green growth, although the presence of other types of microbiological growth less visible to the naked eye, cannot be discounted. This observation does, however, suggest that walls left unprotected from daylight will be colonised by microbiological growth.

Masonry surfaces can support various types of microbiological growth, which may include fungi (commonly known as mould), algae, lichen (combination of a fungus and an alga), and bacteria. These may be unsightly, some create a characteristic 'mouldy' smell and promote decay of susceptible mortar and plaster. They live on nutrients present in the clay mortar, plaster and on the surface of stone.



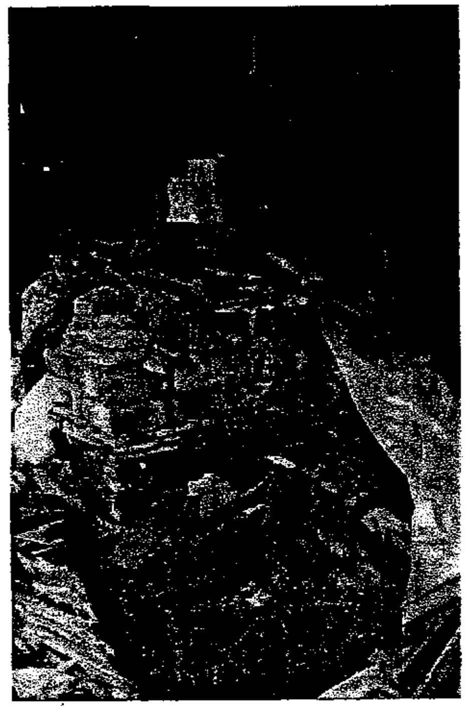
Photograph 9 Detail of microbiological growth on plaster

Some macrobiological growth in the form of small plants was also noted on the masonry. Should the environment around the bath house be altered to expose the masonry to a combination of daylight, high moisture content and a source of seeds and spores, a proliferation of plant growth would occur on the walls. These conditions would prevail if the bath house were given a protective roof, open at the sides. Plant seeds and spores would be deposited on the masonry by wind, by birds and animals and would readily colonise the clay mortar and plaster surfaces.

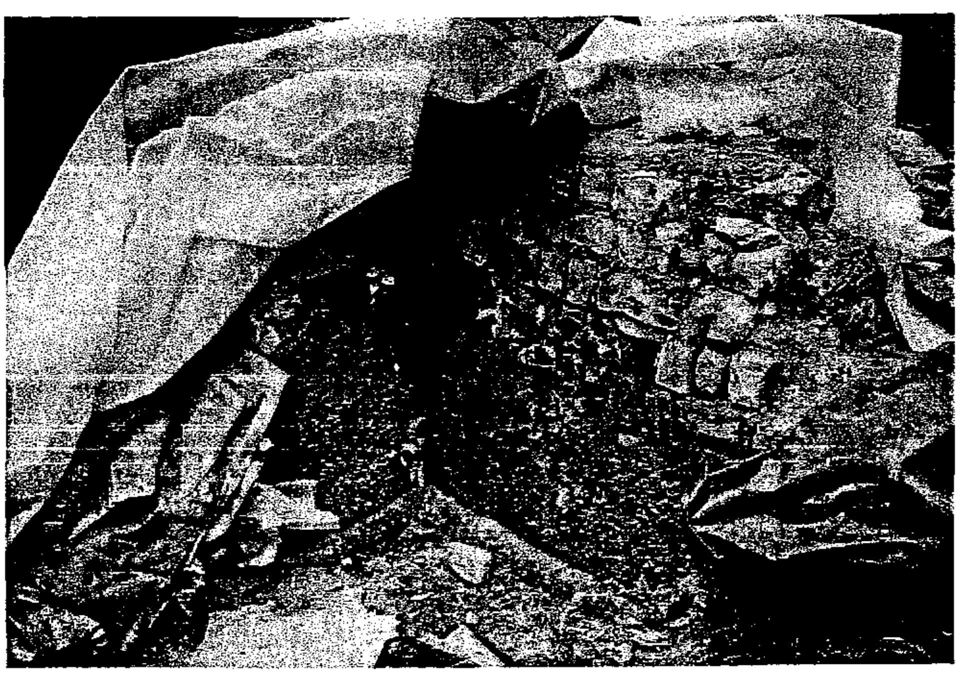
5. Light

As described above natural light plays a role in masonry decay by encouraging organic growth. At present masonry surfaces are protected from sunlight to some extent by the black protective sheeting.

Direct incident light would also dry out the masonry at an accelerated rate, potentially causing failure of earth mortars, as described above under 'Water / Moisture Content'.



Photograph 10 Organic growth on masonry in the north east corner of room I



Photograph 11 South west corner of room II. As in the photograph above, areas covered by transparent plastic sheet appear to support more organic growth than those covered in opaque black plastic

6. Animals

No evidence of nesting or burrowing animals was observed during the site inspection but the bath house presents an attractive environment for animals seeking shelter. Birds in particular often prove to be a nuisance on partially enclosed archaeological sites. Although the roof seems to have created an effective exclusion zone to wildlife, the roof sheeting is sufficiently damaged in places to allow birds to gain access and become trapped in the enclosure.

7. Vandalism

It appears that vandalism has not been a significant factor in the decay of the bath house masonry to date. This may be mainly due to its location, close to the golf course, but may be due in part to the protective sheeting which makes it difficult to access all parts of the structure. However, it is important to note that access is not difficult for curious children and there is evidence of climbing on walls (broken tiles); in addition to the danger to the fabric the site does constitute a significant risk to anyone gaining access. If the building were more accessible (for example under a roof structure open at the sides) it is likely that vandalism would increase.

8. Mechanical/Structural Failure

The bath house walls currently bear the load of the protective roof structure at corners formed between rooms. This is far from an ideal situation and it would be desirable to devise an independent support system especially bearing in mind damage which could result from any movement of the roof.

Photograph 12 View of the centre of the bath house (room I) looking west and showing roof timbers resting on bath house masonry

Certain sections of wall are at risk and display instability either in the form of cracks though the wall face with displacement of stones or leaning or bulging of the wall. Notable amongst these are the east wall of room I and the south west wall face of room V.

EMERGENCY STABILISATION OF BATH HOUSE AND PROTECTIVE ROOF

Measures urgently required to stabilise the fabric of the bath house and the protective roof structure include the following:

1. **Propping and securing unstable sections of roof and roof repair**

   While there is no doubt that the enclosure has protected the fabric of the bath house in the past it is ageing and deteriorating. Only a cursory inspection of the principal roof timbers, accessible from ground level was possible. Wet rot is present in some sections including include those of the northern section over rooms X and XI. 'Acrow' or timber props with head and cill plates need to be inserted under sound sections of timber. Diagonal bracing and strutting of the props may also be needed. Installation of any propping is a hazardous operation and the work will need to be carried out in accordance with current Health and Safety Regulations, including a risk assessment. Additional protection of the Roman masonry should be provided in advance to prevent accidental damage and all activity on site overseen by an appointed conservator.

   All roof timbers should be inspected thoroughly and any other decayed timbers propped in the same way. The condition of the roof cover could not be safely inspected, but it is in a degraded condition and could certainly cause damage if sections collapsed.

   Missing and damaged sections of roof cover which are admitting rain should also be replaced, subject to the same risk assessment.

   Site Security

   The site is at risk of vandalism and could cause human injury. As a matter of urgency access should be restricted by means of a secure lock on the present entrance.

2. **Supporting unstable masonry (face of east wall of room I and of south wall at door between rooms V and IX)**

   In the short term the few areas of very unstable masonry at risk of collapse may be held in place by buttressing with sand bags. This can be done very quickly and in advance of putting in hand the work of consolidating these areas of masonry.

   The face of the east wall of room I is bulging and appears unstable in general. The wall face should be supported in the short term with sand bags. Synthetic fabric bags (preferably of non-woven geotextile) sould be used; they are slightly less susceptible than their counterparts in natural fibre to damp and decay. The wall face may be protected by draping a layer non-woven geotextile over the top and face; the covering should not extend onto the floor or the added weight of the bags may exert a pull on the wall, further destabilising it. A sandbag buttress can then be formed by stacking and bonding the bags. Black polythene sheeting should be used to cover the exposed wall head.

The masonry face of the wall to the south of the door opening between rooms V and IX appears unstable with facing stones loose and cracks opening up around them. The wall end forming the entrance is in danger of collapsing into the door opening. The wall end and unstable wall face may be propped as described above for the east wall of room I. Normal shoring and strutting of bulged or leaning wall sections is problematic and the soft buttressing is seen as the best option in these locations.

Any other structurally unstable masonry should be supported laterally, either with sand bags or timber shores, depending on the location.

Photograph 13 Unstable section of masonry along the east wall of room I

3. Masonry Consolidation

These unstable areas of masonry will require consolidation at the earliest opportunity using stabilised earth mortar to secure facing stones. The mortar design is important to provide a repair which is visually unobtrusive and compatible in terms of its physical properties with the existing weakened bedding mortar. An appropriate mortar would in this case need to be developed on site by preparing samples. It is anticipated that the repair mortar should contain clay with well graded aggregate and a small amount of lime. Preparation of mortar samples and consolidation work should be carried out by a conservator or mason experienced in masonry consolidation in an archaeological context.

Consolidation will entail a combination of void filling and re-bedding of loose and displaced stones. Recording the location of loose and displaced facing stones must precede any taking down of facing stones. Recording can be done with a tracing frame holding polythene sheet in contact with the masonry face onto which the profiles of stones can be drawn. Photographs will also assist in locating individual facing stones. The stones should be numbered and marked on an unseen face and on the sheet as they are taken down so that they can be re-bedded in their original positions with the stabilised earth mortar.

OPTIONS FOR PROTECTION AND DISPLAY

The options for a course of action to protect and display the bath house are discussed below. They are listed in order of anticipated effectiveness, from the least effective to the measure most likely to ensure the long term preservation of the bath house.

1. Exposure of the bath house with preparatory consolidation of masonry

This option is not considered viable for one over-riding reason, the susceptibility of the bedding mortar and plaster to weather. To consolidate the masonry sufficiently to withstand the weather would involve virtual rebuilding of the faces and exposed wall heads with a more durable mortar, based on natural lime rather than the clay originally used. This would be a time consuming and laborious process and would rob the monument of its significance, its authenticity and intact and unaltered condition.

In general, masonry remains left exposed to the elements may be expected to disintegrate; this is particularly true for masonry bonded with clay. The remains of the Roman bath house and villa at Ashtead, Surrey, which are comparable to the Beauport Park Bath House in building type and construction, and also served an industrial site, the local brickfields, were excavated in the 1920's without subsequent protection and have virtually disappeared.[10]

There is no method of securing the friable plaster undercoats against the weather and these would soon be lost, as would the surviving *opus signinum*. The clay tiles of the floor and the exposed *pilae* would likewise suffer from the combined action of water, frost, salt and organic growth.

2. Retain existing protective structure

Whilst the existing roof structure has undoubtedly served to protect the building against the weather since its excavation, it is unfortunately near the end of its life. It admits rain water through holes in the cover and at junctions. Many of the roof timbers are decayed, particularly on the north section of the roof, and there is a real risk of collapse, posing a serious health and safety risk to anyone working within the enclosure. Although the condition of the roof is better on the south side, it cannot be relied upon to last much longer

With some temporary propping of the north section, the present structure might be relied upon to protect the bath house in the short term, until a decision is made on the best course of action.

3. Protective roof structure open at sides

Although a roof would obviously be a better option than no protective structure at all and would prevent rain from impacting on the masonry, the bath house would remain exposed to many other risks. The relative humidity and temperature would fluctuate even more than they do at present; the bath house would effectively be in

[10] A W G Lowther, "Excavations at Ashtead, Surrey", *Surrey Archaeological Collections*, vol 38, part 2, Surrey Archaeological Society, 1930, pages 132-148

an external environment. The fabric would be susceptible to high wind and horizontal rain, frost, plant growth and micro-biological growth, animals (notably birds whose droppings are a particular nuisance) and vandals. Soiling of various kinds, including dead leaves and other vegetation, would accumulate within the building. This would need to be removed at regular intervals.

It would be particularly difficult to control organic growth on the walls. A protective roof would admit a considerable amount of natural light around the sides of the bath house and would permit spores and seeds to be carried by air, birds and animals onto the masonry surfaces, encouraging plant growth. Small plants could be removed as they appeared but pulling them out by their roots will damage mortar and plaster. Micro-biological growth would be very difficult to control. Masonry biocides normally used for killing fungi and other growth cannot be recommended for masonry susceptible to soluble salts, or indeed for any intrinsically valuable masonry, since they contain salts. Frequent re-treatment is necessary with biocides since their effectiveness is short-lived, and potentially harmful biocide residues would accumulate in the masonry at a fairly rapid rate.

All the options of covering the bath house under a protective structure of some sort raise the question of how to deal with the floors, whether to leave them covered with sand or to expose them. If the intention were to open the bath house to the public a balance would need to be struck between access and protection. In their present state the floors are not suitable for visitors to walk on, either from the point of view of protecting the floors and pilae, or from a health and safety perspective. Holes in the floor exposing drainage channels and *pilae* are an obstacle to visitors.

Viewing Platforms

One solution for visitor access in the event of opening the bath house to the public is a viewing platform installed at a sufficient height to provide a view down into the rooms and the topography of the site makes this quite feasible. A viewing platform built within the rooms is another option but the location of supports would need to be considered carefully and such a structure could detract from the visual impact of the bath house, depending on its scale and construction.

4. Enclosed protective structure

An enclosed structure provides protection against more risks than any of the options listed thus far. It would be more secure against animals, vandals, wind and wind-blown debris than a protective roof, even if the latter had a perimeter fence. An enclosed protective structure which forms a complete envelope around the bath house would even afford some degree of environmental control. Such a structure could be designed to buffer the internal environment against the extremes of temperature and potentially to prevent the internal temperature from falling to near freezing temperatures.

Depending on the design and materials used in its construction, the structure could modify the internal environment in other ways. It could cause an increase in relative humidity at times and if glass were used in the construction could create a miniature green-house effect in summer. Possible effects on the internal environment are very difficult to predict with precision. Although the structure would prevent ingress of rain, the moisture in the ground and the masonry itself would probably maintain the relative humidity at a relatively high level. This would,

in turn encourage microbiological growth, probably at greater quantities than seen at present. Certain types of microbiological growth will thrive and the problem of microbiological growth on damp, enclosed masonry is a difficult one.
An enclosed building requires provision of ventilation to ensure adequate air circulation. This will assist to some extent in combating organic growth on the masonry.

Recent research suggests that organic growth can be controlled using UV-C (ultraviolet) light exposure over an extended period.[11] Growth on plaster has been treated and the rate of re-colonisation found to be low over an 18 month period. However this technique is still in the early stages of research and application and its use on such a large scale would be experimental. In any case the effect on such extensive growth into the depth of masonry face and corework may be insignificant. UV-C radiation treatment would need to be carried out at times when the building is empty.

In summary, an enclosed protective structure has numerous benefits but presents one substantial risk – a high relative humidity and increased microbiological growth on the masonry surfaces. The extent of growth would need to be monitored. It is possible that growth can be killed off at intervals using exposure to uv light. Such a treatment would require a source of electricity and the building design would need to incorporate this service.

Light is an important factor to be considered in the construction of the building. It is inadvisable to have windows which admit light, either directly or indirectly, onto the masonry surfaces since in combination with a high RH and damp masonry surfaces light will promote certain types of microbiological growth (typically those which are green in colour). Even total exclusion of daylight will not, however, eliminate all micro-biological growth; some species (for example bacteria and fungi) will thrive in darkness, provided moisture and nutrients are available.

In the absence of natural light, provision of artificial light will be necessary. The need for electrcity on site is problematic in this location. Consideration may be given to an alternative source of power for light and ventilation such as photovoltaic cells on the roof.

Since the microbiological growth has emerged as one of the most significant factors for protective structures it is advisable to consult a specialist who can advise on the types of microbiological growth already present on the masonry and which others might be expected to appear depending on the internal environment.

Drainage of Water from the Ground Surface and Roof

Any protective roof or building should have a perimeter drain at least on the north, west and east sides, to absorb surface water and water run-off from the roof. The drainage channel should be designed to collect water shed from the roof, via gutters and downpipes, depending on the design of the building.

[11] Katy Lithgow and John Stewart, "Conservation Strategies for Damp Buildings and Plaster: Lacock Abbey in Wiltshire", *Journal of Architectural Conservation*, no. 2, vol 7, July 2001, page 19

5. Enclosed cover building with environmental control

As discussed above under point 4 the provision of an enclosed building over the masonry remains will not be sufficient to prevent masonry deterioration and microbiological growth in particular will remain a problem.

Environmental control normally refers to maintaining a certain relative humidity and/or temperature within a building to specified levels. In the context of Beauport Park bath house effectively controlling the environment within an enclosed cover building would be very difficult to achieve. An environment can only be effectively controlled when the internal atmosphere is completely enclosed by an inert stuctural envelope. If the bath house were enclosed by a roof and walls around the perimeter the ground would remain a source of moisture and potentially of contaminants such as salts contributing to an elevated relative humidity in the building. Attempting to exclude this source of moisture by inserting a damp proof barrier/floor around the perimeter of the bath house may turn the bath house masonry into a wick drawing moisture through it.

It would be impractical to try to control the environment at Beauport Park in the way that the environment within a museum or gallery space can be maintained by mechanical systems which carry out constant monitoring and alter the temperature or humidity as necessary. Certain measures could, however, be made to modify the environment to some extent.

It would be useful to know the extent to which ground water feeds the moisture content of the bath house masonry. It would also be useful to confirm the geology of the immediate bath house vicinity. This could be achieved jointly by removing soil cores at selected locations around the bath house and monitoring the ground water level using a narrow pipe (piezometer) inserted into the drill hole left by extraction of the soil core. Little can be done, however, to prevent ground water making its way through clay into the masonry.

Installation of drains around the perimeter of the the bath house shelter to divert surface water away from the bath house may lead over the long term to a slightly lower moisture content in the masonry. A gradual change is better, in any case, since sudden changes in moisture content could be disastrous for the clay mortar and plaster.

Attempts to alter the environment by lowering the relative humidity are risky since they could have an immediate effect on the mortar and plaster on the face of the masonry. The moisture content would drop quite rapidly if the atmosphere suddenly became dry and the mortar and plaster could be weakened considerably.

On the other hand a very high RH, especially if coupled with a lack of ventilation, will present other problems, principally increased microbiological growth on masonry surfaces. If fresh air can be circulated this may assist in reducing levels of microbiological growth.

The building should be designed to act as a sufficient buffer against the external environment that the bath house is not at risk from frost. If it proves difficult to design a building which excludes the risk of frost a system of heating the space to a very low temperature can be installed. Overhead convector heaters connected to a thermostat are used by the National Trust at Chedworth Roman villa to ensure that the temperature does not drop below a certain level (5°C).

The option of constructing a protective building with limited environmental control carries the responsibility of a long term commitment to inspection and maintenance of the building and the bath house on a regular basis, treatment of microbiological growth at intervals and cleaning. Although the Beauport Park Archaeological Trust may be able to carry out regular inspections and some maintenance work, it may be necessary to commission others to carry out masonry consolidation to selected areas which might suffer, for example, from decay of the earth mortar and require consolidation. An ongoing expenditure on such masonry consolidation and care of the building should be anticipated in addition to the initial cost of construction and installation of services such as electricity and ventilation.

6. Re-burial

The option of re-burial may be the least risky for the bath house in the long run and the most economic. Only the complete re-burial option can be recommended; any half measures of partial burial and periodic exposure carry various hazards for the bath house fabric.

Re-burial should be preceded by an extensive survey and black and white photographic record; ideally rectified photographs should be taken of elevations from which scaled drawings could be produced. This record should be lodged with the National Monuments Record in Swindon and with the Sussex County Council Sites and Monuments Record to form a permanent archive for the site. Unstable sections of masonry will still require consolidation using stabilised earth mortars prior to re-burial.

Re-burial would entail first covering all wall and floor surfaces with a sand/soil mixture. The standing walls are a difficult subject for re-burial owing to their considerable height. It is likely that re-burial can be most effectively achieved by carefully buildigg up sand bag buttresses (containing sand and earth in hessian bags) against the walls. The rooms can be filled in with soil of a similar pH to that of the local soil and that contained in the clay bedding mortar itself. The whole area should be covered with a turf-covered earth mound, partially covering the depression in the hillside in which the bath house sits. A geotextile membrane should be incorporated to inhibit penetration of roots. The depth of soil above the wall tops should be a minimum of approximately 1 metre to protect against future soil erosion. The turf would need to be kept clear of any large plants with invasive roots. Geogrids (meshes) may be necessary to secure any slopes from subsidence and a drainage system sould be in place, depending on the profile of the soil covering.

It is generally recommended that sand used in re-burial be clean, free of salts, and low in iron content to avoid iron staining. The sand should be well graded from fine to coarse.

In this event the moisture content of the masonry will be high, corresponding to the local soil conditions, but the soil environment should remain relatively constant. Masonry materials, stone and lime generally remain stable in a buried environment provided the soil conditions are constant. At the depth suggested temperature is will not alter substantially and there would be no risk of frost.

Partial re-burial whereby part of the bath house (for example the floors) are buried and other parts (for example the upper sections of walls) left exposed is not a safe option for the fabric. Exposed sections of masonry would deteriorate at an accelerated rate due to the susceptibility of the bedding mortar. These sections could only survive exposure if they were extensively consolidated with a more durable mortar based on natural lime, compromising the authenticity of the fabric.

Periodic exposure of sections of the bath house is not recommended. It is best to leave the remains once buried to reach a stable equilibrium with the surrounding soil.

General Criteria for a Protective Building

The following are ideal standards for the design and construction of a protective structure over the Beauport Park Bath House:

- *Shelter from climatic elements*: full protection against the most harmful components of local climate, principally rain, fluctuations in temperature, especially frost. Should also exclude wind-borne seeds and spores.
- *Lighting*: In the case of Beauport Park the control of organic growth (or at least of photosynthetic growth) by excluding natural light is important. Even artificial lights can sustain some species of microbiological light.
- *Drainage*: dispersal of rainwater away from the roof and structure; and diversion of surface water.
- *Security*: controllable public access against unlawful entry, theft and vandalism as well as the exclusion of animals.
- *Ease of maintenance, monitoring, cleaning*: the design of the structure should facilitate routine maintenance (painting, mechanical installations, etc.), without the need to bear on any part of the Roman building. The new structure should not obscure any part of the building, and should allow regular cleaning and monitoring of condition. It should also exclude external soiling agents.
- *Stable internal climatic environment*: the building needs to create, preferably through passive means, an internal climate, which reduces the rate of deterioration of Roman masonry and plaster. Ventilation must be sufficient to prevent a stagnant environment with a very high RH, which would encourage certain types of organic growth – mainly fungi (moulds) and bacteria. The use of UV-C radiation, recently employed at historic sites to control microbiological growth, is an active method of controlling the internal environment.
- *Minimal disruption of archaeology*: foundations of the new structure should cause minimal disturbance of adjacent buried archaeology, which needs to be professionally excavated and recorded.
- *Structural separation from ancient fabric*: in order to minimise risk, the new building should not bear directly on any part of the ancient fabric, nor be structurally fixed to it.
- *Disaster prevention*: the structure should be built of materials resistant to fire

- *Environmental monitoring, recording* and understanding ambient conditions are the basis of good curation and maintenance of an environment based on the principles of preventive conservation. This is achieved by electronic means in real time, before and after construction of the cover building. Monitoring enables the confirmation that the new regime is effective, and the identification of (e.g. mechanical failure). It requires staff able to download and process data on a dedicated software programme.

- *Public circulation*: it is self-evident that the visiting public should not be allowed to walk on, or come within reach of fragile remains

- *Maintenance*: The success of a protective cover is only as good as its state of repair. A cyclical programme of maintenance is most effective. This consists of:
  a) Regular cleaning of the site on a daily/weekly/month/annual basis, according to a prescribed schedule and specification, by trained staff.
  b) Small routine operations: e.g. cleaning of gutters, drains.
  c) Medium term operations: e.g. painting.
  d) Long term operations: e.g. roof replacement.
  e) In addition, there needs to be a regular inspection (e.g. every five years) by a trained surveyor/architect, in order to specify and programme repair works.

In general, the building materials and appearance should be subordinate to building function and design. The building design sould be guided by the criteria above. The clay-bonded masonry of Beauport Park bath house masonry is particularly susceptible to various agents of decay and presents an unusual challenge in terms of design. It is recommended that flexibility be built into the design, especially in the lighting and ventilation of the building. Lighting could be artificial or it could also consist only of natural light admitted through sliding panels in the sides of the building. Ventilation can be installed as a separate mechanical system or built in as slatted or louvred panels which can be opened or closed, as required.

Archaeological Investigation

Any excavation in the area around the bath house, such as that required for installation of drainage or for building foundations, would be subject to consent from English Heritage and the Local Planning Authority. It is likely that trial pits *will be required* to confirm the extent and nature of any archaeology in the area to be excavated and that a watching brief will be necessary during the course of excavation.

Cost Implications

It is difficult to provide firm guidance on costs for either re-burial or a protective structure since these proposals need to be further discussed and developed. At this stage only very approximate figures can be given. Anticipated costs should include materials, labour (contractor) on site, and professional fees for architect, designer, and mechanical and services engineer.

A budget cost of £40,000 may be anticipated for re-burial. To construct an enclosed building over the bath house would cost in the order of £200,000. These costs could vary significantly depending on the design and detail of the building and issues of access and security have not been addressed. These figures are intended as general guidance on the comparative costs of the two options.

It is anticipated that measures to protect the bath house, including recording and re-burial, would be eligible for grant funding from English Heritage.

RECOMMENDATIONS

Emergency Measures

Immediate measures are necessary to stabilise the northern section of the roof structure whose timbers are extensively rotted locally. Propping should secure the timbers in the short term.

Sections of the bath house wall require temporary support using sand bags to form buttresses, as described above under "Emergency Stabilisation". Areas which are at risk of imminent collapse of facework include the east wall of room I and the west wall of room II, south of the door opening between rooms II and V. These areas also require consolidation, filling of voids and re-bedding of sections of facing stones.

The bath house needs to be secured against unauthorised entry as the site poses a hazard to visitors and the masonry is at risk of damage from vandalism.

Assessment of Significance

Further discussion about the significance of the bath house is essential as it has a fundamental bearing on the selection of the most appropriate option for protection and conservation of the Roman masonry. The historic and archaeological importance of this particular bath house needs to be appraised by a forum of experts in terms of its local, regional, national and even international significance.

Protection and display of the bath house

The most obvious forms of decay to date have been ongoing erosion of earth mortar from the wall face (the mortar around the stones), which makes the face structurally unstable, and loss of plaster. The plaster and mortar are in a weakened condition. Organic growth of various kinds is probably the single most significant factor in deterioration of the bedding and core mortar of the bath house masonry. Growth will continue to grow and penetrate into the walls to cause further disruption of masonry.

Re-burial of the bath house subsequent to thorough recording is the option presenting the least risk to the fabric and has added benefit of being less costly than enclosing the bath house in a protective structure, both in the short term and in terms of ongoing maintenance. The bath house is unlikely to draw, in itself, sufficient visitor numbers to warrant the expense of the protective building with limited environmental control which is considered the next best option.

If the option of an enclosed protective structure is to be pursued the aim should be to design a building that will provide the most stable environment, to minimise other interventions to the Roman masonry. The design criteria set out on the previous pages should act as a guide. A building that will be dark when closed is recommended to inhibit organic growth. Ventilation is, however, necessary to avoid a stagnant environment where fungi and bacteria will thrive. A flexible building is the ideal: one where natural light can be admitted by large openings when required and that is well ventilated through slatted or louvred panels but which is also sufficiently insulated against freezing temperatures.

Whatever the nature of the protective building, masonry consolidation will be necessary in the short term to prevent further loss of fabric, especially facework. Some of this work needs to be carried out as soon as safe access is available to the site to avoid localised collapse. The full extent of work required can only be fully assessed by a thorough survey once all the various coverings have been removed. It is not unreasonable to anticipate that the cost of work necessary to prevent loss of fabric within the short term, which should be carried out only by conservators suitably experienced in the conservation of masonry in an archaeological context, will equal or exceed the cost of re-burial (£40,000).

Recording

It is important that the fabric be thoroughly recorded and the record lodged with the National Monuments Record and the Sussex Sites and Monuments Record. This should be a pre-condition of re-burial. If the option of a protective structure is chosen, some ongoing loss of fabric is bound to occur in the long term, whatever measures are taken, and the best way to preserve what survives now is to produce a record. This should consist of black and white medium or large format rectified photographs of elevations (1:10 or 1:20 scale) and general views. Scaled elevation drawings can be produced from rectified photographs.

The painted plaster fragments have not been analysed in detailed and would furnish information about pigment types and possibly painting techniques.

Additional Survey Work

The following additional survey work would assist in assessing the impact of erecting a protective structure over the bath house:

- analysis of water soluble salts, their type and quantity
- microbiological survey of organic growth on the masonry

It would be helpful to have a better picture of the internal conditions (temperature and relative humidity) within the present structure; this information would feed into the design and specification process for a new structure. This can be achieved by leaving small monitors on site from which the information can be collected, typically on a monthly basis.

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LIST OF PHOTOGRAPHS

GLOSSARY OF ROMAN BATH HOUSE TERMS

Apodyterium	Changing room
Balnea	Bath house
Bessales	Square tiles – $^2/_3$ foot x $^2/_3$ foot (19.7cm x 19.7cm)
Caldarium	Hot room
Classis Britannica	Romano-British fleet
Frigidarium	Cool room
Hypocaust	Roman system of under floor heating. A furnace (praefurnium) heats air under the floor which is then circulated through walls via hollow tiles set into plaster on walls (*tubuli*) or by *tegulae mammatae*
Imbrex	Tile roughly sem-circular in section that covered the junction between tegulae on a roof
Opus signinum	Mortar designed to be waterproof for lining cisterns and pools. Vitruvius describes its composition of lime and crushed lava (Vitruvius VIII, VI, 14). Term also applied to a mixture of lime and crushed tile.
Pilae	Small pillars located on a regular grid supporting the hypocaust floor (*suspensura*), usually made of brick or stone
Praefurnium	Furnace
Sesquipedales	Square tiles - 1½ feet x 1½ feet (44.4 cm x 44.4 cm)
Suspensura	Floor supported by pilae in the hypocaust system (Vitruvius 5.10.2-3)
Tegula	Roofing tile, flat with raised edges to correspond with imbrex tiles
Tepidarium	Warm room
Tubuli	Box flue tiles; hollow terracotta tiles secured to walls by mortar or mortar and metal fixings, often with additional holes in the sides to connect the flues laterally. Box flue tiles allowed the hot gases from the hypocaust to heat the walls. *Tegulae mammatae*, large square tiles with projecting "nipples" at their corners could be fixed to walls as an alternative system for creating a cavity through which the hot gases could travel. See Yegül, *Baths and Bathing in Classical Antiquity*, pages 363-365