PENTRWYN COPPER SMELTING SITE EXCAVATION, 2011
GREAT ORME, LLANDUDNO, CONWY
GAT PROJECT G2178
PRELIMINARY REPORT

GAT Project No. 2178
Report No. 1029
March 2012

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust
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PENTRWYN COPPER SMELTING SITE EXCAVATION, GREAT ORME, LLANDUDNO, CONWY, 2011 (GAT PROJECT G2178)

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Prepared for
Cadw

March 2012

By
George Smith
with an assessment of the archaeo-metallurgical material
by
Alan Williams

Cover: Excavating the grey layer (117) in the top of the V-shaped feature [114] from the south

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RESCUE EXCAVATION AT THE BRONZE AGE COPPER SMELTING SITE AT PENTRWYN, GREAT ORME, LLANDUDNO, CONWY, 2011

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1 SUMMARY

In 1997 eroding deposits were identified at the east side of Pentrwyn headland, Great Orme, Llandudno, Conwy, by David Chapman of Ancient Arts, Deganwy. He noted material indicative of early activity, including fragments of shell, bone, charcoal and copper slags. The proximity to the Great Orme Bronze Age copper mines, and the possibility that the site was of prehistoric site gave it great potential value. A rescue excavation grant-aided by Cadw was carried out in 1998 by Gwynedd Archaeological Trust. This work indicated an upper deposit of Medieval date and a lower deposit of Bronze Age date, broadly contemporary with the prehistoric exploitation of the Great Orme mines. Pentrwyn was shown to be the earliest known copper smelting site in Britain. A small area of the occupation deposits as well as lower layers and a V-shaped feature remained. In 2010 it was noted that these were undergoing further erosion and a further brief rescue excavation was carried out, again grant-aided by Cadw. The excavation recovered further archaeological material from the activity layer associated with the copper smelting, which will allow more detailed analysis and radiocarbon dating. It also showed that the lower layers, not excavated in 1998, were largely natural and unrelated to the copper smelting activity.

2 INTRODUCTION

The value of the site had been proved by the previous excavations in 1998. This had produced evidence of both domestic activity, in the form of food debris and charcoal, and of copper smelting in the form of copper slags. Geochemical sampling carried out in 2010 also produced high levels of copper, both in the activity layer and in the V-shaped feature beneath the activity layer (Doonan 2010). Evidence of metallurgical activity of the Bronze Age is rare and the opportunity to study it is therefore extremely valuable. An interim archaeological report on the 1998 excavation was produced as well as specialist reports on the various types of material (Hopewell and Jones 1999). No final report was published, apart from a brief report in Archaeology in Wales (1999 Vol. 39, p. 79), largely because of the length of the scientific reports. Ongoing erosion of the remnants of the site, with archaeological material falling onto the road below, was observed in 2010. This was notified to Cadw and a rescue recording project was proposed, agreed and subsequently carried out in May 2011.

This report provides and interim description of the excavations up to assessment report stage. Specialist reports and radiocarbon dating are either in progress or are proposed.

Acknowledgements

The project was grant aided by Cadw. The area of work is within a Site of Special Scientific Interest and thanks go to John Osley, Area Warden for the Countryside Council for Wales for granting conditional permission for the work. The area belongs to the Mostyn Estate and falls within the Great Orme Country Park. Thanks go to Richard Thomas of Mostyn Estate office and to Sally Pidcock of the Great Orme Country Park for permission to excavate. Thanks also go to Emma Anthony of Conwy County Borough Council for permission to use the Marine Drive. The work involved a small amount of excavation and a large amount of sieving work carried out by volunteers, David Chapman, Cliff ‘Beaver’ Hughes, Jeff Marples and Rhys Mwyn. Off-site palaeo-environmental soil flotation was carried out by Gill and Richard Collier. Scaffolding for access was provided by RS Scaffolding (NW), Llandudno and site services by Elliott Glasfryn Hire.

3 OBJECTIVES

As the earliest metal working site in Britain Pentrwyn is undoubtedly an important site and the eroding remains needed to be properly excavated and recorded. Because the archaeological layers survive only on a narrow ledge, exposed in a near vertical face of the steep slope about 4m above the nearby road there was no possibility of making the remains stable. It was therefore proposed that a short course of excavation should be carried out to excavate and record the remaining deposits and to complete the publication of both excavations. The production of more archaeological evidence would provide the possibility of greater understanding and of producing more dating evidence. If more metallurgical evidence was produced then this might also contribute to current research into early copper mining and the provenance of Bronze Age bronze objects.

4 METHODS

The excavation was carried out over two weeks in late May 2011. The aim was to continue excavation from the point at which it was left in 1998. This involved removing and storing the backfill from the previous excavations, then hand cleaning and recording the exposed, eroding cliff face deposits and excavating the remaining deposits in plan, from the surface. A small additional area about 1m wide was to be excavated to the north of the 1998 trench as it was clear that the archaeological deposits were continuing there. A scaffold platform was erected against the cliff face to allow access

All the work was carried out by hand. All deposits were wet-sieved to 1mm mesh partly on-site during the excavation and partly off-site at a later date. Bulk samples were also taken from each of the main contexts for off-site flotation for palaeo-environmental remains. After sieving and flotation, stone residue samples were dried and hand-picked for additional artifacts. The stone residues were also examined by the metallurgy specialist, Alan Williams, using a rare earth magnet, which lifted out a considerable number of additional metallurgical particles, including ore and slag (see assessment report below).

After excavation the remaining backfill and stored stones were used to re-instate and consolidate the surface and face of the ledge. The face was also strengthened by pinned steel woven fencing mesh.

5 TOPOGRAPHIC AND ARCHAEOLOGICAL BACKGROUND

The site is situated at SH 7812 8377, on the east side of the Great Orme peninsula and on a local headland, known as Pentrwyn (Head of the Nose). It lies on a narrow, east-facing ledge at *c*. 45m OD, at the foot of vertical limestone cliffs. Below the cliffs is a steep slope, which, some way below, terminates at further vertical cliffs, created by sea erosion. The steep slope is grassed-over scree that derives from heavy thermoclastic weathering at the end of the last ice age. The narrow ledge is just a small remnant of what was once a wider terrace around the Great Orme, along which was a natural route, known as ‘Cust’s Path’. This was largely quarried away in the late 19th century during construction of the present Marine Drive road, from 1875 to 1878 (Wynne Jones 1975, 45). The ledge must originally have been several metres wide and so the archaeological deposits must once have been more extensive.

The east-facing location of the site below high cliffs gives it good shelter from the prevailing westerly winds. Although the ledge is in quite a remote location it lies only some 300m south of a natural, sheltered quay, near which is a cave, Pigeon's Cave, where Late Bronze Age tools have been found (Savory 1954, 51).

6 RESULTS OF THE EXCAVATION

The excavation aimed to continue from the two previous episodes of excavation at Pentrwyn, in 1998 and in 2005. It is necessary to describe these first in order to understand the 2011 results. Context numbers used in the 1998 excavations were from the block 1-100. In the 2011 excavation some of these layers were excavated again but all layers and features were given new context numbers from 101 onward.

In January 1998 Gwynedd Archaeological Trust carried out a topographic survey of the site and then excavated an area of 2.2m by 1.8m, regarded as about 70% of the archaeological deposits surviving on the terrace (Jones and Hopewell 1999). In 2005, after further erosion was observed, Susan Jones and David Chapman carried out a small excavation of the upper part of the small amount of remaining deposits.

The 1998 excavation

After removal of the topsoil the excavation first identified a large shallow sub-circular pit (025). The fill of this produced burnt stone fragments, animal bone fragments, marine shells (mainly limpet) and a whetstone. Pit 025 cut a smaller pit, 031, the lower fill of which (036) was charcoal-rich. Charcoal from this layer produced a radiocarbon date of cal AD 1035 to 1285 at 95% probability (Beta-127077). Pit A031 cut a thin layer of burnt debris, A023, which contained charcoal, slag, burnt stone and unburnt animal bone fragments. All these features and layers cut or overlay a lower layer of grey silty clay 002/010/020/028. In places this lower layer lay directly below the topsoil, because of recent erosion on the terrace. In one of these areas this lower layer was overlaid by a thin sub-circular patch of dark material, 021, *c*. 200mm diam. and 30mm deep (Fig 4A). This overlay a small conical hole, 030, 40mm diam. and 120mm deep, filled with charcoal–rich silt, 029, which contained fragments of slag and some vitrified material. Charcoal from this feature produced a radiocarbon date of 1755 to 1415 cal BC at 95% probability (Beta-127076). This feature lay directly below the topsoil but cut into the grey silty clay, 002/010/020/028 and so could belong to activity associated with that layer, stratigraphically predating features 025 and 031.

The grey silty clay, 020/028, was the lowest layer excavated. On its surface, and so not well stratified was a fragment of shale bracelet. Within it were animal bone fragments and pieces of slag and ore. Part of this layer continued to the north of the area and was left unexcavated and so further excavation was carried out in this area in 2005 and 2011.

Removal of the grey silty layer revealed a layer of buff-pink clay, 004/052, the top of which produced a few fragments of animal bone and shell, probably derived from the layer above. Although excavation ceased at this level in 1998 the layers below were exposed and recorded in the cliff face section. The pink clay layer appeared sterile and possibly natural but it overlay a thin dark grey horizon, 05, which was interpreted as a possible buried soil. This in turn overlay stony, buff-pink clay 09, which filled the V-shaped feature, 06.

The 2005 excavation
An area of *c.* 1m by 0.5m was investigated immediately north of the 1998 excavation area. The topsoil was removed and part of the surface of the underlying grey silty layer 020/028. This revealed a diffuse, shallow patch of slightly more yellow material, which was retained for possible analysis. Below this patch two small sub-circular features were found, one being fully excavated with the fill retained and the other half-sectioned and the fill retained. The excavation and recording of these features was completed in 2011.

The 2011 excavation
In 2011 the backfill of the 1998 excavation was first removed. This was easily done as plastic net-mesh had been placed at the base of the excavation before backfilling. The exposed surface was then cleaned and recorded (Fig. 3A). The eroded cliff face was then cut back slightly and the section re-drawn (Figs 4A and 7). New context numbers were given from a block beginning at 101. During the excavation a West-East cross-section was recorded through the centre of the V-shaped feature (Figs 4B and 9).

After removal of the 1998 backfill the surface exposed showed pieces of limestone rock protruding through a matrix of buff-pink clay (116). At the south end of the trench was a remnant of 1998 pit 025 and at its base was a remnant of its charcoal-rich lower fill.

At the north end of the trench a remnant of an upper layer 102/104, excavated in 1998 survived within a horizontal fissure in the rock under a slight rock overhang (Fig. 3A). This layer is equivalent to the 1998 layers 002 (lower topsoil) or 026 (top fill of pit A025). This layer was dark grey humic silt containing heat-shattered pebble fragments, animal bone fragments, limpet shells and charcoal.

Layer (102)/(104) overlay a continuation of the dark grey silt excavated in 1998 (020/028). At the west side it was dark grey, context (107), and extended a little way into the horizontal fissure under the rock overhang. It had one charcoal-rich patch which proved to overlie a horizontal limestone slab (Fig. 3A, 3B). At the east side was a lighter grey silt, context (108), possibly ashy and this produced several copper prills (Fig. 8). This was the area where the lighter-coloured patch had been recorded in 2005, retrospectively given the context [129]. In this area were also two small features, [109] and [111], one of which had been sealed by context [129]. These features were sub-circular in plan, almost vertical-sided but tapering at the base. [109] was 100mm diam. and 100mm deep. [111] was 90mm diam. and 150mm deep. The fills were slightly darker and more charcoal-rich than the general layer (108) into which they were cut, [111] also cutting into the layer (116) below.

The dark grey silty layer (107) was at its deepest, *c.* 250mm, against the cliff face at the west, becoming shallower to the east, with no perceptible stratigraphic relationship to layer (108) which also became shallower to the east, so it did not appear in the north-south section (Fig. 4A). However, both layers lay abruptly over the layer (116), below (Fig. 9).

Layer (116) was an approximately horizontal deposit up to 0.40m deep, of buff-pink clay containing numerous angular limestone fragments. It first appeared to be sterile, being non-humic and with no visible animal bone, marine shell of charcoal. However, during excavation occasional pieces of charcoal were seen, which suggested that it was a re-deposited layer, whether natural or anthropogenic. It seems too substantial and homogeneous to have been humanly re-deposited so perhaps derived from an episode of severe natural weathering of surrounding stony clay deposits. However, the recovery of charcoal from the layer suggests that it may have been humanly

deposited. This could have happened during the copper smelting episode as suggested by the recovery of a quantity of metallurgical particles from within layer (116) (Tables 1 and 2).

The clay layer (116) abruptly overlay a thin dark grey layer (117), which had been observed in the eroded section face in 1998 and interpreted as a possible buried soil layer (05). Layer (117) was silty, almost stone-free and quite different to the stony clay layer (116) above and (118) below. (117) was lighter at its surface, becoming darker grey with depth and its darkest colour was at the point where the layer dipped slightly over the centre of the V-shaped feature [114] (Figs 4A and 7). This indicates that the V-shaped feature was partly extant when the dark layer (117) was formed. Layer (117) continued, somewhat lighter in colour to the north, beyond the excavated area (Figs 4C and 10). Two flint flakes, a small amount of charcoal and a few fragments of burnt bone were found in (117) supporting the suggestion that it was a buried old land surface although there was no metallurgical evidence. The sealing of this layer by the deep clay deposit (116) suggests that it preceded the upper deposits containing the metallurgical material by some time.

In the south-north section the edges of the V-shaped feature were not clearly defined but the feature as a whole appeared quite substantial, approximately 0.80m wide at the top and 0.50m deep (Fig. 4A). The fill (118) was light buff-pink clayey silt with numerous angular limestone fragments at various angles and its base was defined by a larger slab of limestone lying at an angle. However, when excavated in plan the feature proved to be just a shallow remnant, with a steep sloping side continuing only 200mm further west beyond the section face, as seen in the west-east section b – b2 (Fig. 4B). Its fill was very similar to the surrounding deposits (119) and (120), which, with the absence of charcoal, bones, marine shells or other artefacts gave the impression that it had originated as a natural erosion feature. The lack of artefacts was confirmed by the subsequent sieving and flotation.

7 ARTEFACTS

The finds are summarised by material in Table 1. The bone, shell and charcoal are not quantified by item as these have not yet been studied. The greatest quantity of objects came from layer (107), the grey silty layer that must have been an occupation horizon. There were fewer objects from most other layers. Small mammal bones and land snail shells occurred in all layers and are likely to be intrusive natural fauna. Pieces of other bone and of charcoal were all small and fragmentary. Some marine shells were complete but there were also many small fragments in the sieving residues, perhaps a result of trampling during occupation.

Table 1 Summary of finds (bone, shell and charcoal by bag)

Context	*Bone*	*Shell*	*Charcoal*	*Stone*	*Flint*	*Pot*	*Metallurgical*
102	1	1	2			1	16
104	3	2	3	1			32
105							3
107	4	4	4	1	1		>270
108		1				1	122
108/116							17
116	1	1	3				206
117	1		1		2		

118			1				
127	1	1	2	2			27

Artefacts associated with metallurgy were all small, mainly < 10mm and so the majority were collected during sieving or subsequent residue sorting and consisted of copper prills and small pieces of slag, sometimes incorporating copper prills. Examples of ore were difficult to identify amongst the mass of limestone fragments, most being collected by magnet from the stony residues after sieving and drying. There was a noticeable absence of *in situ* or loose burnt or vitrified clay that could derive from furnace lining. The archaeo-metallurgical material has been recorded in detail, photographed and some preliminary studies made by R.A. Williams, whose assessment of this material and its potential is included below.

Two pieces of pottery were found. One, from layer (102), was a small plain undiagnostic fragment of hand-made, heavily grogged fabric. The other came from the interface of layers (108) and (116) and was a small thin bodysherd of fine hand-made fabric with two incised lines that could be decoration. The latter could possibly be Beaker but seems of too hard a fabric (F. M. Lynch, pers. com.).

There were three pieces of flint. One, possibly an accidental flake from a pebble, came from layer (107). Two certainly struck flakes came from layer (117). Both are tertiary flakes and deeply corticated, probably showing the pervious or alkaline nature of the surrounding soil. One has possible evidence of utilisation. Although these two pieces are not diagnostic in terms of date they do show that there was human activity prior to the deposition of the buff-pink clay (116).

8 ASSESSMENT OF ARCHAEO-METALLURGICAL MATERIAL FROM THE 2011 PENTRWYN ARCHAEOLOGICAL EXCAVATION, GREAT ORME

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Summary
An assessment of the archaeo-metallurgical finds from the Pentrwyn site on the Great Orme has shown the presence of over 500 slag particles from 1mm to over 12mm in size. Although the quantity of material is small and material fragmentary it represents important evidence from the only known site of probable Bronze Age smelting activity in Britain. With the use of various scientific analyses the material could offer important evidence about Bronze Age smelting technology and establish a link to the Great Orme mines and British Bronze Age metalwork.

Methods Used to Obtain the Archaeo-metallurgical Material
Most of the archaeo-metallurgical material was obtained by the excavation team by painstakingly processing all the excavated spoil from each context by hand in the following ways:-

- Washing & Screening. Each bag of spoil was wet screened at 1mm
- Hand picking was then used to isolate items of archaeological interest including charcoal, pottery and archaeo-metallurgical material.
- Rare Earth Magnet. A further stage was suggested and implemented by the author by the innovative use of a powerful industrial rare earth rod magnet which was passed over the 1mm screened material from each context resulting in many addition metallurgical particles being

recovered as well as many naturally weakly magnetic particles which were then separated using a binocular microscope.

Assessment Work Programme

The collected archaeo-metallurgical material was labeled by context and logged with any relevant information. The assessment undertaken so far has included the following steps:-

- Rewashing and cleaning of the collected material where necessary.
- Examination using a binocular microscope to isolate metallurgical material from the natural materials.
- The metallurgical finds from each context were described, numbered, weighed, tested with a hand magnet and logged on paper.
- The key data was then transferred into an evolving MS Access database with photographs being taken of most particles or groups of particles.
- An initial polished section of four of the slag particles was prepared after mounting them in resin. The samples were ground and then polished down to one micron.

Assessment Results

The number of particles considered to have a metallurgical origin in each context is tabulated below. The typical size of most particles was between 1mm and 10mm but a few were up to 20mm in their maximum dimension. Natural particles identified (e.g. stone and natural iron oxide) are excluded.

Table 2 Quantities of archaeo-metallurgical material by context

Context Number	Total approximate number of particles (from all samples in that context)
102	16
104	32
105	3
107	> 270
108	122
108/116	17
116	206
127	27
117	0
118	0
Total	> 515

The metallurgical particles were all apparently copper slag and showed a number of similarities as well as some differences. Key observations are summarized below: -

- The small size of the material with most particles being 1 to 10mm in size with only a handful up to about 20mm. (Figure 1). One possibility is that the slag had all been crushed to extract the copper metal particles.
- The quantity of material was very small (final figures are being assessed but only a few hundred grams) and this does not indicate large scale smelting activity although most of the site may have been lost during the construction of the Marine Drive in the nineteenth century.
- The unweathered (or less weathered) core of most of the particles is composed of a black slag of varying hardness, porosity and texture. These core areas, especially on the largest particles could hold the most precious information.

- All the slag particles show varying degrees of deep weathering which is seen by the presence of light green secondary copper minerals (carbonates? to be identified) and brown secondary iron oxides. Also many particles are covered in a light brown coloured dust from the layer in which they originated.
- Particle morphology was very irregular often showing nodular features. Some particles were more porous and had smoother outlines.
- A polished section of four slag particles revealed the presence of microscopic areas of copper metal within two of the largest particles from context 107. (Figure 2)

Potential Importance of the Material

The Pentrwyn site is the only know probable Bronze Age site in Britain showing metallurgical residues that are suspected of being from copper smelting. So even though the current material is small in quantity and fragmentary with no clear smelting furnace being found, the site is the only one known and is therefore of national importance providing clues to Bronze Age smelting technology.

The key questions the metallurgical material may help to answer are:-

- Was malachite (secondary carbonate) ore and/or sulphide ore being smelted here?
- What type of smelting process was being used and what was the likely temperature? Was it the type of process that left minimal slag?
- Were the ores from the Great Orme mines being smelted at this site?
- Can the trace element signature in the microscopic copper particles be used to link this copper with Bronze Age metalwork analyses?

Some work was done by previous investigators on material from the 1998 excavation from context 21 and work on all the new material from all the additional contexts should throw new light on the technology being used. New carbon 14 dates on the charcoal should clarify the single Bronze Age date obtained previously.

Recommendation

To help answer the key questions given above it is recommended that a range of analytical techniques be deployed depending on available funding and these will include at least two or three of the following – reflected light microscopy, SEM-EDS analysis, lead isotope analysis, XRD and trace element analysis.

Results from this investigation will be written up and submitted for publication in a suitable journal.

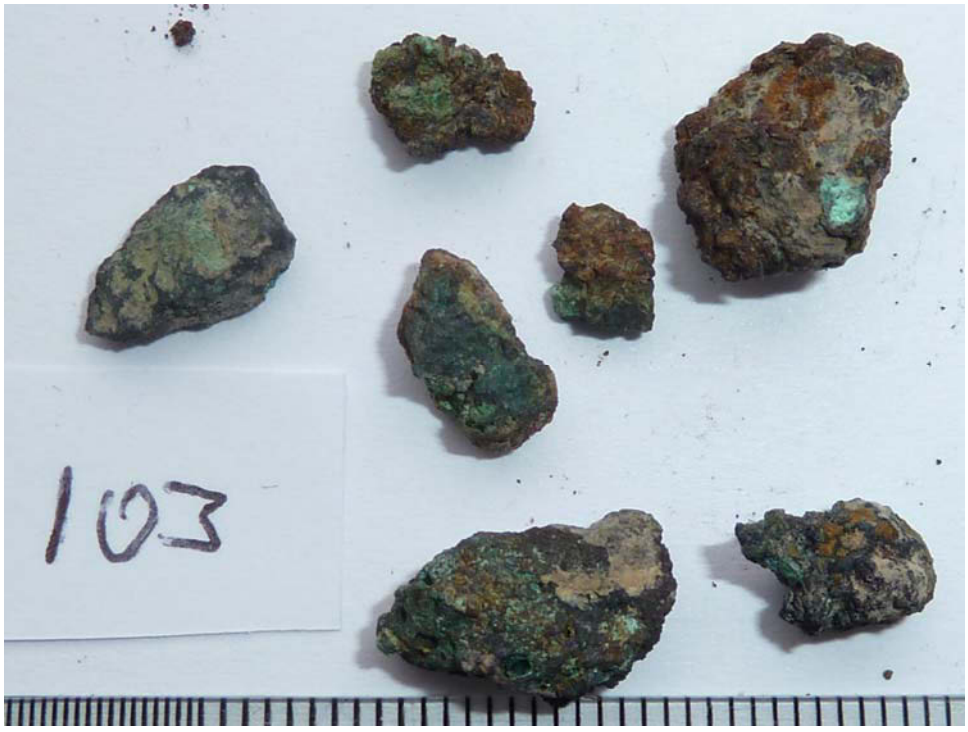

Figure 5 Pentrwyn archaeo-metallurgical material from context 107. The major scale is millimetres.

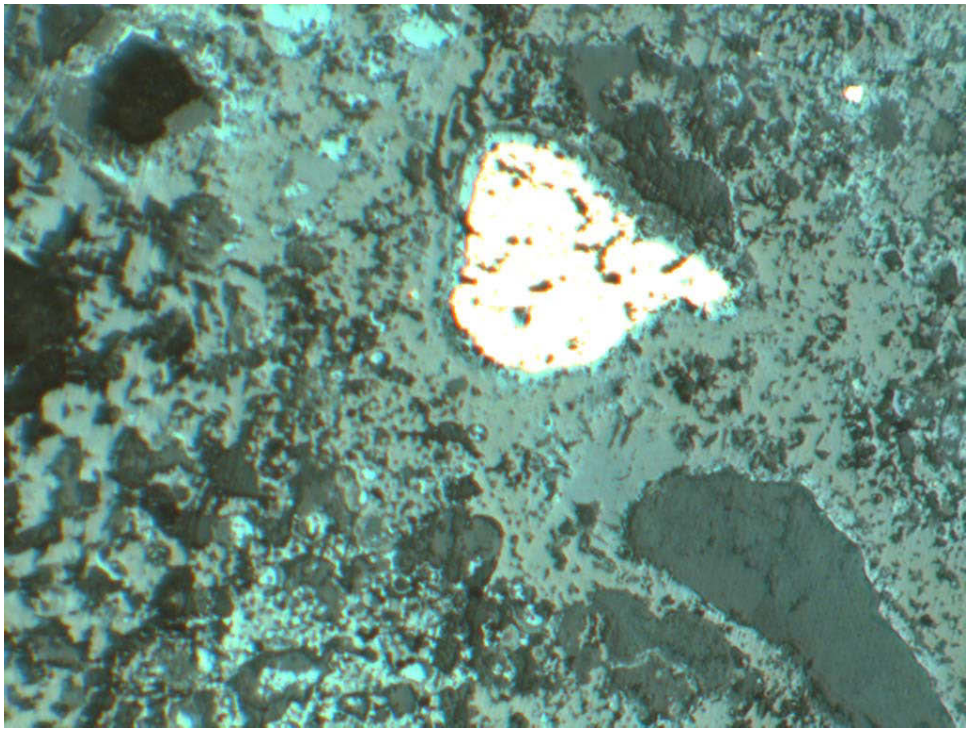

Figure 6 Polished section of a piece of Pentrwyn metallurgical material set in resin. Photograph in reflected light showing a piece of copper metal (approx. 120 microns) and associated phases.

9 **ASSESSMENT OF POTENTIAL FOR ANALYSIS**

The completion of excavation of the remaining deposits at Pentrwyn was aimed at first, understanding of the deposits below those excavated in 1998, notably the V-shaped feature and second, providing more metallurgical debris for analysis and thirdly, providing more material to confirm and refine the periods of activity represented.

a. The work has shown that the V-shaped feature is probably natural and was not a product of smelting as originally seemed possible. The high copper readings of the soil within it seem to result from leaching from the layers above as suggested by Dr D. Jenkins in the earlier report (XRF Trace element data, Hopewell and Jones 1999). The only fact contrary to this suggestion is that the fill of the V-shaped feature was sealed by a thick layer of re-deposited clay (116), which would be expected to have prevented leaching from above. However, layer (116) did, itself, contain metallurgical debris. The dark layer (117) immediately below (116) and above the fill of the V-shaped feature does have evidence of human activity in the form of charcoal and two worked flints but has no evidence of metallurgical activity so probably pre-date it.

b. Although relatively little remained of the occupation levels a considerable amount of metallurgical debris was recovered in the form of small fragments of slag, prills of copper and ore. It is notable that there were no larger pieces of slag or ore and no loose or *in situ* burnt clay pieces that could be part of smelting ovens or crucibles.

c. Bulk samples of soil from the main contexts were floated for carbonised palaeo-botanical evidence. Wet sieving of all the excavated soil as well as sorting of the flotation residues produced numerous small pieces of charcoal, mostly wood charcoal but including some hazelnut shell and cereal grains. These and the animal bone provide good material for radiocarbon dating and three samples will be selected initially.

The excavation has provided more evidence about the site stratigraphy which can be informed by analysis of the artefacts and ecofacts and soils.

The considerable amount of metallurgical debris provides the potential for further analysis of the ores, and smelting by-products. As the only known prehistoric copper smelting site in the UK and because of its proximity to the largest known prehistoric copper mine in the UK the excavated material deserves further study.

The excavation has provided amounts of discrete and well-stratified material for radiocarbon dating. A preliminary selection of material from layers (107) and (117) has been identified (Appendix 1) and a three samples have been sent for AMS dating. After the preliminary dating results are received and considered a further dating programme may be warranted to refine the dating.

10 ARCHIVE CONTENTS

Context sheets	29
Recorded finds	100
Metallurgical samples	>515
Environmental samples	14

Drawings	9
Photographs	68

Specialists for assessment

Animal bone	S. James
Flint	G. Smith
Metallurgy	R. A. Williams
Palaeo-botany	Roz McKenna
Pottery	F. M. Lynch
Soils	D. Jenkins
Stone	D. Jenkins

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APPENDIX 1

Pentrwyn, Great Orme, Preliminary Charcoal identification G2178

By Pat Denne, European Plant Science Laboratory, Bangor.

Identifications from contexts 107 and 117

1. Context 107, find 38
   Multi-pieces, mostly too small or too incinerated for identification, but the following were possible:
   a) *Corylus*. 7x7x5mm
   b) part of nut shell probably *Corylus*, possibly *Quercus*
   c) probably *Ericaceae (Calluna, Erica, Vaccinium* etc.) 8x7x4mm

2. Context 107, find 39

   Multi-pieces, from which the following IDs were possible:
   a) *Quercus*. 17x8x5mm very narrow growth rings.
   b) *Quercus*. 10x8x5mm. Part of a twig.
   c) *Quercus*. 13x10x4mm.
   d) *Corylus*. 8x8x7

3. Context 107, find 40
   Single piece: 10x8x8mm 8 growth rings
   Taxus

4. Context 107, find 41
   Single piece: 10x8x4mm twig about 1 cm across
   Corylus

5. Context 107, find 43
   Single piece: 12x8x5. Twig about 1cm across.
   Ericaceae, probably *Erica* spp.

6. Context 107, find 45
   Single piece: 10x8x5mm
   Ericaceae, probably *Erica* spp.

7. Context 107, find 47
   Single piece: 12x10x5mm, in poor condition
   Probably *Quercus*

8. Context 107, find 51
   Single piece: 12x12x7mm
   Ilex

9. Context 117, find 63
   Single piece: small twig, too fragile for ID (broke up on touch)

10. Context 117, find 65
    Single piece, probably part of nutshell, probably *Corylus*, possibly *Quercus*

11. Context 117, find 66
    Multi-pieces, mainly too small or too incinerated for positive ID, though features suggest probably *Corylus*, the following piece was positively identified:
    Corylus 5x5x4mm.

12. Context 117, find 85
    Multi-pieces, all small twigs about 2-3mm across (possibly all the same twig).
    Ilex.

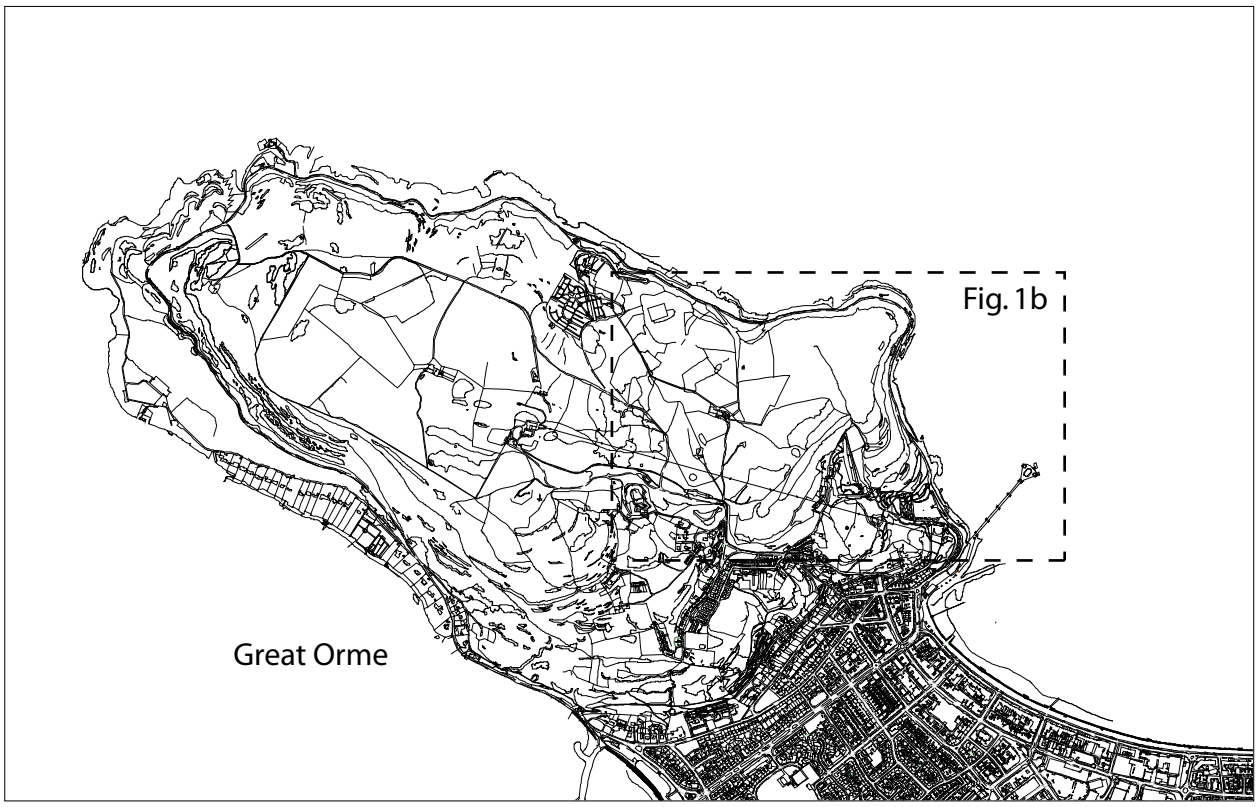
Notes:

a) Measurements given were approximate, before breaking up for ID

b) Specimens noted as probably Ericaceae were unlikely to be a long lived tree species, probably a shrubby plant.

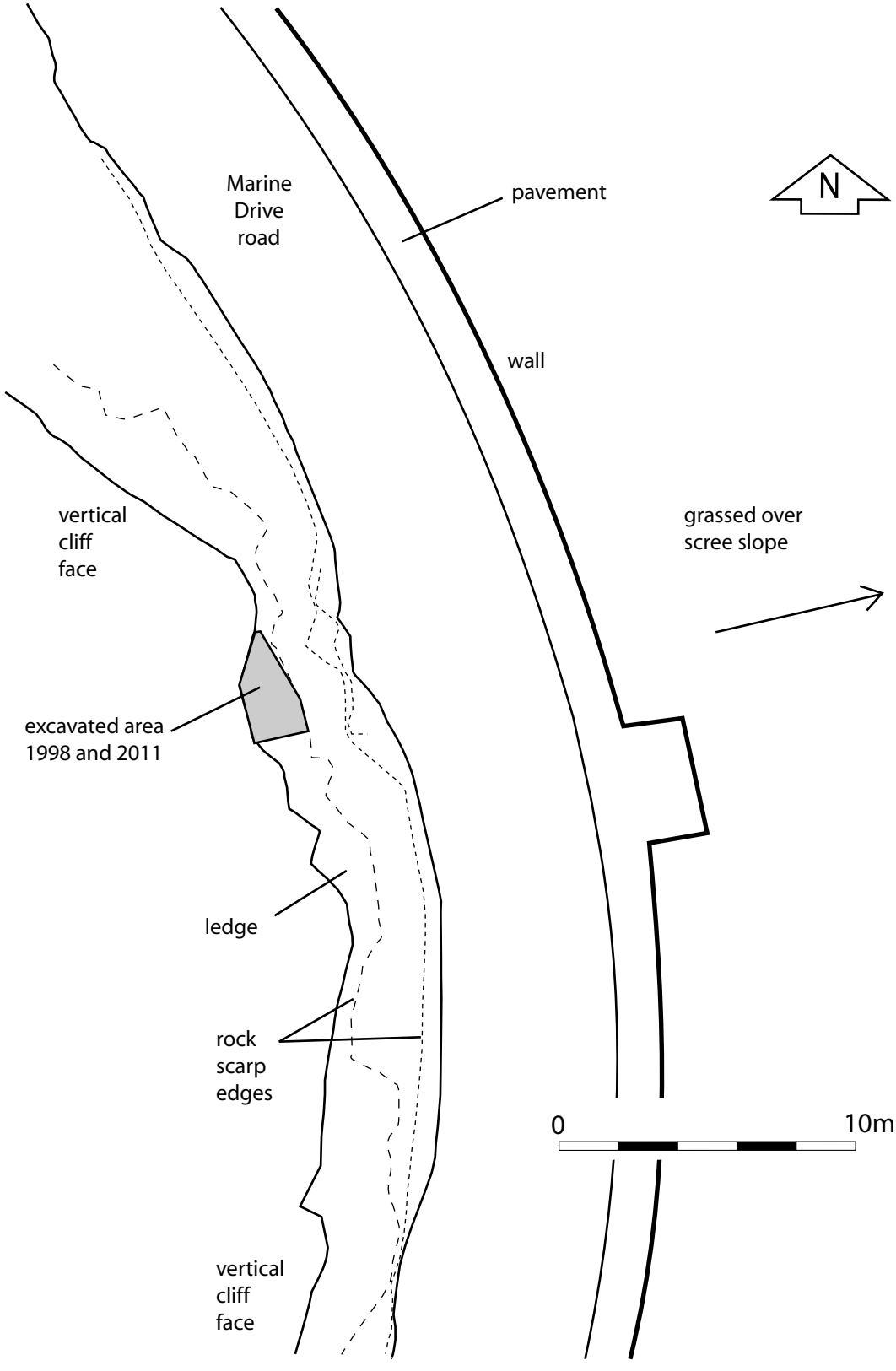
c) Identified spp have been put into separate bags within the original bag

d) It was not possible to count the growth rings in any of these samples except the *Taxus*, being either too indistinct or too narrow to have a reliable count.

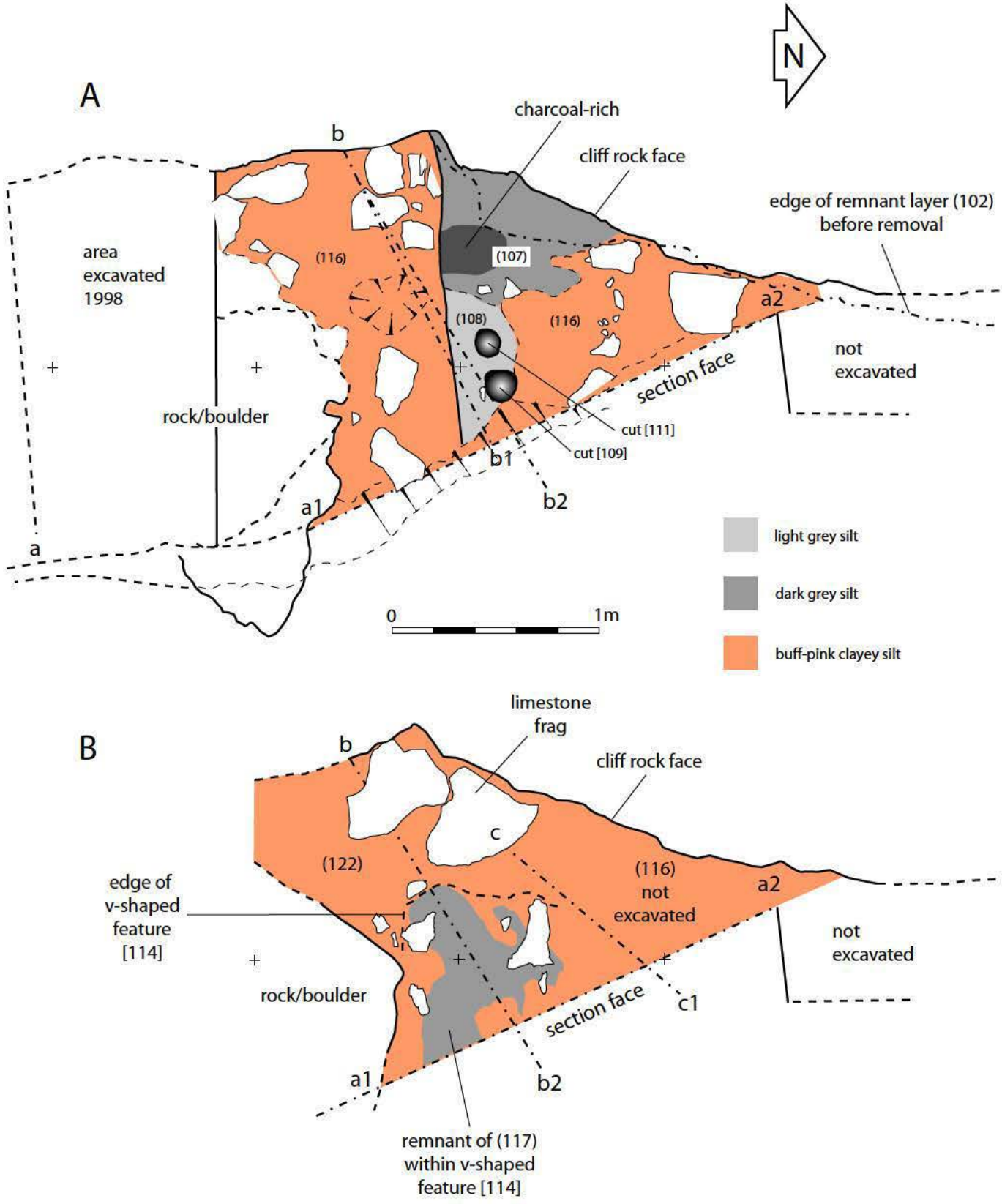


G2178 Pentrwyn Fig1a General location map

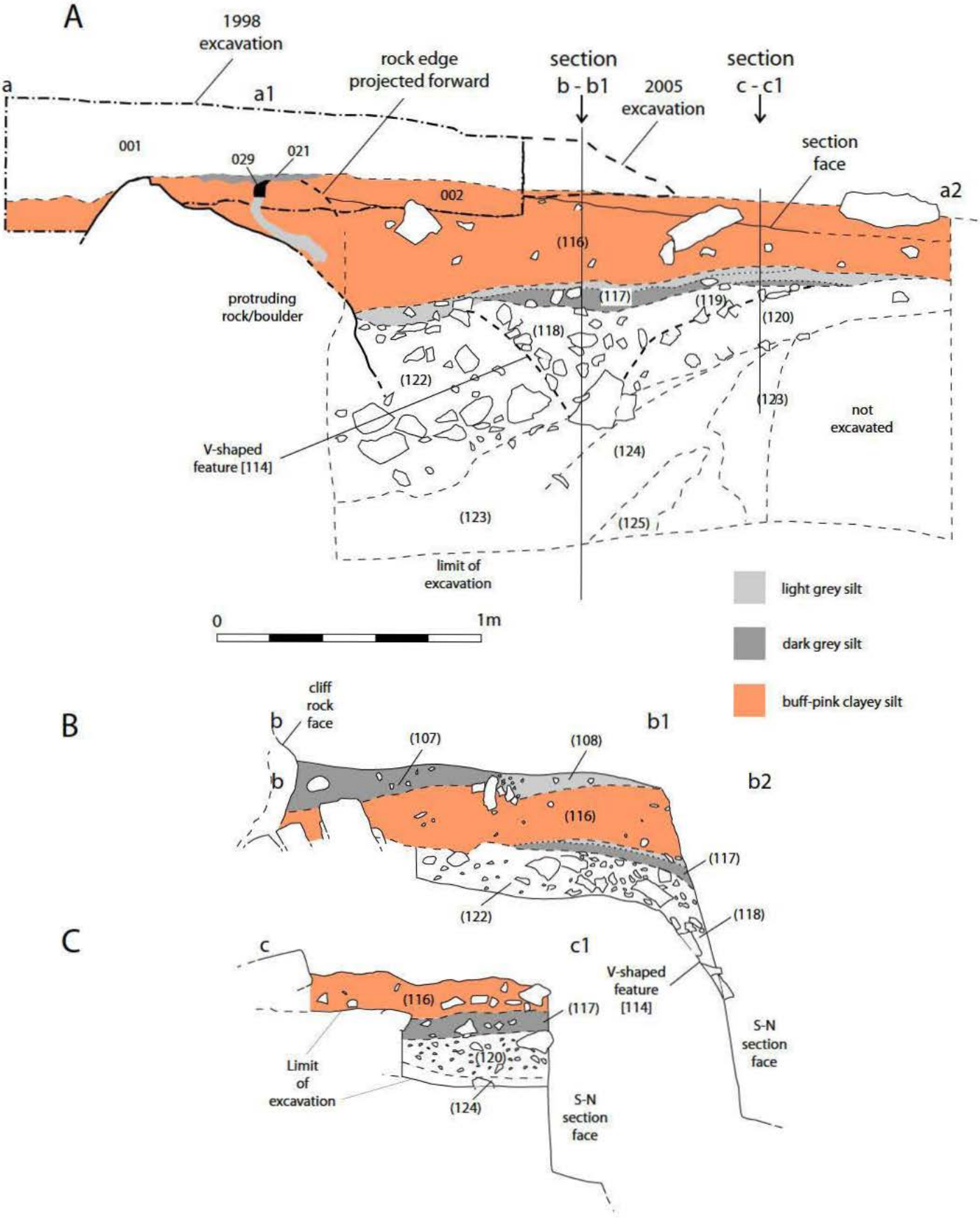
G2178 Pentrwyn Fig1b Site location



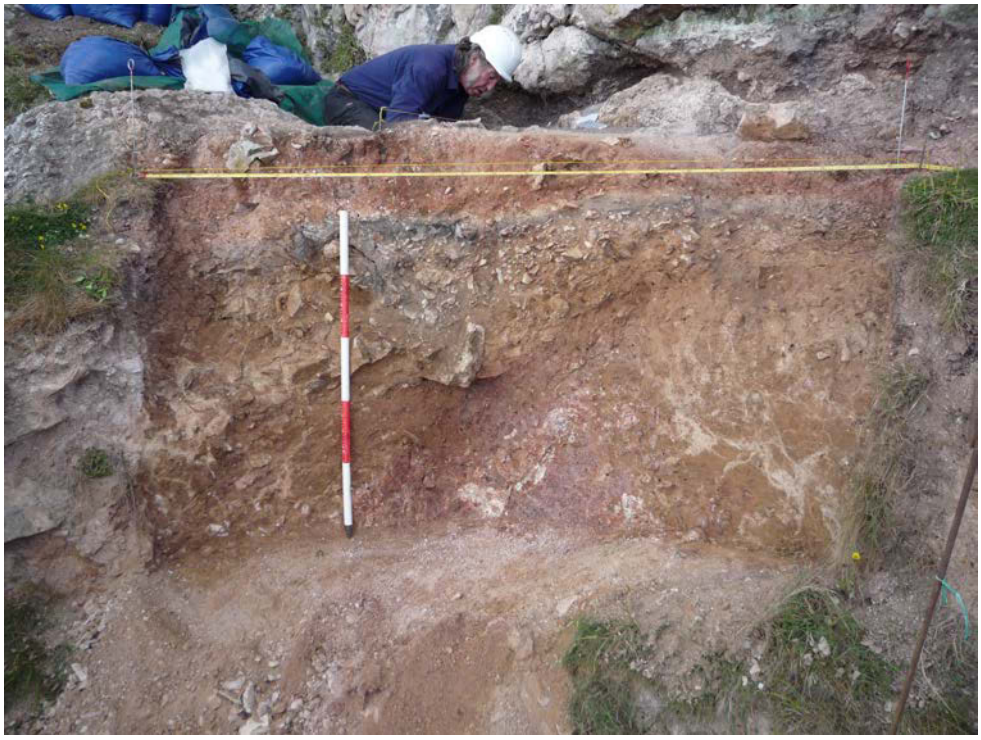
G2178 Pentrwyn 2011 Fig. 2 Topographic location of excavation area



Pentrwyn 2011 Fig. 3 Trench plans.
A: After removal of 1998 backfill, topsoil and layer (102)
B: After removal of layers (107), (108) and (116)



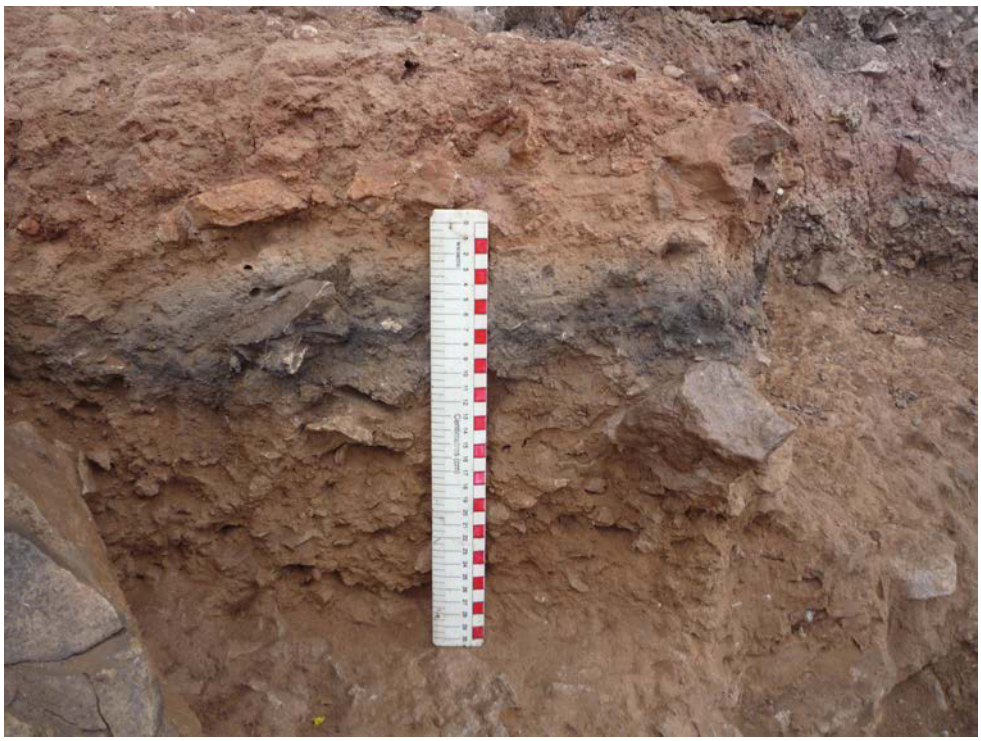
G2178 Pentrwyn 2011 Fig. 4 Excavation sections



G2178 Pentrwyn Fig. 7 Section a1 - a2, the V-shaped feature [114]. From the east. 1m scale

G2178 Pentrwyn Fig. 8 General view of excavation to the top of layers (107) and (108). From the south. 1m scale

G2178 Pentrwyn Fig. 9 Section b - b2 - longitudinal section through the V-shaped feature [114] to the top of the grey layer (117). From the east. 30cm scale



G2178 Pentrwyn Fig. 9 Section c - c1 Detail of section through layer (117). From the east. 30cm scale

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