LEY HILL, A DESERTED MEDIEVAL SITE ON EXMOOR

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SUMMARY

A deserted medieval hamlet was discovered in 1994 on Ley Hill on the National Trust's Holnicote Estate. As the use of a bridleway was causing damage a programme of recording was initiated. Little work had been undertaken on sites of this type on Exmoor, and this presented a unique opportunity to learn more about the nature and material culture of these settlements. Work included a detailed measured survey in 1997, geophysical surveys in 1998 and 1999 and three seasons of excavation between 1998 and 2000 which are the focus of this report. The results show that the buildings were constructed of cob or cob on stone footings; one building examined was a house, a trench external to another building suggests this was a long house and another building excavated was

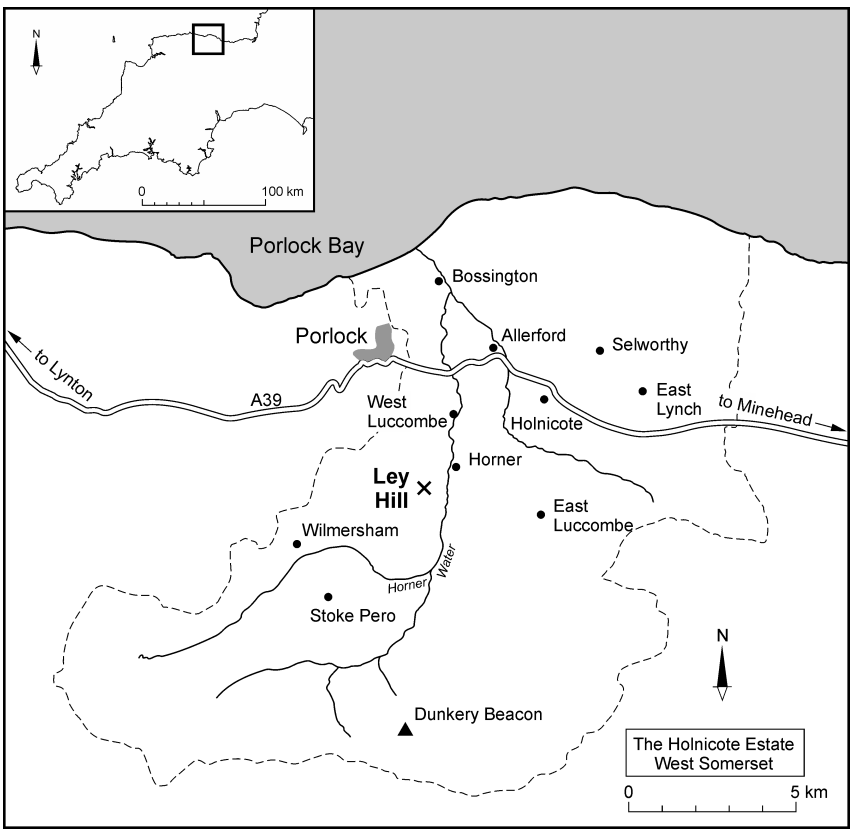

Fig. 1 Map showing location of Ley Hill deserted medieval hamlet

probably a barn. A radio-carbon date and analysis of the pottery indicates that the settlement was in use in the 12th to 14th centuries and that the bulk of the pottery was locally made from an unidentified source. Analysis of the charcoal and plant remains provides additional insights into the crops grown and woodland management. The small number of flints from the site reflects not only the prehistoric settlement of the area but also the apparent relevance of prehistoric stone tools to the settlers who collected them. The Ley Hill site is still the only excavated deserted medieval settlement in Exmoor National Park.

INTRODUCTION

The deserted settlement, NGR SS 8917 4500, was found by Richard McDonnell in 1994 during an archaeological survey of the woodland in the Horner valley (Fig. 1) (McDonnell 1994). Seven buildings were identified, grouped around a hollow way connecting the Horner valley to the open moorland of Ley Hill. This route can be traced further south-west to other medieval sites such as Wilmersham and Stoke Pero. The field system directly associated with the settlement extends southwards along the hillside and includes both lynchets and field banks. Further south again, 1200m away on a spur of the hill, is a prehistoric enclosure at NGR SS 8905 4405 (Fig. 2).

Granny's Ride, a permitted bridleway, runs along the east sides of Ley Hill and Crawter and directly across the lowest of the seven buildings (Fig. 3, building 7). Displaced stonework was recorded in 1997. As the path could not be rerouted it was decided to record the site and excavate it in the following spring.

A measured survey of the deserted settlement and associated field system was undertaken by the Royal Commission of Historical Monuments of England (RCHME) as part of their survey of Exmoor (Wilson-North 1997; Riley and Wilson-North 2001, fig. 3).

The survey highlighted the clear grouping of buildings in the settlement with numbers 1, 2 and 3 forming a cluster, 4 and 5 close together though angled to each other, but with 6 and 7 much more isolated and to the east of the rest of the settlement (Riley and Wilson-North 2001, 95-97). The hollow-way appears to respect building 4, as it dog-legs round it northwards and then turns another right angle to lead west over the top of Ley Hill.

The field system (Fig. 2) is fairly extensive covering about 14 ha on steep slopes down to the east with the major lynchets over a metre high. They are difficult to access as they are under encroaching woodland and woody debris. On the higher ground south-west of the hamlet the field boundaries seem to be simple earth banks, similar to most of the earlier enclosure banks on the Holnicote Estate (Richardson 2001).

Topography and geology

The Horner Water flows due north in the valley below the settlement, towards the hamlets of Horner and West Luccombe, to enter the Bristol Channel near the east end of Porlock Bay (Fig. 1). The settlement is set partly on a slight shelf in the hillside, on the east bank at about 220m O.D. The valley sides are covered with ancient woodland, mainly sessile oak, with some hazel and holly. The hamlet and the prehistoric enclosure are now partially covered by trees. The Vale of Porlock, with its scattered settlements, opens out to the north-east with the sea only two miles to the north and the parish church is at Luccombe (East Luccombe).

The underlying rock is of Devonian sandstones and slates. The soil is very thin and tends to be acidic. Above the tree-line there are heather and grasses, with gorse, the latter particularly where the soil has been disturbed.

History

No documentary evidence directly relating to the settlement has been found. Crawter and Ley Hill were part of the Manor of West Luccombe, with most of the population living in the two hamlets of Horner and West Luccombe. The first mention of the manor is in Domesday Book (Thorn and Thorn 1980), the Saxon owner was Vitalis (Fitel in the original Latin) but William I granted the holding to Odo, son of Gamelin, who seems to have kept Vitalis in charge of the manor. The latter was probably a successful land-holder, as the value was 40s both before and after the Conquest, the second highest in the area. It was the only manor that Odo held in Somerset. In Devon however he had been granted 24 manors, and his father-in-law 26. They were therefore substantial land holders and the West Luccombe manor is unlikely to have received much attention from its lord. Vitalis however is recorded as having held Shirwell and Hacche before 1066, and as holding Willand from Odo in 1086, its value also 40s. It is not known however whether the name 'Vitalis' refers to one person or is a reasonably common name, a Ralph Vitalis is mentioned under Odo's holdings in the Devon Domesday in connection with two other manors.

It is not clear where the eight villeins and one small holder recorded in Domesday lived. The two hamlets of Horner and West Luccombe were likely to have had at least two farms in each of the settlements; it is also possible that Woodcock's Leigh and Buckethole existed then, although the first is not recorded by name until the late 13th century. A boundary bank is continuous round these two farms (Richardson 2009) suggesting one phase of enclosure. The ploughland and the meadow of the manor were probably in the Horner valley and the Vale

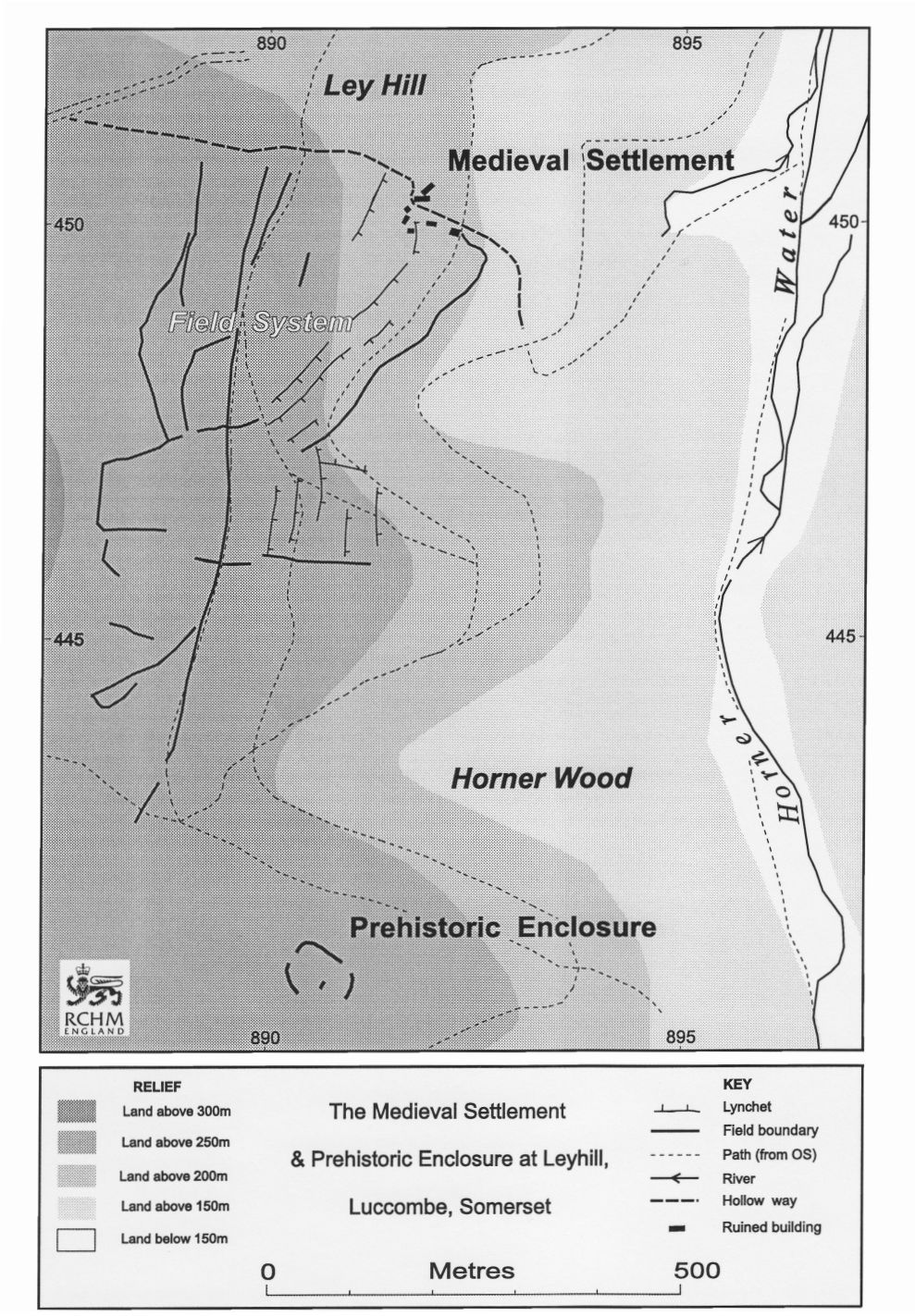

Fig. 2 Map showing archaeological features in the vicinity of Ley Hill (Wilson-North 1997 fig. 2). Crown Copyright © Historic England Archive

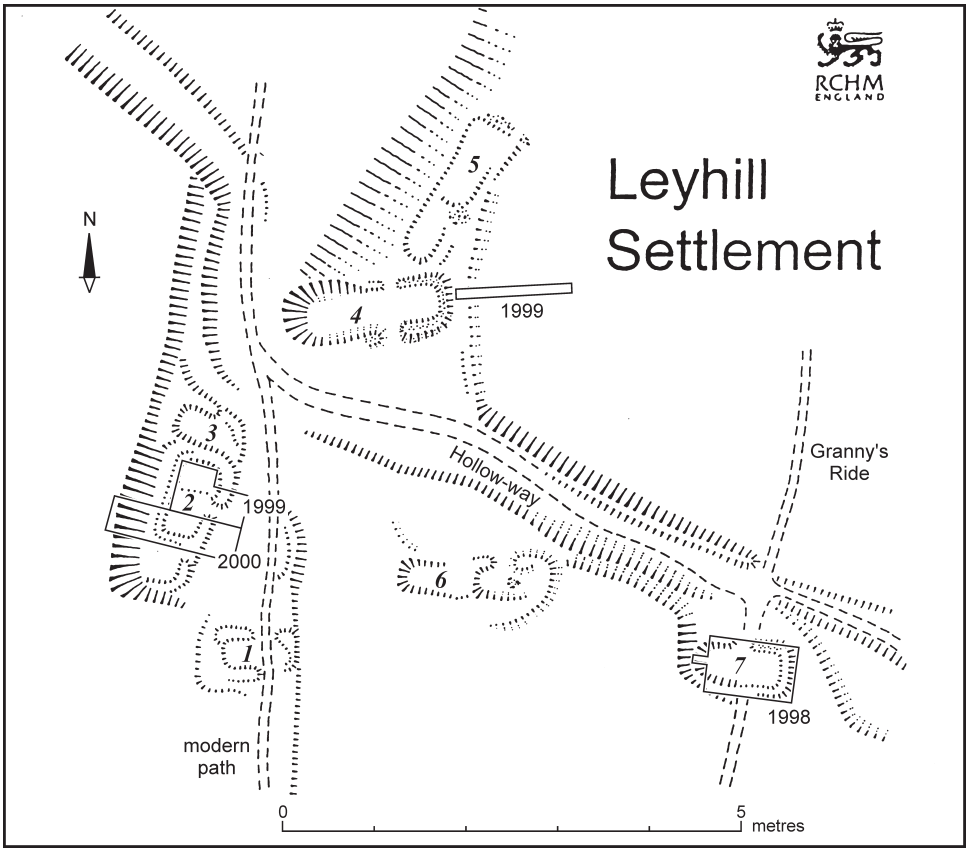

Fig. 3 Ley Hill settlement. RCHME 1:500 earthwork survey with the excavation sites indicated. (Wilson-North 1997 fig. 4) Base image Crown Copyright © Historic England Archive

of Porlock, with the 12 acres of woodland on the steep valley sides and the 50 acres of pasture on the tops of the hills. Unusually there is no indication of the numbers of stock kept. This information is mostly derived from the Exon Domesday, for instance (East) Luccombe had six cattle, six pigs, 100 sheep, 50 goats, and one cob (Thorn and Thorn 1985). As with Luccombe, the majority of animals in Selworthy and Allerford Manors were also sheep, and it is likely that West Luccombe was similar. Domesday Book is the only guidance available for the stock likely to have been kept in the neighbourhood for some hundreds of years.

Unfortunately, very little survives about West Luccombe Manor in the Holnicote Estate records for the 12th to 14th centuries when Ley Hill was occupied (Richardson 2008). It was held by the Luccombe family from 1284-5 until at least 1346-7, by 1385 the Copplestone family were connected with it (Chadwyck Healey 1901). The effect of the Black Death in 1348-9 in the area is likely to have been severe, as it was across most of the country. Between a third and a half of the population died. In the neighbouring parish of Stoke Pero three rectors were recorded as dying in 1348 (Usmar 1990).

Documents recording the use of Horner Wood only go back to the 16th century, but show that until the second half of the 20th century the woods supplied oak bark for the tanning industry, coppice wood for hurdles, fences and buildings, and timber for roofs and other uses. There were also many oak and a few ash trees that had been pollarded for timber, which was often used for roofs and lintels. Many of these trees still survive, particularly on Cloutsham Ball, and are hundreds of years old. Some pollards are still living on Ley Hill.

No evidence has been found to help determine the name of the deserted settlement on Ley Hill. ‘Ley’ ‘Lege’ or ‘Leigh’ derives from the Old English 'Leah' meaning forest, wood, glade or clearing (Gelling 1984,

198). Later meanings were 'pasture' or 'meadow', the latter obviously not applicable to this site. 'Ley' is recorded first in 1257 as 'Lege' when Emeryc of Lege was outlawed (MacDermot 1973). In 1298 in the Perambulation of the Forest of Exmoor for King Edward III 'Leghe Wodecok' was named (now known as Woodcocks Ley). It is possible that the name 'Ley' was used generally for the area and 'Woodcocks' was added to differentiate the present farm site from the settlement.

Under the 'Survey of the Manor of West Luccombe 20 Sep 1711' (DRO 1148M/6/20) the title 'Higher Wells' was used to refer to an entry (no. 43) that listed lands from the north end of Crawter across Ley Hill to the south as far as Rowbarrow. The name 'Higher Wells' does not occur again until it is found on the 1889 Ordnance Survey First Edition map. Here 'Higher Wells' appears to refer to some springs near the top of the hill. McDonnell (1994) suggests that the name 'Wells' or 'Lower Wells' may have defined the deserted settlement which is about 200m from Higher Wells; there is a small spring about 20m to the north of the site, however, no record of these suggested names has yet been found.

Other possibilities for its name are Ray or Rey Combe, as 'Ray' or 'Rey' is derived from 'rye', and this crop was certainly grown by the inhabitants (Carruthers, below). Horner Gate is suggested as a possible name (Wilson-North 1997). The 'Gate' name refers to the junction of the enclosed cultivated land and the open moorland, but the present position of Horner Gate is further from the site than the other suggestions. Research by Mick Aston into deserted medieval settlements on Exmoor does not help although he records the name Woodcocks Ley in the Lay Subsidy of 1326 (Aston 1983).

The hollow way which connects the settlement to the Horner valley and on to Horner village was an important early route in the area. It is shown clearly on the 1782 Day and Master's Map of Somerset, where on Ley Hill it joins tracks from Porlock to Stoke Pero and on to Exford. It is also clearly drawn on the first surviving estate map, dated 1809-12, where the hollow way is depicted with an enclosure shown on either side where the abandoned settlement would have been. These closes are numbered p.9 and r.4, and were held by the tenants of Horner Mills and Steer's Cottage, Horner, respectively. There is no indication on the map of any remains of the buildings or enclosure banks (Richardson 2008).

Geophysical survey

Immediately before the excavation a resistivity survey was carried out over the whole site (Papworth 1998). Most of the area surveyed was under woodland. Fallen trees and wood ants' nests hindered the taking of some of the readings. The results showed the seven buildings already identified and suggested the possibility of further footings. A trench excavated below building 4 was designed to evaluate these results but proved negative in this area.

A magnetometry survey was carried out (Papworth 1999) and two possible hearths were identified, one in building 2 in the north end, the other in building 4, nearer to the west end.

THE EXCAVATIONS

Three seasons of two-week excavations were undertaken in 1998-2000. The first area excavated was the building being damaged by users of the bridleway (Fig. 3, Building 7). Following this, it was decided that two more years of excavation should take place to determine further the date and character of the settlement. A trench on building 2 to include part of the inside and outside of the building, and a trench below building 4 were designed to evaluate the results of the geophysical survey and obtain environmental samples. The structural remains were left in position. When recording was completed a geotextile was laid and the trenches were back-filled. In the area of the bridleway, the soil was built up for the protection of Building 7.

[Context numbers are shown in square brackets; small finds are indicated SF with their number also in square brackets. A separate sequence of context numbers was allocated for each year of excavation.]

Building 7

This building is the furthest east, downslope of the settlement. Most of the stone wall footings [4, 16, 17] could be distinguished, but hillwash had hidden the west wall [18]. An initial east-west trench was later extended to locate the west wall [18] and further examine the nature and extent of the building (Figs 4, 5).

The building's external size was 10.5m x 5.4m. The walls, in random rubble construction of local purple sandstone, were generally 0.6m wide and survived to a maximum height of 1m. One doorway in the north wall faced the hollow way. It was reduced in size from 1.8m to 1.0m in width by a blocking of larger whiter stones to the west side of the opening, probably reducing it from two doors to one [19]. The floor [10], a hard, gritty earth surface, lay directly on natural subsoil. Charcoal flecks on the floor were sparse in distribution but enough seeds were found in sample 115507 for a radio-carbon date (see below, Table 6). On the floor, a little way back from the doorway, a residual flint flake was found, clearly placed there purposely [SF 114]. An apparent gap in the south wall [17] was caused by erosion from the bridleway. There was no sign of a drain or a hearth.

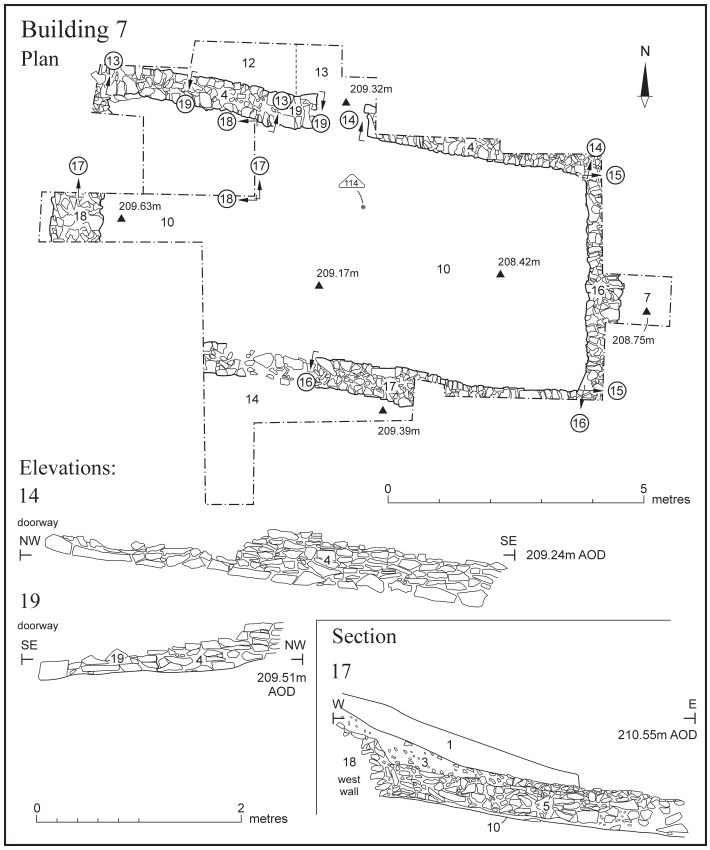

Fig. 4 Plan and sections of Building 7

Stone rubble [5] inside the walls (Fig. 4, section 17) represented collapse or infill of the building. Below the rubble there was dark brown soil [6] possibly an occupation layer where four sherds of pottery [SF 109-112] were apparent. A sherd of unglazed 13th/14th century pottery [SF 100] was found near the north wall [4]. A fine layer of orange soil [8], possibly representing decayed cob also lay above the floor [10]. The leaf litter and topsoil layer [1] was up to 200mm deep in places.

The trench below building 4

In April 1999 a narrow east-west trench 12m x 1.5m, immediately below building 4 (Fig. 6), was sited in an area considered to have environmental potential and possible structural features shown in the resistivity survey.

The top of the trench appeared to contain a drain [49] leading from the base of the east (lower end) wall of building 4, although time did not permit excavation of the wall face. The drain was under occupation debris [48] probably from Building 4, yielding pottery [SF 176, 177, 178, 179] and flint [SF 167]. The fill of the drain [50, 54] was sampled. The drain cut redeposited natural [55] which possibly resulted from the construction of Building 4.

A grey-black layer [45] over the top part of the trench was of varying depth; it held charcoal, pottery [SF 168, 169, 170, 171, 173] and burnt stone. It probably resulted from a series of dumps of material from the house or from the destruction of the building. Samples 250/45 and 251/45 were taken for environmental analysis. Above this was an orange brown layer [44] of possible cob debris, containing a chunky sherd of pot [SF 166]. Below the turf [42] stony layers [43, 47] were possibly from the demolition of the building. An area of disturbance at the base of the drain was caused by animals or a tree root hole [51, 52].

The trench was excavated down to natural, no evidence for buildings or boundaries was found but geological slumping was apparent.

Fig. 5 Building 7 from the north-west, doorway on left side of trench

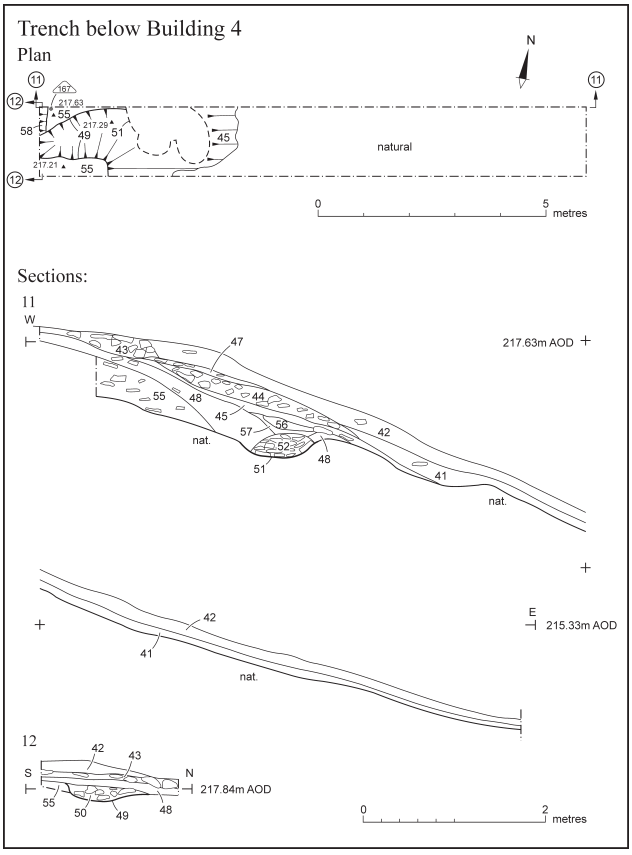

Fig. 6 Plan and sections of trench below Building 4

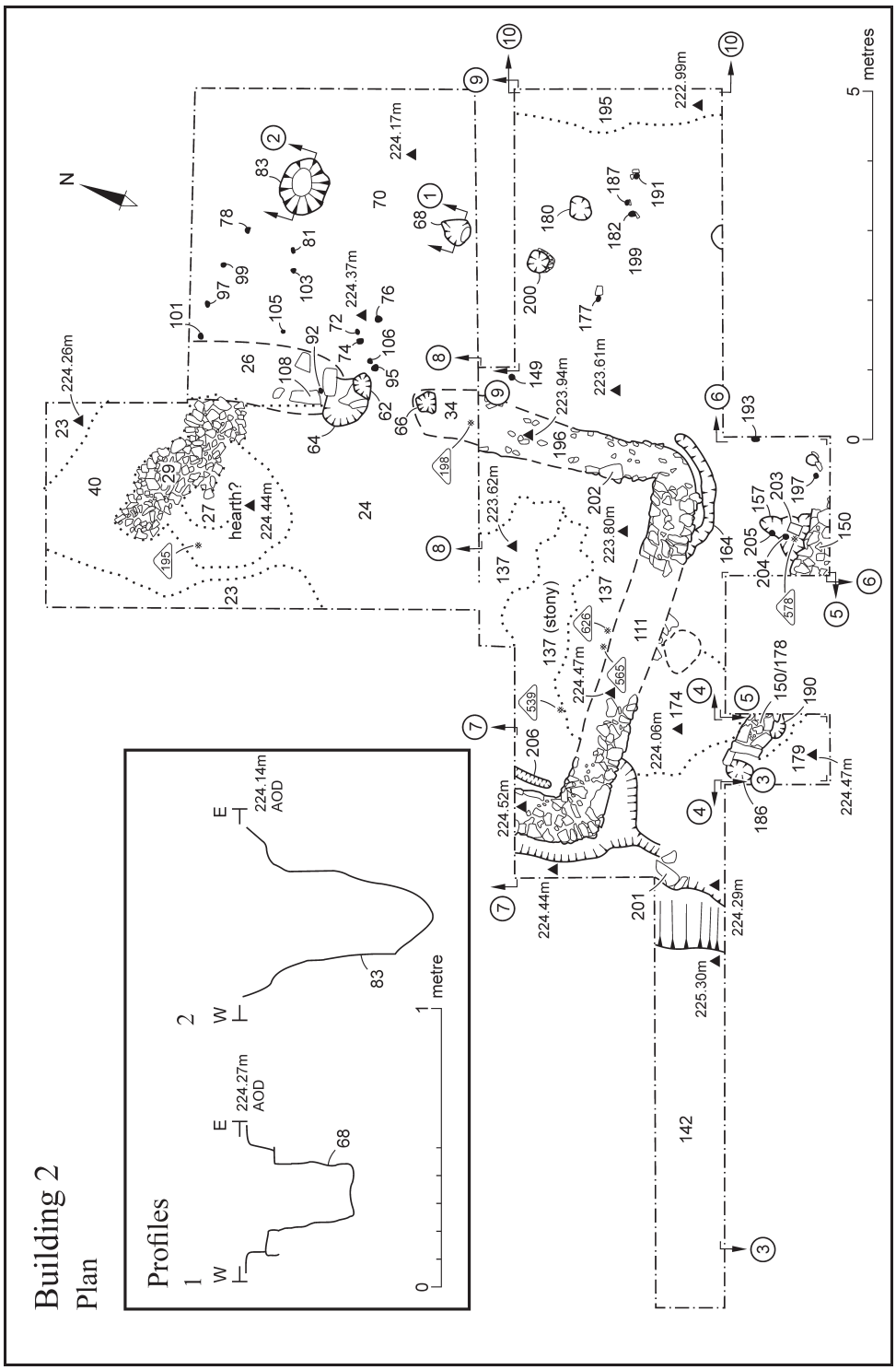

Fig. 7 Plan of Building 2 showing possible hearth [27] and east doorway

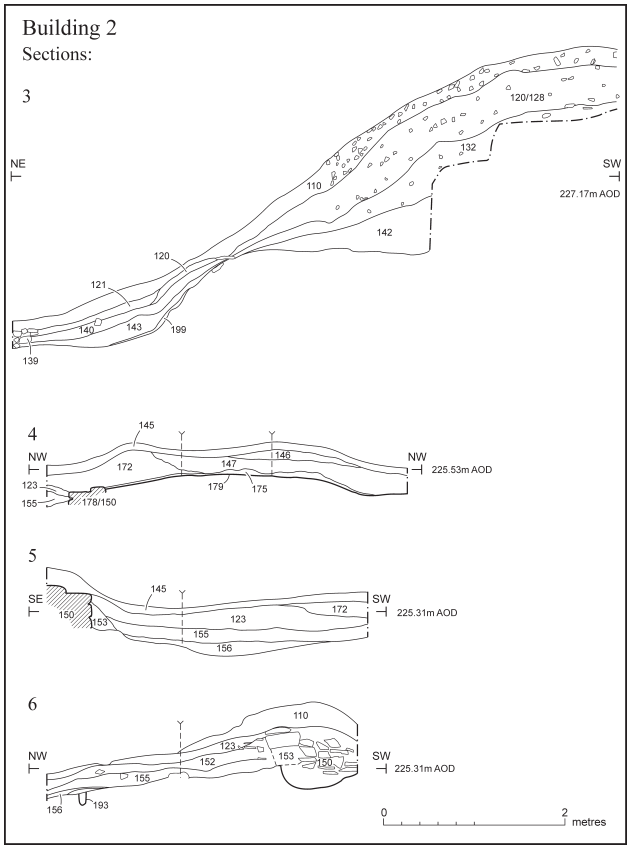

Fig. 8 Building 2, sections 3-6

Building 2

Wilson-North (1997) defined building 2 as part of a group (Fig. 3, buildings 1-3) probably representing a single unit, most likely a farmstead and yard, L-shaped in form. It is set above the rest of the buildings in the settlement on a platform cut along the east facing hillside and is visible as low earthworks covered in bilberry and holly, these thrive on the dry walls.

Building 2 appeared to be the principal building in this group and the magnetometer survey (Papworth 1999) suggested it contained a hearth. It was excavated over two seasons. The main trench in 1999 was a rectangular area (4m x 7m) covering a possible doorway. It was extended by 2m x 3m inside the building to include the possible hearth area. The following year a 17.5m x 3m trench was excavated from the top of the scarp behind Building 2 down to the eastern line of the 1999 trench. It included part of the slope affected by erosion caused by deer. To see if the building extended further to the south two small trenches were added at that end.

The roughly rectangular building proved to be of two phases. The southern wall and parts of the eastern and western walls together with part of a yard area were excavated (Fig 7). The north wall was not excavated but its line was probably indicated by the bilberries.

Phase 1

The earliest phase of the house was approximately 11m x 5m internally, equating to about 12.2m x 6.2m externally. There was no rear ditch and the cutting of the rear scarp seemed to be contemporary with the building of the house as the padstone [201] was set against it. The position of the southern extent of the house in this phase was established by small trench extensions which exposed parts of the stone footings of a wall [150, 178]. Near the south eastern end of the wall [150] was a padstone [203] set over an irregularly shaped pit [157], with two stakeholes [204, 205]. The west end of

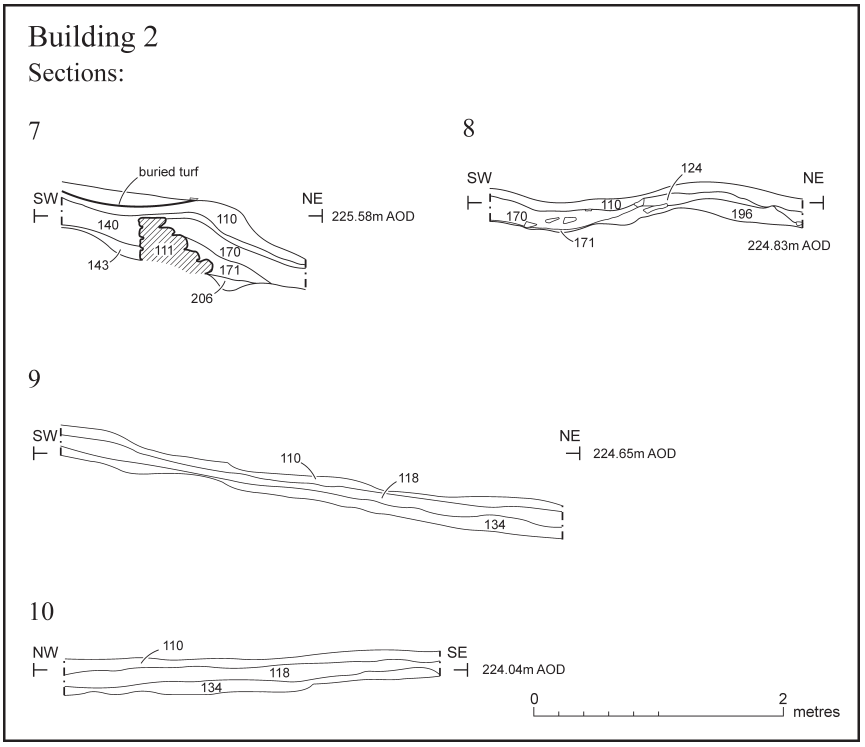

Fig. 9 Building 2, sections 7-10

Fig. 10 Building 2 trench from the north with padstone [202] on the front cob wall [196] and inserted south wall [111], the possible earlier south wall [150/178] beyond

this wall [150, 178] was collapsed rubble and it did not show in the section (Fig. 8, section 4). It is possible there was a doorway there or the stonework had been robbed. Removing the loose stones revealed a large posthole [186]. The fill [185] contained a flint blade [SF 624]. Another post hole [190] to the south of and partly under the wall contained a sherd [SF 623] of locally made pottery. Charcoal flecks were observed under the wall, with post hole [190] this suggests repair or rebuild.

The relationship between this southern wall and the west and east walls was disrupted by the insertion of the later Phase 2 wall [111]. The line of the east wall [26, 34, 196] was clear as a long compact mound, dark in colour, interpreted as degraded cob, either side of a doorway. In the wall south of the doorway [34] a plano-convex knife (later Neolithic/early Bronze Age) was found [SF 198]. Post holes [66] and [62] probably held door posts, the northern post hole [62] was partly in a larger post pit [64] which held large packing stones, set vertically. An offset padstone [108] in wall 26 could have held a roof timber. Another padstone [202] was set into the fabric of the front wall [34, 196] near the south end. At the bottom of the back scarp the position of the Phase 1 western wall may be indicated by a padstone [201] which was likely to have been paired with the one [203] found in cut [157] in the south-east extension.

The floor [24, 40, 137, 174] inside the phase 1 building was generally hard and smooth, most of it in very good condition, with small pebbles and some charcoal included, but in the centre it had been disturbed by roots, and to the north it was softer. The floor surface [137, 174] just reached the stonework of the southern wall [150,178] and was clearly evident beneath the phase 2 wall [111].

Phase 2

The house was shortened from the south by about 2m internally and a new south and west wall [111] was built with a rounded corner (Fig. 10), this new phase had rubble stone footings with a mixed small stone and soil core (Fig. 7). It was built on top of the phase 1 floor [174/137]. Above the floor [137] was a hard, black-brown or orange-green layer [130] over most of the south end of the phase 2 interior, similar to the yard layer [30, 134]. A gulley [164] running from the back of the wall [111] around the south-east corner into the yard area was possibly a drip gulley or was connected with the construction of the phase 2 building as was possibly gulley [206] (Fig. 9, section 7).

The hearth

The presumed hearth [27] was probably in use in both phases of occupation of the building. It was stony and approximately circular, with slate, burnt slate and flecks and lumps of charcoal (Gale below). There were no hearth stones surviving, so it is likely that they were taken away and reused as there is little good flat stone available in the area. A dark surface [89], sample 4, beneath the hearth proved to be the same as the floor [40].

Fig.11 Building 2 local Ley Hill- type pottery [SF 626 Fig.12 no. 4] found against the inserted wall [111]

The yard

Outside to the east of the building there was a hard yard surface [30, 134], a greenish, yellow-brown silty layer with small and a few larger stones. Further south the whole yard surface was a solid concreted layer [25, 134], very hard and blackish green and orangey brown in colour, possibly the result of years of treading by animals. On the south side of the phase 1 wall footing [178] a similar surface [179] confirmed that the footings marked the original south end of the building. The yard surface was very difficult to remove but lay on natural subsoil [70/199] and covered a series of post and stake holes.

Four post holes or post pits were found [68, 83, 180, 200 Fig. 7, profiles 1, 2] with 18 smaller holes, interpreted as stake holes [72, 74, 78, 81, 95, 97, 99, 101, 103, 105,

106, 149, 177, 182, 187, 191, 193, 197]. One post hole [180] contained a rim sherd of local ware [SF 622], the profile of another [200] was not so clear and it is possible that the post had been pulled out and not rotted in situ. The posts may have been for structures or boundaries while the stakes provided fences or hurdles.

Possible occupation deposits

Dark soil [114] and a thin wedge-shaped layer of fine silt [115] inside the building possibly represent early silting or occupation debris. Some softer soil [131] against the south wall [111] contained pottery [SF 626], (Figs 11, 12, no. 4), and a complete whetstone [SF 539] on the floor. South of wall [111] a considerable amount of pottery was found in dark brown soil [123] beneath stone rubble. The pottery included the spout and part of the rim of a Ham Green-type ware jug [SF 563] (Fig. 12, no. 1).

In the yard area layers [118, 122, 126, 156] (Fig. 8, section 6) possibly represent soil development or occupation use.

Decay of the building

The infill of the building was represented by material thought to be decayed cob and rubble wall debris. In the northern part of the trench layers [23, 29] curved around the hearth area. To the south, pottery [SF 504] (Fig. 12, no. 13) was found in material interpreted as degraded cob [115] lying against the phase 2 wall [111]. An area of stones [116] possibly represented collapsed wall material and a general layer [119] across the interior of the building was likely to be degraded cob.

Against the south wall [150] loose stone rubble and layers [146, 147, 151, 152, 153, 155] probably represent silting and collapsed cob. Layer [146] contained a rim of the local coarse ware [SF 602] (Fig 12, no. 9) and several sherds of fine red ware, including a rim [SF 596] (Fig. 12, no. 3). A layer of well packed large stones was possibly collapsed wall [147]. A spread of dark brown degraded wall material containing pottery [22] extended into the yard from the east wall [26], but no stone of any size was present.

The area of the trench extending up the hillslope to the west exposed a series of soils representing hillwash (Fig. 8, section 3). Beneath this [121] was a general scatter of pottery including a base of fine red ware [SF 524] (Fig. 12, no. 2).

THE MEDIEVAL POTTERY
John Allan

In contrast with the ceramics of Dartmoor, the medieval and later pottery of Exmoor have received virtually no attention in the past, the nearest samples which have been examined being those from Cleeve Abbey to the east (Allan 1998) and the potting towns of Barnstaple and Bideford to the west (Markuson 1980; much unpublished work by Trevor Miles and subsequent researchers). The Ley Hill finds therefore offer the opportunity to begin the study of the moor's pottery, and to introduce the techniques of petrological and chemical analysis to medieval finds from this area. Compared with the plentiful ceramics from some deserted settlements elsewhere in South-West England (e.g. over 10,000 sherds from Meldon, Devon, and over 6,000 from Sourton Down, also Devon: Allan 1978; Allan and Langman 1997), or the very substantial collections from extensive fieldwork on medieval sites such as Shapwick, Somerset (Gutiérrez 2007), the Ley Hill collection is a small one, consisting of 692 sherds, all of medieval date, most of them small or very small. In pronounced contrast with the wide range of wares and the high proportion of jugs in broadly contemporary deposits at nearby Cleeve Abbey, nearly all the collection (all but three vessels) consists of unglazed coarsewares, as is commonly the case on medieval rural sites in South-West England (cf. for example 98% at Meldon; 99% at Sourton Down: Allan 1978; Allan and Langman 1997, 81). Acidic soil conditions have altered the appearance of much of the collection; many sherds are heavily weathered, the surfaces of some of them being obscured by black encrustation, whilst the glaze has been stripped almost entirely from the few glazed jug sherds. This is not, therefore, easy material to study.

Listings of the sherd counts, minimum numbers of vessels (MNVs) and forms of each fabric in each context are deposited in the Site Archive. The thin-sections have been deposited in the regional reference collection at Exeter City Museums; the EXTS numbers quoted in the Catalogue are Exeter thin-section slide numbers.

Fabrics and Pottery Sources

When the pottery from Ley Hill was first examined it was anticipated that most of the collection would prove to be of North Devon type, since the wares made in the kilns of the Barnstaple-Bideford area were marketed in the 13th and 14th centuries over most of north Devon, much of central Devon and far into eastern Cornwall (Allan 1994). In fact the most common North Devon medieval coarsewares – those tempered predominantly with well-sorted quartz sand, typically with a few plates of black mica, are represented here by only two definite sherds. Instead, most of the Ley Hill pottery (all but six vessels) consists of coarse, hand-made, unglazed wares, usually fired mid or dark brown, characterised by rounded inclusions of shales and sandstones. Medieval sherds of

this general fabric type have previously been identified from Cleeve Abbey (Allan 1998, 47–9) and Lundy (where it forms only 3% of the sherd total: Allan and Blaylock 2005). Dr Taylor showed that the tempering sand of the Cleeve and Lundy sherds was probably taken from streams draining from the shales and sandstones of Exmoor or the Quantocks (Taylor 1998, 57–9; 2005); they were therefore categorised as 'Exmoor/Quantocks-derived' wares. The forms and general surface appearance of the Ley Hill ceramics seem to differ from other local wares; the small rounded body of the single vessel profile which can be reconstructed, and the simple rims and lack of any decoration, appear to be distinctive features. Whilst it should be borne in mind that the sample is small, it seems that they represent a new local fabric type, which we may call 'Ley Hill-type' ware.

Pottery with a similar range of inclusions was however also made in North Devon: the products of the small kiln excavated at Tuly Street, Barnstaple, in 1985 (Anon 1985) were also tempered with inclusions of shales and sandstones, so the possibility arises that body sherds from the two sources may prove indistinguishable simply by visual or petrological means. Shale- and sandstone-tempered pottery of this general type is also widely distributed in south Wales, where at least some of the pottery of this type appears to have been made locally (C. Freeman pers. comm.). In an effort to resolve whether the Ley Hill pottery can be distinguished from North Devon wares, an initial programme of chemical analysis has been carried out (Hughes, below). This demonstrates that the chemical signature of the Ley Hill wares is different from that of a series of samples from Barnstaple, although it should be borne in mind that the number of samples analysed is quite small and this conclusion should be reviewed as our database grows. Jean Le Patourel's research into the documentary evidence for medieval pottery production in Somerset showed that potters lived and presumably operated at Nether Stowey, Milverton and Bridgwater (Le Patourel 1968, 125). Other local production centres no doubt escaped the documentary record, so one might speculate that a minor kiln on the fringe of Exmoor, close to Ley Hill, supplied most of its pottery.

There are just three examples of other wares. The Ham Green ware jug [SF 160a] lies towards the southern edge

TABLE 1: SUMMARY OF POTTERY FROM LEY HILL

Fabrics	*No. of sherds*	*Min. No. vessels*	*Forms/comments*
Ham Green	2	1	jug
Similar to Ham Green	1	1	jug
Somerset/E. Devon Redware	84	1	jug (many tiny scraps from one vessel)
North Devon Medieval Coarseware (NDMC)	2	1	
Unclassified coarsewares	5	2	
Exmoor/Quantocks-Derived Coarseware (EQDC)	598	c. 15	cooking pots
TOTAL	692	c. 21	

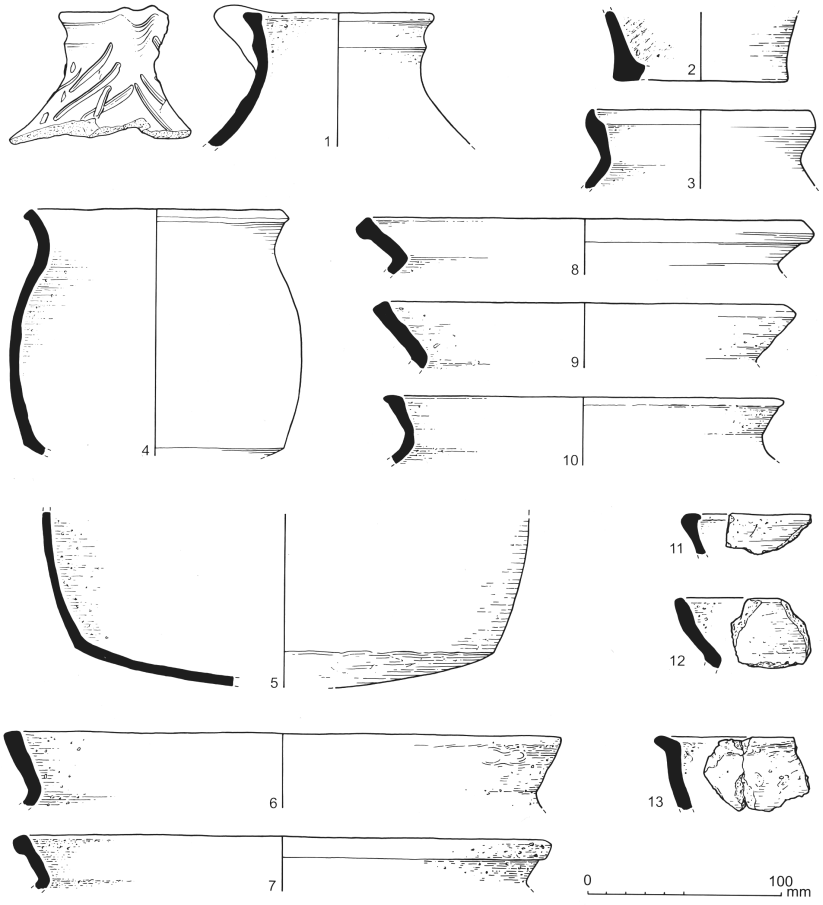

Fig. 12 Medieval pottery, scale 1:4, no. 1 unidentified jug, nos 2, 3 fine redware, nos 4-13 Ley Hill-type pottery

of the main group of find spots of this widely-distributed Bristol pottery type (cf. McCarthy and Brooks 1988), although a few examples are known further along the coast of Devon and Cornwall, for example at Barnstaple, (unpublished sherds in the Museum of Barnstaple and North Devon), Tintagel Castle, Cornwall (O'Mahoney 1989, 5) and Castle Street, Plymouth (unpublished sherds in Plymouth City Museum collection). The two other vessels which are not local have not been identified firmly.

Dating

A first point which may be noted is the absence of any examples of the Saxo-Norman coarsewares made around the fringes of the Blackdown Hills, characterised by inclusions derived from the Upper Greensand ('Upper Greensand-Derived' or UGSD ware: Allan *et al*. 2010) which were made in potteries operating around the fringes of the Upper Greensand deposits on the borders of Somerset and Devon (Taylor 2002; 2003). Such wares were very widely distributed in South-West England in the 11th and 12th centuries, being transported into most of Devon and Somerset, and into parts of Dorset and Cornwall. Since pottery of this type is known from Saxo-Norman contexts in Barnstaple (Miles 1986, 71) and from many rural contexts in Devon and south Somerset, it seems likely that such wares would have circulated even to remote sites on Exmoor. This appears to indicate that the Ley Hill sherds are probably no earlier than the late 12th century, when dispersed local potteries began to emerge in rural Somerset (e.g. those at Butleigh, Batcombe and Wrington, recorded in Abbot Sully's estate survey of 1189 (Stacy 2001, 13)). The dating of the emergence of local potteries is however poorly

understood; pottery production is currently believed to have begun in North Devon somewhere around 1200, but the evidence is imprecise (Allan 1994).

Only the Ham Green jug is datable from external evidence; this ware was produced between the mid 12th and the late 13th century (Ponsford 1991). In the absence of any specific dating for the Exmoor-derived fabrics at Ley Hill, the hand-made coarsewares forming the bulk of the collection can only be attributed broadly to the late 12th, 13th or 14th centuries, or perhaps even the early 15th; the period after the mid-15th century is characterized by wheel-thrown wares, absent from this collection. Later medieval deserted peasant sites on Dartmoor and elsewhere are also characterized by the introduction of pottery cisterns with their distinctive bung-holes (Ponsford 1991). Since cisterns seem to have become established all over southern England in the late 14th century (McCarthy and Brooks 1988, 112–13; Allan 1994, 144–6), their absence from the Ley Hill pottery (although admittedly a small sample) might suggest that the collection dates before c. 1400, and need not be later than c. 1350.

Catalogue (Fig. 12)

In each entry the small finds number SF00 is followed by the context number [00], and where relevant the Exeter City Museums thin-section number (EXTS 00).

1. Rim of a jug with pulled spout, applied iron-rich clay pellets on the body, broad incised lines below the spout, one applied clay strip laid obliquely over the lines, the external glaze almost stripped off. The writer identified this vessel as Ham Green ware but Mike Ponsford has pointed out that iron-rich clay pellets are unknown among the kiln waste there, so this appears to come from a different source. [SF563] [123], EXTS 32.
2. Jug base in fine redware, unglazed. [SF 524, 121].
3. Rim and many body sherds of a fine redware jug, perhaps the same vessel as No. 2. SF 568 [130].

4–13. Vessels of local unglazed sandstone-tempered coarsewares, probably all cooking pots, probably all Exmoor/Quantocks-derived wares, although some are heavily stained. No. 4 heavily sooted externally, patch of internal sooting, SF 626 [131]; No. 5 sooted externally, SF 565 [130]; No. 6 SF 154 [22]; No. 7 SF 151[22]; No. 8 SF 228[22/39]; No. 9 SF 602 [146]; No. 10 SF BB [82]; No. 11 SF 578 [158]; No. 12 SF 580 [161]; No. 13 SF 504 [115].

14. Not drawn: two sherds from the neck of a hand-made jug with horizontal incised grooves and traces of dull green-brown glaze, now blackened. Ham Green ware (Barton 1963). I am grateful to Mike Ponsford for confirming this identification. SF 160a [22].

PETROLOGICAL STUDY OF THE TEMPER OF SHERDS FROM LEY HILL
Roger T. Taylor

The surfaces and broken edges of ten different vessels were examined by the writer under the binocular microscope at a magnification of x20; five thin-sections were prepared from this material. Almost the entire collection appears to belong to one local fabric type. In preparing a report on this pottery, each individual vessel was first described separately; however, since the descriptions are so similar to one another, a single overall description is offered here, the individual reports being placed in the Site Archive.

Exmoor/Quantocks-derived wares

All but one of the samples consist of pottery with a temper which could readily be found in streams washing down from Exmoor or the Quantocks – presumably the former in this case. Colours are typically oxidised light orange on the surface, and reduced mid or light grey in the core. These vessels are only lightly tempered: in most examples the temper forms between 5% and 15% of the fabric, but in one sample it amounts to about 20%. Inclusions are listed below in approximate order of frequency, starting with the most frequent:

1. Quartz: predominantly transparent to translucent colourless, a few white in individual samples; occasional vein quartz; one with translucent white angular grains, another with a few larger composite fine-grained quartzitic grains; angular to sub-angular, rarely sub-rounded or rounded, mainly less than 0.2mm but a few up to 0.3mm.
2. Sandstone rock fragments: buff to grey or white weathered fragments, some angular irregular and tabular, others rounded rich in fine-grained quartz and quartz/feldspar, a few micaceous, rarely micaceous silvery-buff with a scatter of quartz grains, mainly 0.5–2.5mm, a few up to 4mm.
3. Slate: a few soft buff sub-angular and sub-rounded micaceous fragments, some buff tabular, some silvery-grey micaceous tabular fragments, 1.0–3.0mm.
4. Mica: a scatter of fine-grained cleavage flakes of muscovite, mostly less than 0.05mm, some up to 2mm.

The mix of sandstones, slates and shales evident in these samples is typical of the 'Exmoor/Quantocks-derived' temper identified by the writer in pottery from Cleeve Abbey, Somerset (Taylor 1998) and Lundy (Taylor 2005). Unlike the samples from Lundy, which were more heavily tempered than the Ley Hill finds, these samples do not display the unusually plentiful iron oxide fragments suggesting an origin near the iron-rich parts of Exmoor. The inclusions in this local pottery would not be readily distinguished from the 'Exmoor-derived' wares made in

Barnstaple, such as those examined by the writer from the small kiln found at the Library Site, Tuly Street.

Unidentified jug (Fig. 12, no. 1)

Temper forms c. 5% of the fabric:

1. Quartz: colourless transparent angular to sub-rounded grains 0.1–0.5mm across, but predominantly c. 0.3mm.
2. Rock fragments: a few medium grey sub-angular slate and fine-grained sandstone fragments, 0.4–0.6mm.
3. Mica: sparse fine-grained cleavage flakes of muscovite.

The mineral components are broadly similar to the 'Exmoor-derived' local wares but the temper is particularly sparse and the well-sorted and transparent quartz is not quite typical. The rock fragments are less altered than those in North Devon and Exmoor-derived wares. The overall impression is that this jug does not have a local origin.

THE ANALYSIS BY INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION ANALYSIS (ICP-AES) AND MASS SPECTROMETRY ANALYSIS (ICP-MS) OF POTTERY FROM LEY HILL

Michael J. Hughes

Introduction

Medieval pottery from Ley Hill has been analysed by inductively-coupled plasma-atomic emission (ICP-AES) and –mass spectrometry (ICP-MS), and its results compared to analyses of sherds from a number of sites in Somerset and Devon. The theory and practice of such pottery provenance studies has been described elsewhere (Hunt 2017; Orton and Hughes 2013).

The aim of the analytical investigation was to obtain a chemical signature for the Exmoor-Quantocks derived ware and to see whether it is distinguishable from

TABLE 2 ANALYSES OF POTTERY FROM LEY HILL BY INDUCTIVELY- COUPLED PLASMA ATOMIC SPECTROMETRY (ICP-AES) AND MASS SPECTROMETRY (ICP-MS)

no.	*lab.*	*Al_2O_3**	*Fe_2O_3**	*MgO**	*CaO**	*Na_2O**	*K_2O**	*TiO_2**	*P_2O_5*	*MnO**	*Ba*	*Co*	*Cr**	*Cu*
7	Q27	14.9	6.50	2.55	0.28	0.13	3.94	0.81	0.17	0.044	466	25	71	31
8	Q28	13.4	6.72	2.10	0.27	0.10	3.63	0.85	0.12	0.035	422	27	77	25
6	Q26	12.6	7.62	1.03	0.29	0.24	2.99	0.83	0.36	0.005	330	9	112	32
9	Q29	12.7	7.75	0.83	0.31	0.26	2.84	0.83	0.46	0.006	310	8	104	27
10	Q30	12.4	7.16	0.78	0.32	0.24	2.71	0.66	4.15	0.011	740	10	117	26
11	Q31	11.9	7.13	2.23	0.32	0.29	3.81	0.82	1.80	0.023	547	10	117	23
no.	*Li**	*Ni**	*Sc**	*Sr*	*V**	*Y**	*Zn**	*Zr*	*La**	*Ce**	*Nd*	*Sm**	*Eu**	*Dy*
7	83	38	15	43	95	14	139	64	34	58	35	3.6	0.9	3.0
8	50	38	15	37	103	13	108	74	32	56	33	3.0	0.8	3.0
6	43	25	13	27	136	12	55	78	34	54	34	1.5	0.7	2.2
9	46	25	16	28	140	12	55	76	32	49	32	1.3	0.7	2.2
10	42	31	16	66	98	19	42	70	44	73	45	5.0	1.0	3.6
11	49	39	15	50	135	16	65	74	41	67	41	4.5	0.9	3.1
no.	*U**	*Yb*	*Pb*	*Th**	*Rb**	*Nb*	*Cs**	*Y*	*La**	*Ce**	*Pr**	*Nd**	*Sm**	*Eu**
7	3.22	1.9	22	14.8	124	14.4	15.9	17	38.7	73.3	8.7	35.3	6.49	1.21
8	3.13	2.0	17	16.7	104	15.2	12.4	14	37.0	75.8	8.4	33.8	6.17	1.18
6	2.83	2.1	29	15.8	107	14.0	10.2	12	34.6	58.9	7.0	28.1	4.53	0.89
9	3.31	2.1	29	14.7	97	15.1	11.0	12	33.6	56.8	6.7	25.9	4.60	0.88
10	3.13	2.4	56	14.6	86	12.8	8.4	21	47.4	85.3	10.1	41.5	7.06	1.51
11	3.40	2.2	29	17.0	112	16.2	10.1	20	47.4	83.9	10.2	41.8	7.48	1.48
no.	*Gd**	*Dy*	*Ho**	*Er*	*Yb**	*Lu**	*Ag*	*As*	*Pb*	*Cd*	*Tl*	*Mo*	*Sb*	*Bi*
7	5.38	3.14	0.65	2.03	1.79	0.26	0.5	9.6	18	0.1	0.6	1.1	1.6	0.6
8	5.31	2.72	0.52	1.91	1.62	0.25	0.5	10.1	16	0.1	0.5	1.1	1.9	0.4
6	3.72	2.16	0.45	1.47	1.67	0.25	0.5	13.1	26	0.1	0.8	1.6	1.9	1.0
9	3.74	2.16	0.45	1.54	1.72	0.24	0.5	9.0	28	0.1	0.7	1.9	1.5	0.4
10	6.13	3.68	0.72	2.25	2.32	0.31	0.5	8.7	52	0.1	0.5	1.0	0.8	0.8
11	6.49	3.42	0.67	2.31	2.06	0.28	0.5	42.4	25	0.1	0.6	0.6	0.8	0.4

Key: lab: laboratory sample number; Al_2O_3 aluminium; Fe_2O_3 iron; MgO magnesium; CaO calcium; Na_2O sodium; K_2O potassium; TiO_2 titanium; P_2O_5 phosphorus; MnO manganese; Ba barium; Co cobalt; Cr chromium; Cu copper; Li lithium; Ni nickel; Sc scandium; Sr strontium; V vanadium; Y yttrium; Zn zinc; Zr* zirconium; La lanthanum; Ce cerium; Pr praesodinium; Nd neodymium; Sm samarium; Eu europium;Gd gadolinium; Dy dysprosium; H holmium; Er erbium; Yb ytterbium; Lu lutetium; Ag silver; As arsenic; Pb lead; Cd cadmium; Tl thallium; Mo molybdenum; Sb antimony; and Bi bismuth. The results from Al_2O_3 to MnO inclusive are given as the oxide in weight percent; all the rest are given as the element in parts per million. The elements listed * were used in the statistical tests to interpret the analyses.

pottery made in Nether Stowey (on the other side of the Quantocks but similar inclusions) and Crowcombe (nearer but visibly different fabric) (Allan 1998). From another ICP investigation (Hughes 2005) there were analyses of pottery from kilns in Barnstaple (Tuly Street and Green Lane); of North Devon medieval coarsewares from Beere, Okehampton Castle and Okehampton Park; and there was also a minor presence of 'Exmoor/Quantocks derived' pottery on Lundy in apparently similar fabric.

Chemical Analysis

Six samples (Fig. 12, nos 6-11), were selected for analysis and the results are given in Table 2. The chemical analysis and statistical procedures were the same as described in the earlier investigation of pottery from Pig's Paradise, Lundy (Hughes 2005), including the advantages of using a combination of atomic emission and mass spectrometry ICP.

Statistical Interpretation of the Chemical Analyses

Initial review of the analyses indicates that they are fairly similar across many elements, containing lower levels of most elements compared to pottery from other sites in North Devon. The aim of the statistical tests was to draw out the significance of the analyses by looking for patterns of similar chemistry among the sherds, which indicates similar origin, and comparing them with analyses from other sites. The statistical processing was done in stages following the procedures as for the Lundy sherds.

Principal Components analysis of atomic emission spectrometry results alone on sherds from Ley Hill, Lundy, Barnstaple Green Lane and Tuly Street kilns, Beere, Crowcombe, Nether Stowey, and Okehampton Castle and Park

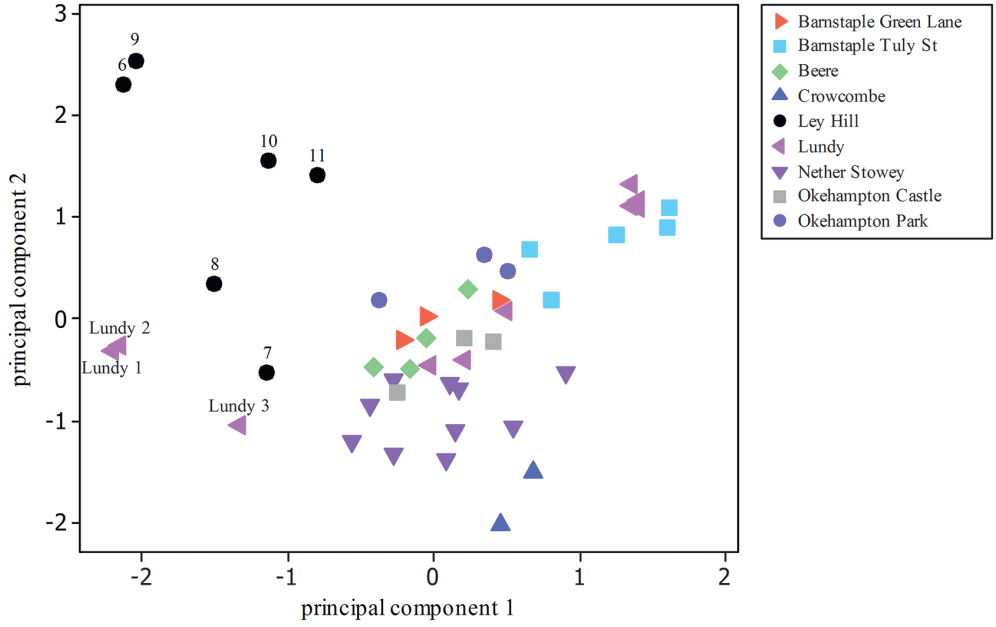

Fig. 13 Plot of the first two principal components arising from ICP-AES analyses of pottery analysed in this project. The first principal component contains 45.5% of the variation in the data and is positively correlated with the concentrations of many elements – sherds with high concentrations of many elements plot on the right (positive values of principal component 1), and low concentrations on the left. But sodium, iron and vanadium contributes relatively little to the variation in the first principal component. The second component contains 21.8% of the variation and is associated positively with vanadium (0.81), iron (0.64) and titanium (0.62) and negatively with lithium (-0.74), zinc (-0.72) and potassium (-0.53). Sherds which plot towards the top of the Figure contain high concentrations of vanadium, iron and titanium and low concentrations of lithium, zinc and potassium. The third principal component (not shown) contains just 9.0% of the variation in the data and is positively associated with sodium (0.79) and aluminium (0.40) and negatively with chromium (-0.42).

The first stage was a principal components analysis test comparing the Ley Hill analyses against as wide a range of available analyses of pottery from the region as possible. These included pottery from Barnstaple Green Lane and Tuly Street kilns, Beere, Lundy, and Okehampton Castle and Park (Hughes 2005); and also Nether Stowey and Crowcombe (Allan 1998) analysed by ICP-AES alone. Because of the inclusion of the latter two, a reduced-elements statistical test was carried out. This can reduce the capacity to distinguish pottery from different sites, but it was considered a worthwhile investigation. The same seventeen elements were used as previously (Hughes 2005), and Fig. 13 plots the first two principal components derived from the data; the program extracted just four statistically-significant components. This is a kind of chemical map showing analytical similarities and differences between pottery; the archaeological information has only been used for the symbols and labels to aid interpretation.

Fig. 13 shows that the sherds from Ley Hill fell on the left, away from the rest of the pottery, except three sherds of hand-made cooking pots in Exmoor-derived fabrics from Lundy (Allan and Blaylock 2005, cat. 1-3, table 4). All the Ley Hill sherds have relatively lower aluminium than the rest, but each other group differs from them in different ways. Two from Ley Hill (nos 7 and 8) have a closely similar chemical composition to the Lundy trio and seem to have the same origin. The other four from Ley Hill fall into pairs (6/9 and 10/11), in which each member of the pair are very close in composition – if they are not from the same pot, they are from the same batch of clay. Compared to the pair

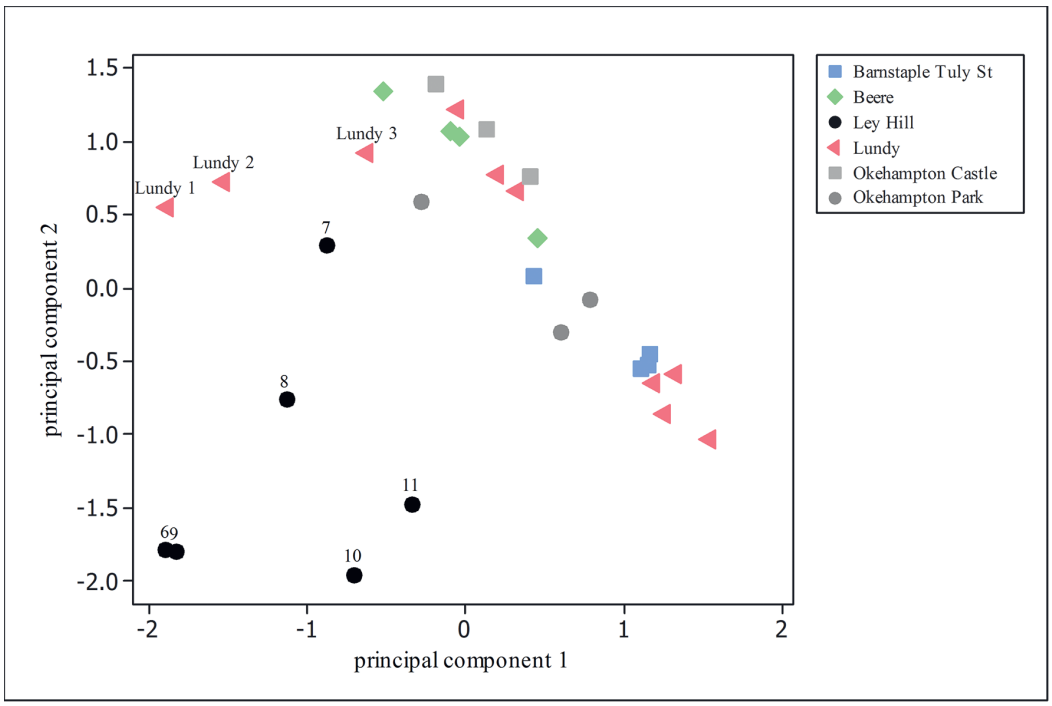

Fig. 14 Plot of the first two principal components arising from a combination of elements obtained by ICP-atomic emission and mass spectrometry analyses of pottery in this project. Like Figure 13, the first principal component contains much of the variation (56.4%) and is positively correlated with all elements apart from caesium – sherds with high concentrations of many elements will therefore be plotted on the right. The second component contains 17.7% of the variation in the data and is associated positively with caesium (0.90), rubidium (0.75), lithium (0.70), and potassium (0.64), and negatively with thorium (-0.70), iron (-0.64) vanadium (-0.58), titanium (-0.57) and chromium (-0.56). sherds which plot towards the top of the Figure contain high concentrations of the alkalis and low concentrations of thorium, iron, vanadium, titanium and chromium The third principal component (not shown) contains just 6.2% of the variation in the data and is positively associated with magnesium (0.68), zinc (0.58) and thorium (0.55) and negatively with chromium (-0.42).

7/8 and the Lundy trio they have lower aluminium and magnesium but more iron, chromium, potassium and the rare earths. All the Ley Hill and these Lundy sherds could well be from the same clay source/production centre, with some variability in the clay source; they stand distinctly different to the pottery from all the other sites tested. Pairs 6/9 and 10/11 from Ley Hill are distinguished from Nether Stowey and Crowcombe by slightly more iron, but less aluminium, magnesium, potassium, titanium, nickel and yttrium and to some degree, lower rare earth elements.

Principal Components analysis using combined atomic emission and mass spectrometry on sherds from Lundy, Barnstaple Tuly St kiln, Beere and Okehampton Castle and Park

As with the Lundy project, the second principal components analysis included only those analysed by both ICP techniques and thirty elements were submitted to the statistical program (listed in Hughes 2005, 85). The patterns observed in the first principal components were closely repeated with the combined-elements test, although as Fig. 14 shows, the graph has 'flipped' top to bottom while retaining the relative dispositions of the samples on it. The conclusions drawn above were therefore entirely supported and with the extra elements included, the sherds were in more tightly defined groups in Fig. 14 compared to 13. This results from the significantly higher percentage of the variation in the data 'captured' by the first two principal components – 64% for the atomic emission elements alone but 74% in the 'combined elements' set. The Ley Hill sherds show the same general pattern as Fig. 13 with similarly more scatter than other sites on the second component. The Ley Hill and Lundy trio differ from the source groups on the right of the figure in that the latter tend to have higher aluminium and rare earths, sodium, potassium, iron and magnesium. Sherds high up on Fig. 14 contain higher alkali concentrations (sodium, potassium, rubidium), aluminium and magnesium, but lower transition metals (iron, chromium), thorium and titanium; the Ley Hill sherds show most variation in these elements.

There are quite complex differences between the Ley Hill and other source groups within the mass spectrometry elements, which helps to differentiate between them (principally uranium, thorium, rubidium, caesium, niobium and the rare earth elements). None of the thorium concentrations are particularly high (mostly 12-16 parts per million), whereas clays derived from acid (high-silica) rocks show higher values of the 'high field strength elements' uranium and thorium, together with high alkalis and rare earths and lower chromium and cobalt (Blackman *et al*. 1989; Krauskopf and Bird 1995, 544). Ley Hill pairs of sherds 6/9 and 10/11 contain about half the rubidium and caesium concentrations of sherds from Beere and Okehampton which have the highest in this project. These two elements (part of the large-ion lithophile geochemical series) have proved especially useful in past provenance studies involving neutron activation analysis, so it is especially useful to have results for them now available again though ICP-mass spectrometry.

Discussion and Conclusions

The use of elements from both atomic emission and mass spectrometry ICP has produced greater clarity in distinguishing pottery from different sources in the region compared to the use of atomic emission ICP alone. The questions posed of the analysis can now be considered. The Ley Hill sherds have a distinctive chemical signature, though with more variability than other single sites in the region. This may be due to the method of manufacture – for example percentages of inclusions may vary from sherd to sherd, either deliberately introduced or in the natural clay. The Ley Hill analyses seem to group into three pairs, which may in some cases represent the same pot or other vessels made from the exact same clay. The pottery of Ley Hill is distinctive chemically compared to the sites on either side of the Quantocks, Nether Stowey and Crowcombe, and unlike those from Barnstaple which lies to the immediate west. Given these differences, and the fabric descriptions and petrological evidence of local geology in the clays, the ICP analyses of the Ley Hill sherds are consistent with an origin within Exmoor.

The Ley Hill sherds all have a similar chemical signature which could represent the output of a single production centre. It is significant that three sherds from Lundy in the 'Exmoor Quantocks-derived' fabric share the same chemical pattern as two sherds from Ley Hill, while other Lundy sherds show the clay chemical patterns of sites in the Quantocks and Barnstaple.

THE LITHIC ASSEMBLAGE
Henrietta Quinnell

A full report on the assemblage is lodged with the archive. It consists of 24 pieces of flint and one of Portland chert, for which dates range from the Mesolithic to, probably, the Middle Bronze Age (Fig. 15). Most of the pieces, whether categorised as tools or debitage, appear chunky and thick. The assemblage is otherwise unusual for two reasons. Firstly there is little unused debitage: most of the pieces are tools, including eight scrapers, one third of the whole: the proportion of scrapers in a South Western assemblage is more usually about 1/20, as in the recently published material from the Tiverton area (Quinnell *et al*. 2015, table 12). A possible explanation is that the lithics were brought to Ley Hill from sites in the vicinity for use

Fig. 15 Flints recovered from the medieval site: [SF198] plano-convex knife and [SF613] extended end scraper, later Neolithic – Early Bronze Age : [SF167] denticulate scraper probably Middle Bronze Age. (Photo G.M. Young)

in small cutting and chopping jobs. There is no known comparandum for such a practice in South Western Britain, but this need not mean that it did not on occasion happen, especially in settlements in rather isolated positions. An alternative or complementary suggestion would see at least some of the pieces selected as 'good luck charms', brought in and deposited for this reason. The findspots of some significant pieces, for example denticular scraper [SF114] and plano-convex knife [SF198] (see above), could support this. The seminal 19th-century work on flint implements by John Evans (1897, 364-6) only touches on the magical properties formerly attached to some artefact types, mainly arrowheads, and Leslie Grinsell (1976, 71-2) in his study of folklore of prehistoric sites in Britain only contains a single page on that attached to 'flint arrowheads, stone axes and other stone objects'. The time may be ripe for a review of the data from a modern perspective.

THE PLANT REMAINS

Wendy Carruthers

This report discusses the analysis of charred plant remains recovered from soil samples taken during excavations at the Ley Hill settlement.

Methods

Seventeen dry, peaty soil samples were processed using standard methods of flotation with a 250 micron mesh used for the flots and 1mm mesh for the residues. The dried flots were assessed for plant macrofossils (Carruthers 2001). The assessment revealed that charred cereal remains were common in two of the samples but sparse in most of the remaining samples. In view of the lack of information about the arable economy of settlements on Exmoor in the medieval period (Vanessa Straker pers. comm.) it was recommended that all seventeen samples were analysed. This involved fully sorting the flots under an Olympus SZX7 stereoscopic microscope and scanning the residues for plant material.

Results

Table 3 presents the list of charred plant remains recovered from the samples. Nomenclature follows Stace (2010) except for the cereal remains which follow Zohary and Hopf (2000).

Some notes on cereal identification:

a) *Oats* – The recovery of a few oat pedicels and an intact floret base confirmed that common oat (*Avena sativa*) was being cultivated. The predominance of oats amongst the grains also confirmed that they represent a crop plant rather than a weed, although a few of the smaller, thinner grains could have been from wild oat. Bristle oat (*A. strigosa*) may also have been present but was not positively identified due to the lack of chaff fragments.

b) *Barley* – Six-row hulled barley (*Hordeum vulgare* subsp. *vulgare*) is the most likely type of barley being cultivated and was confirmed by the presence of twisted lateral grains. However, it is possible that some two-row barley was also grown.

c) *Wheat* – A few plump, rounded free-threshing wheat grains were present in the trench below building 4.

TABLE 3 LEY HILL: CHARRED PLANT REMAINS

sample	1	4	5	6	7	8	9	10	11	1	2	115507*
context	22	89	63	133	136	137	143	156	175	250/45	251/45	10
building	2	2	2	2	2	2	2	2	2	4	4	7
GRAIN & PULSES period	C12-14th	C12-14th	C12-14th	C12-14th	C12-14th	C12-14th	C12-14th	C12-14th	C12-14th	?C13th-C14th	?C13th-C14th	C13th-C14th
Triticum aestivum/turgidum s.l. (bread/rivet wheat-type grain)										4	2	
Hordeum vulgare subsp. *vulgare* (hulled six-row barley, twisted grain)												
Hordeum vulgare L. (hulled barley grain)										4	34	
Hordeum sp. (poorly preserved barley grain)		1										
Avena sp. (common/bristle/wild oat grain)	3f	4	2			2f		5	2	152	340	38*
Avena sativa/strigosa (common or bristle oat grain with floret base)												1
Secale cereale L. (rye grain)				1					2	13	166	
Indeterminate cereal grain								1		118	665	1
Vicia faba L. (field bean seed)		2f									1	
Vicia/Lathyrus/Pisum sp. (large pulse seed)											1f	
CHAFF												
Triticum aestivum L. (bread wheat rachis fragment)											1	
Hordeum sativum L.emend. (barley rachis fragment)											2	
Avena sativa/strigosa (common/bristle oat pedicel)											2	
Avena fatua L. (wild oat pedicel)											1	
Secale cereale L. (rye rachis frag,)											3	
cereal-sized culm nodes											5	
WEEDS / WILD PLANTS												
Ulex sp. (gorse seed) Geasp											1	
Ulex sp. (gorse leaf spine) Geasp											6f	
Rubus sect. Glandulosus (bramble seed) DHSW										1		
Viola sp. (violet seed) GEHSW										1		
Rumex acetosella L. (sheep's sorrel achene) EoGCas			1				1					1
Spergula arvensis L. (corn spurrey seed) ACas			1					4			1	3
Agrostemma githago L. (corn cockle seed) AC											3	
Calluna vulgaris (L.) Hull (heather shoot tip) Emsp												1
Erica sp./Calluna vulgaris (heather/ling fruit) EM					1				1	3	3	1
Galeopsis tetrahit L. (common hemp-nettle nutlet) ACDWow				1							4	
Chrysanthemum segetum L. (corn marigold achene) ACD											2	
Asteraceae - indeterminate embryos								1			3	
Cyperaceae - indeterminate											1	
Arrhenatherum elatius var. bulbosum (Willd.)St-Amans (onion couch tuber) ACG												1
Bromus sect. Bromus (brome grass caryopsis) ACD											1	1
Poaceae (small seeded grass caryopsis) CDG								1	1			
TOTAL	3	7	4	2	1	2	1	12	6	296	1249	48*
sample volume (l)	12	30	6	20	12	16	10	35	20	42	42	22*
charred fragments per litre of soil processed (fpl)	0.3	0.2	0.7	0.1	0.1	0.1	0.1	0.3	0.3	7.1	29.7	2.2*

Key: *includes a sample of oats examined by Vanessa Straker (unpublished); e=embryo; f=fragment; [ ] = uncharred. HABITAT KEY: A=arable; C=cultivated; D=disturbed; E=heath; G=grassland; M=marsh; P=pond side, riverside, ditch etc.; a=acidic soils; o=open soils; p=peaty soils; s=sandy soils; w=wet/damp soils

It is not possible to confidently identify wheat grains to species level (Jacomet 2006) which is why in the table the grains are listed as bread/rivet-type wheat (*Triticum aestivum/turgidum*). However the recovery of a bread wheat rachis fragment (*Triticum aestivum* s.l.) confirmed that this species was being cultivated. Evidence for rivet wheat (*Triticum turgidum*) is scarce in south-west England and Wales (Moffett 1991).

d) *Field bean* (*Vicia faba*) – The fragments and whole cotyledon of beans recovered from samples 4 and 251/45 were long and thin in shape (12.5 x 7mm in sample 251/45), making them more similar to modern field beans than the rounded Celtic beans of prehistoric to Roman times. Protein-rich field beans (containing 20-25% protein; Zohary and Hopf 2000) have been valued as a food plant by poorer communities and used for fodder through the medieval period.

Description of the Samples by Building

Building 2

Nine samples were examined from Building 2. Low numbers of charred plant remains were recovered from all of the samples, including a floor layer [137] and a post pit [63]. This type of low-level waste is to be expected in a domestic building that was probably swept clean on a regular basis. The only reason why charred plant material would be present in high concentrations is if the building burnt down catastrophically while still in use, preserving stored foods *in situ*. The recovery of oat grains from six of the nine samples from Building 2 (18 grains in total) suggests that oats (*Avena sativa/strigosa*) were the main cereals being consumed. Three rye grains were the only other cereals recovered from this structure. Oats were probably mainly consumed as oat cakes and in pottages, although oat flour can also be added to other flours to make a mixed cereal bread. The single barley (*Hordeum* sp.) and rye (*Secale cereale*) grains had probably been burnt amongst refuse such as stable waste used for kindling and fuel. They may also represent minor cereal crops that were also consumed as bread or used whole in pottages. Two fragments of field beans (*Vicia faba*) were present in sample 4 [89], a dark layer below a probable hearth; perhaps representing pulse consumed as whole beans in pottages or ground into flour and added to bread. The young shoots of field beans can be eaten as a vegetable. They may also have been used for fodder and become charred when waste materials were being burnt on the hearth.

The few weed and wild plant fruits and seeds derive from several plants of acidic soils, including corn spurrey (*Spergula arvensis*), sheep's sorrel (*Rumex acetosella*) and heather/ling (*Erica/Calluna* sp. capsules). They are all small seeds and fruits that would either been present as crop weeds (for example corn spurrey) or amongst heathland vegetation gathered locally for fuel. It is unlikely that they were picked out of the grain during food preparation and thrown onto the hearth because of their small size. Heather remains and weed seeds could also have fallen from thatch or bedding as these types of materials were often used as a base coat (Letts 1999). No chaff fragments were present in the samples from this building, suggesting that cereals were probably being brought into the house as fully processed grain, ready for the pot. The general scarcity of evidence and the fact that oat and barley chaff does not survive burning well mean that interpretations of this type must be tentative. However, crop processing waste was clearly not being burnt in any quantity on the domestic hearths at this site.

Trench below Building 4

The two most productive samples [250/45, 251/45] came from the slope below Building 4. Oats were the dominant cereal (69% of identifiable grains from the two samples), although rye (25%) and smaller amounts of barley (5%) and wheat (<1%) were present (715 identifiable grains in total).

Sample 251/45 was the only sample from the site to produce chaff fragments. Small amounts of chaff from all four grains were recovered; wheat, barley and rye rachis fragments, oat pedicels and probable cereal straw nodes. In addition, low numbers of arable weed seeds were present, including wild oat (*Avena fatua*), corn spurrey (*Spergula arvensis*), corn cockle (*Agrostemma githago*), corn marigold (*Chrysanthemum segetum*), brome grass (*Bromus* sect. *Bromus*) and common hemp-nettle (*Galeopsis tetrahit*). Ecological information recovered from the seeds suggests that the crops were being grown on acidic, sandy and moist soils. Some of the other remains from weeds/wild plants probably derived from gathered heathland vegetation used for fuel, such as gorse (*Ulex* sp.), heather (*Calluna vulgaris* and *Calluna/Erica* sp.), violet (*Viola* sp.) and indeterminate sedges (Cyperaceae). As a whole, the assemblages were typical of a midden-type build-up of burnt material accumulating close to the longhouse (Building 4) and possible barn (Building 5). The main type of waste being deposited was cereal grains (mostly oats and rye) that had been burnt either accidentally during drying or deliberately because it was infested. Traces of processing waste (chaff and arable weed seeds) and materials used for fuel may have been swept up amongst ash from hearths.

Building 7

The single sample from Building 7 was taken from a floor deposit [10]. A sample of 30 oat grains (*Avena* sp.) had

previously been examined from this deposit by Vanessa Straker (pers. comm.) - this unpublished material has been added to the species table (marked by *). Oat grains were the only cereal remains present, and these included one grain with an almost intact floret base allowing identification to common or bristle oat (*Avena sativa/strigosa*). A small number of arable weeds were also present (corn spurrey, brome grass and onion couch (*Arrhenatherum elatius* var. *bulbosum*)). Onion couch 'tubers' can behave like weed seeds leading to a build up over time of this grass in crops grown on poor soils. It is also a plant of poor grasslands and can become charred when turves are burnt. It is likely that the grain and weeds derive from crops being stored in the barn. The trace of charred heather (a shoot tip and fruit) may have fallen from heather thatch, been blown into the barn from midden material or been brought in on trample.

Discussion

Rural sites such as farmsteads rarely produce high concentrations of charred plant remains unless accidental or deliberate whole-scale burning has occurred, for example in the case of the barn burnt down in 1553 at Wharram Percy, North Yorks (Carruthers 2010). Waste products such as crop processing waste would have been valued as fodder for livestock and poultry, although the occasional use for kindling or fuel may have preserved chaff fragments and a few cereal grains amongst the ashes from hearths and ovens. The scarcity of charred plant remains from most of the samples from Ley Hill, therefore, is not surprising. Five of the seventeen samples analysed contained no plant remains and nine samples from Building 2 all produced less than one charred fragment per litre of soil processed (fpl). The sample from the floor of Building 7 was also fairly clean of charred material (2.2 fpl). The absence of crop processing waste (i.e. abundant chaff and weed seeds) in the deposit from the barn floor could be said to suggest that the barn was not being used as a covered space in which to carry out threshing or the de-husking of oats and barley prior to cooking. However, it is possible that some crop processing activities that do not involve the use of fire, such as threshing, could have taken place in the barn without plant material becoming preserved by charring. Alternatively the barn may simply have been kept clean. Like farmhouses, barn floors are likely to have been swept on a regular basis in order to reduce pest infestations and the spread of crop pathogens.

Higher concentrations of grain, some chaff and weed seeds were recovered from two samples from the trench below Building 4. The deposit appears to have consisted of a midden-type build-up of waste, so it probably contained accidentally and deliberately burned food items (cereal grains and bramble seeds) and materials burnt as tinder and fuel on domestic hearths (for example waste animal bedding, crop processing waste, fuel wood, heathland vegetation, flooring materials etc.).

Oats, a spring sown crop, appear to have been the main cereal being grown throughout the period of occupation. Because of poor preservation it was uncertain whether one or both of common oat (*Avena sativa*) and bristle oat (*Avena strigosa*) were being cultivated. Bristle oat produces smaller grains but is particularly hardy on poor soils. Oats readily fall from the ear when fully ripe so must be harvested slightly unripe and dried under cover. This probably explains the presence of barns at Houndtor, Devon, containing corn-dryers and ovens described in the section below (Austin and Walker 1985). Once released from the ear they still need to be de-husked prior to being consumed by humans, although not prior to being fed to livestock. The threshed grains may have been dried piecemeal over a fire or in an oven until the husk was brittle enough to be rubbed from the grains by hand or with quern stones. On a larger scale they could have been dried on the floor of a kiln and gently ground between raised mill stones to remove the chaff. In Wales, where oats were the preferred cereal crop throughout most of the medieval period, the oat grains were usually ground into oatmeal to be stored in oak chests in a warm, dry room upstairs until required to make oat cakes (Tibbott 2014).

Although only traces of rye were recovered from Building 2, 25% of the cereals present in deposit 45 from the trench below Building 4 were rye. It is impossible to say whether there were changes in crop preferences through time because the data recovered from Building 2 was so sparse. The relatively high occurrence of rye in context [45] is rare on medieval sites in England. However, in south-west England farmsteads located on sandy heathland have been found to produce the highest percentages of rye (Rippon *et al*. 2014). Rye copes well with free-draining, acidic, impoverished soils and oats are well suited to poor soils in areas of high rainfall. By growing both crops farmers can insure themselves against adverse weather conditions. It is uncertain whether mixed crops of oats and rye would have been grown, but this is perhaps unlikely because of the need to harvest oats before the ears shatter in the fields. Oats and barley (dredge) is a more common mixed crop encountered in the medieval period, particularly on poor soils, but the scarcity of barley grains in the Ley Hill samples suggest that dredge was probably not grown unless it was exclusively used as fodder and so did not become charred. Bread wheat was so scarce (<1% in context [45] only) that it may have been purchased at market for specific purposes from time to time rather than being grown locally. Since bread wheat is demanding of nitrogen it would not have grown well on

Exmoor, although soils on the lower slopes may have supported small amounts of wheat and barley if regularly manured. Nitrophilous weed taxa such as fat hen and chickweed were not recovered from the samples, so there is no definite evidence to show that manuring was carried out. Arable weeds such as corn spurrey and corn marigold are more characteristic of nutrient-poor acidic soils, demonstrating that at least some of the crops were being grown locally, possibly on the more acidic upper slopes of Exmoor.

Although only a few fragments of field bean were recovered from Building 2 and the ashy deposit outside Building 4, pulses are less likely to become charred than cereal grains because their processing does not require contact with heat. They may have been grown as garden vegetables or as field crops, providing an important source of protein and helping to increase soil fertility due to nitrogen-fixing root nodules.

Charred plant assemblages rarely provide much information about the range of fruits, nuts, vegetables, and flavourings being consumed. The recovery of a charred bramble seed demonstrated that wild food resources were being exploited though it was surprising that no hazelnut shell was recovered, considering that hazel charcoal was present in all three buildings (Gale below). It can be common on rural sites, for example Eckweek, Avon (Carruthers 1995), but perhaps its absence was due to taphonomic reasons.

Comparisons with other sites

No other medieval settlement sites on Exmoor have been excavated and sampled for plant remains, so direct comparisons cannot be made. However, excavations of medieval settlements on Dartmoor and in West Devon have provided evidence that cereal cultivation and crop processing was part of the economy on at least some sites, since corn-drying kilns have been found (Henderson and Weddell 1994, Beere, North Tawton, 120, Houndtor I, 123). In the hamlet of Houndtor four barns were excavated, each of which contained a corn-drying kiln and an oven, positioned next to each other at one end of the building. The barns unusually had a single door in the middle of the side wall, as at Ley Hill. There was archaeobotanical evidence that the corn-dryers had been used for drying oats, in addition to palynological evidence for the cultivation of rye and oats in a later 13th- or early 14th- century horizon from an adjacent peat deposit. Cereal cultivation appears to have declined at the site during the 14th century (Austin and Walker 1985).

In Dorset a comparable site at Ower Farm, consisting of a 13th- to 14th-century settlement and shell midden, was excavated on open heathland adjacent to Poole Harbour (Carruthers 1991). As at Ley Hill, all four cereals were present but rye was dominant in 53% of the samples and oats were the least frequent cereal. The preference for rye over oats may be the location of Ower Farm on the south coast rather than south-west England, providing much drier climatic conditions. Of the weed taxa recorded at Ley Hill, corn marigold and corn cockle were also present at Ower Farm.

More locally, thatch from The Old Bake House, Bossington (near Minehead), Somerset was sampled and studied (Letts 1999). The sample was found to consist of oat and rye straw. It is interesting to note that the most frequent cereals in the Ley Hill assemblage were also being used to thatch buildings in the area in late medieval/post-medieval times. Although there is no proof that the straw from oats and rye were put to this use at Ley Hill it seems very likely that at least rye straw would have been used. Rye grows on long, tough straw that has been valued for thatching over the centuries. Oat straw is softer if cut early to prevent shattering in the field, but in this state is useful for fodder. If left to ripen, mature *haver* (oat) straw can be as durable as rye or wheat straw (Letts 1999, 23). Both gorse and heather can also be used when tied in tight bundles to thatch agricultural buildings, and can be used in the base coat (Letts 1999, 16). It is possible that gorse and heather remains, recovered in very small quantities from five samples at Ley Hill, had fallen from the thatch and been thrown into the fire as floor sweepings. However, this type of vegetation also makes excellent kindling and fuel for domestic hearths, burning readily with a hot flame. Therefore, although soils in the area were not sufficiently fertile to grow crops with the highest market value (for example bread wheat), the plentiful supply of heathland vegetation would have been an important incentive to locate a farmstead on the moors, providing fodder in winter, grazing, thatching materials and bedding.

THE ANALYSIS OF CHARCOAL
Rowena Gale

Introduction

Charcoal analysis was undertaken to indicate the character of the local landscape and the economic use of woodland resources at Ley Hill. Fifteen samples were selected for analysis as follows: Building 2: 10 samples; Building 4: 4 samples; Building 7: 1 sample.

Materials and methods

Charcoal was relatively sparse in all samples except 250/45, from which a 50% subsample was extracted. Fragments measuring >2mm in cross-section were considered for species identification.

Samples were prepared for examination using

TABLE 4 THE ANALYSIS OF CHARCOAL.

Sample	**Context**	DESCRIPTION	*Acer*	*Alnus/ Corylus*	*Betula*	*Corylus*	*Eric-aceae*	*Ilex*	*Prunus*	*Quercus*	*Salic-aceae*	*Ulex/ Cytisus*
Building 2, 12th-14th century												
1	22	Over/ part of cob wall	-	-	-	-	-	-	-	11h, 1s	-	-
1	22 big base	As above but in base of largepot	-	-	1	-	-	-	-	1h, 1r	-	4r
3	40	Possibly degraded floor	-	1	-	1	-	1	1	88h	1	2r
4	89	Possibly floor	-	-	-	1r	-	-	-	82h,29r,s	1	2r
5	63	Post pit	-	-	1	-	-	-	-	6	-	1r
6	133	Possible cob	-	-	1	2	-	1	-	2h, 2r	-	2r
7	136	In corner of building on top of floor 137	-	-	-	-	-	-	-	-	-	4r
8	137	Floor	-	-	2	-	1	-	-	1h, 2r	-	-
9	143	Layer, bank, charcoal flecks	-	-	2	-	-	-	-	1	-	-
10	156	Layer, possibly on natural	-	-	-	-	-	-	-	15h, 2r	-	-
Building 7, 13th-14th century												
115507	10	Floor	-	-	-	5r	5r	-	-	18h, 26r	-	-
Building 4, ?13th – 14th century												
1	250/45	Ashy waste from building or burning layer	12	-	15	2	6r	-	23	39h, 15r	-	80r
2	251/45	Ashy waste from building or burning layer	-	-	23	6r	1r	-	-	2h, 3s	-	4r
3	252/50	Possible tree hole	-	-	-	1	-	-	1	3h	-	1r
4	253/54	Fill, possible slumping	-	-	1	-	-	-	-	1h	-	-

Key. h = heartwood; s = sapwood (diameter unknown but probably >20mm);
r = roundwood/ stem(diameter <20mm) The number of fragments identified as indicated

standard methods (Gale and Cutler 2000). Fragments from each sample were fractured to expose fresh transverse surfaces and sorted into groups based on anatomical features observed using a x20 hand lens. Representative fragments from each group were selected for detailed study at high magnification and additional surfaces prepared to show the tangential and radial planes. The prepared fragments were supported in washed sand and examined using a Nikon Labophot-2 microscope at magnifications of up to x400. Anatomical structures were matched to prepared reference slides.

When possible the maturity of the wood (heartwood/ sapwood) was assessed and the number of growth rings recorded (Table 5). It should be noted that stem diameters may be reduced by up 40% during carbonization.

Results

The charcoal analysis is summarised in Table 4 and discussed below. Anatomical differences between related genera are sometimes too slight to allow secure identification to genus level and, in these instances, group names are given. These include members of the Leguminosae (*Ulex* and *Cytisus*), Salicaceae (*Salix* and *Populus*), and Ericaceae (*Calluna* and *Erica*). Similarly, in degraded charcoal some unrelated taxa can be problematical, for example *Corylus* and *Alnus*. Where a genus is represented by a single species in the British flora this is named as the most likely origin of the wood, given the provenance and period, but it should be noted that it is rarely possible to name individual species from wood features, and exotic species of trees and shrubs were introduced to Britain from an early period (Godwin 1956; Mitchell 1974). Classification follows that of *Flora Europaea* (Tutin, Heywood *et al*. 1964-80).

Building 2, Table 4

Charcoal was recovered from several contexts within and around the house, often associated with charred cereal remains and, less frequently, with weed seeds (Carruthers, above). Ten samples of charcoal were examined.

Sample 1 [22] occurred with pottery fragments over, or as part of, the cob wall and included poorly preserved oak (*Quercus* sp.) heartwood and sapwood, oak roundwood (diameter 5mm, 6 growth rings), birch (*Betula* sp.) and gorse or broom (*Ulex* sp. or *Cytisus* sp.).

Sample 3 from a degraded floor [40], consisted mainly of oak (*Quercus* sp.) heartwood but also stems of gorse or broom (*Ulex* sp. or *Cytisus* sp.), holly (*Ilex aquifolium*), blackthorn (*Prunus spinosa*), hazel (*Corylus avellana*), willow or poplar (*Salix* sp. or *Populus* sp.) and degraded material either hazel (*Corylus avellana*) or alder (*Alnus glutinosa*).

Samples 4 [89] and 6 [133] were both from possible cob. Sample 4 was predominantly oak (*Quercus* sp.), both slow- and fast-grown heartwood; also sapwood and roundwood (diameter 12mm, 7 growth rings). In addition there were a few fragments of hazel (*Corylus avellana*), willow or poplar (*Salix* sp. or *Populus* sp.) and heather or ling (*Erica* or *Calluna*) (up to 3mm in diameter). Sample 6 was smaller and contained oak (*Quercus* sp.), hazel (*Corylus avellana*), holly (*Ilex aquifolium*) and birch (*Betula* sp.).

Sample 5 from the fill of a post pit [63], included oak (*Quercus* sp.) roundwood (diameter 10mm, 3 growth rings), birch (*Betula* sp.) and gorse or broom (*Ulex* sp. or *Cytisus* sp.).

Gorse or broom (*Ulex* sp. or *Cytisus* sp.) were named in Sample 7 [136] from the corner of the building on top of floor [137]; and, from the floor itself, Sample 8 included oak (*Quercus* sp.) heartwood and roundwood (diameter 8mm), birch (*Betula* sp.) and heather or ling (*Erica* or *Calluna*). Sample 10 from layer [156], over natural ground, consisted of oak (*Quercus* sp.) heartwood and slow-grown roundwood (diameter 5mm). Flecks of charcoal in sample 9 [143], from a layer in the bank at the back of the building, included oak (*Quercus* sp.) and birch (*Betula* sp.).

Building 7, Table 4

Cereal grains (*Avena* sp.) from building 7 provided a date of AD 1270-1400 (Table 6). Fragmented charcoal from the floor [10] appeared to be mainly oak (*Quercus* sp.) roundwood/ twiggy material (stem diameters 10mm, 5 growth rings; 7mm, 3 growth rings) ~~and~~ also fast-and slow-grown heartwood. Gorse or broom (*Ulex* sp. or *Cytisus* sp.) and heather or ling (*Erica* or *Calluna*) were also present.

Trench below Building 4, Table 4

Samples 1 and 2 from contexts [250/45] and [251/45] both derived from ashy waste below the building, possibly a midden. A wide range of taxa was recorded in the charcoal-rich Sample 1: gorse or broom (*Ulex* sp. and/ or *Cytisus* sp.) with stems (up to 10mm in diameter), oak heartwood and sapwood, blackthorn (*Prunus spinosa*), birch (*Betula* sp.), heather or ling (*Erica* or *Calluna*) (stem diameters up to 3mm), hazel (*Corylus avellana*) and maple (*Acer campestre*). Apart from maple and blackthorn, similar taxa were identified from Sample 2. Hazel roundwood included diameters up to 10mm. Charcoal was sparse in both Sample 3, from a possible tree or animal hole [50] and Sample 4, the lower fill [54] from a drain [49]. Oak (*Quercus* sp.) heartwood was common to both samples. In addition, blackthorn (*Prunus spinosa*), hazel (*Corylus avellana*) and gorse or broom (*Ulex* sp. or *Cytisus* sp.) were present in Sample 3, and birch (*Betula* sp.) in Sample 4.

TABLE 5 ROUNDWOOD: STEM DIAMETERS AND GROWTH RINGS.

Sample	Context	Description	Corylus	Quercus	Comments
Building 2, 12th-14thcentury					
1	22	Over/ part of cob wall, in base if large pot	-	Ø 5mm GR 6	
4	89	Possibly cob	-	Ø 12mm GR 7	
5	63	Post-pit	-	Ø 10mm GR 3	
8	137	Floor	-	Ø 8mm	Incomplete radius
10	156	Layer. possibly on natural	-	Ø 5mm	Slow-grown
Building 7, 13th-14th century					
115507	10	Floor	-	Ø 10mm GR 5	
			-	Ø 7mm GR 3	
			Ø 14mm GR 8		
Building 4, ?13th-14th century					
1	250/45	Ashy waste from building or burning layer	Ø 10mm GR 3		

Key. Ø = diameter; GR = growth rings

Discussion

Charcoal and charred plant remains were recorded from contexts associated with all three of the excavated buildings (2, 4 and 7). The charcoal is likely to represent fuel debris probably, although not exclusively, from domestic use. The richest deposits occurred in the midden or waste dump close to Building 4. Ten of the fifteen samples related to Building 2 with the remaining five from the trenches below Buildings 4 and 7 (Samples 4 and 1 respectively). The taxa identified included oak (*Quercus* sp.), gorse or broom (*Ulex* sp. or *Cytisus* sp.), birch (*Betula* sp.), hazel (*Corylus avellana*), willow/ poplar (*Salix* sp./*Populus* sp.), holly (*Ilex aquifolium*), blackthorn (*Prunus spinosa*), maple (*Acer campestre*) and heather or ling (*Erica* or *Calluna*) (see Table 1). Oak was present in all but one of the samples which suggests that this was the preferred fuel. Although anatomically indistinct from broom, gorse is the more likely taxon here. Its regular occurrence in the fuel deposits implies that it was harvested specifically as wood fuel or for charcoal burning, although gorse discarded from other uses such as thatching or fodder (see Woodland resources) could also be relevant. The remaining taxa occurred sporadically throughout the contexts.

It is difficult to make direct comparisons between the buildings, given the paucity of samples and the small quantities of charcoal, but the general pattern of species occurrence use appears to be roughly similar. Interestingly maple (*Acer campestre*) was recorded only from the ashy waste [250/45] in the midden by Building 4, possibly reflecting its infrequent presence in the local environment (Carruthers, above). Maple wood is non-toxic and does not taint food, hence its extensive use in the medieval period for culinary bowls and platters (Morris 1984; Gale and Cutler 2000). If from artefactual origins, the charcoal could represent either from accidental burning or the recycling of discarded or redundant items as firewood.

Environmental evidence

The medieval settlement at Ley Hill was sited on what would almost certainly have been open or cleared ground, although in the present day encroaching woodland has enveloped the site. A recent survey of Horner Wood (Teverson 1995) shows the acid soils on the steep slopes on the upper reaches of these woods dominated by stands of sessile oak (*Quercus petraea*) and downy birch (*Betula pubescens*) (more oak than birch), with occasional holly (*Ilex aquifolium*), rowan (*Sorbus aucuparia*) and honeysuckle (*Lonicera* sp.).

Ancient oak coppice stools make up a large proportion of the woodland and, although the origins of woodland management in this area are obscure, they are probably several centuries old. On the lower and more nutrient-rich slopes hazel (*Corylus avellana*) combines with sessile oak (*Quercus petraea)* and sometimes hawthorn (*Crateagus* sp.). On the valley floor, where the soils are less than Ph 5.0, alder and birch dominate. Maple (*Acer campestre*) is relatively rare and only occurs where the soil Ph rises above 5.0.

The frequency of oak in these deposits suggests that this was the preferred fuel, either as wood or charcoal. As noted above, oak was readily available in woodland on the upper slopes of the valley near the settlement; birch fuel was probably obtained from the same area. The paucity of holly in the deposits may indicate low distribution in the neighbouring woodlands; the same may be true for other infrequently recorded species such as hazel and alder which probably grew further down the hill slopes. The apparent absence of alder in the samples examined may reflect its poor performance as firewood (Edlin 1949; Porter 1990), particularly when compared to the abundance of high calorie oak available locally. It is also possible that woodland leases restricted tenants' access to particular regions of woodland.

Ericaceous sub-shrubs (heather and ling) and gorse (*Ulex* sp.) may have flourished on the neighbouring moorland (north of the site) and on the uncultivated regions on the upper slopes of the hillside adjacent to the site. The damp ground around the spring line to the north of the site probably supported stands of gorse, much as it does today. The boggy soils here would also have provided an ideal habitat for wetland species such as willow.

Woodland resources

Local tenancy records in and around Horner Wood document woodland management and associated industries undertaken in the 16th century - the production of timber and coppice, wood fuel, charcoal and tan-bark (the two latter activities were traditionally often practised in tandem), and iron-working (Edlin 1949; Teverson 1995). The settlement at Ley Hill predates these records by several centuries, and its proximity to Horner Wood infers that woodland industries were already established in the area in the 13th century. When organised on a seasonal basis these activities would probably have been incorporated into the agricultural routine of settlements such as Ley Hill that had developed around the perimeter of the woods.

Although entire transverse segments of narrow oak (*Quercus* sp.) and hazel (*Corylus avellana*) roundwood were occasionally recorded (see Table 4 and Results), the charcoal deposits were mostly too fragmented to provide evidence of coppicing cycles. After felling and in optimum conditions, the re-generating stems (rods) grow very rapidly in the initial two to three years producing wide annual rings. As the canopy enlarges, competition for ground water from adjacent coppice stools increases and overall growth slows, producing correspondingly narrower rings. Hence coppice/pollard rods usually present a distinct diagnostic pattern in cross section. Coppicing cycles vary with the species, economic use and region, usually between three and fifteen years; many woodlands are typically coppiced on a seven- to ten-year rotation. Despite the presence of narrow roundwood in the samples examined none of the charcoal included the initial fast growth characteristic of coppicing and indeed most displayed moderate to slow growth (Table 5), possibly reflecting environmental factors, especially since much of the fuel was probably sourced from the upper slopes of the valley where the nutrient poor soils may also have been less water retentive.

None of the oak stems exceeded diameters of 12mm (seven growth rings) and the widest hazel stem was 14mm (eight growth rings) - when living these stems could have been about 16mm and 19mm respectively. Wider but more fragmented stems were also present in the fuel deposits. Interestingly, the character of this material is generally comparable to short lengths of charred coppice/pollard rods recovered from slag heaps at the 16th/17th-century hammer mill in Horner Wood, which also demonstrated unusually slow-growth and was, perhaps, a regional characteristic determined by environmental conditions. Given the proximity of the settlement to what were probably already well established and managed woodlands, the use of coppice stems as fuel could be anticipated.

The fuel deposits consisted mostly of oak heartwood (probably from stems or branches exceeding 40mm in diameter) with some narrower oak roundwood, supplemented with wood (probably narrow roundwood) from other species including birch, hazel, holly, willow or poplar, maple, blackthorn, gorse and heathers. Oak wood, particularly the denser heartwood, provides high quality firewood and the use of wider logs or billets produces a relatively long-lived heat source. With the exception of willow and poplar, the remaining wood species also produce high calorie fuel and when used as narrow roundwood make an intensely hot but short-lived fire. Dried heather provides excellent kindling, as does cereal processing waste (Carruthers, above).

Woodland resources would also have provided structural timbers and wood for tools, basketry, hurdles etc, leaf fodder and, in wood pasture or glades, grazing and pannage. Ericaceous species (heathers)

and gorse (*Ulex* sp.) are also of economic significance as, in addition to fuel, both provide thatching material, fodder (the young growth especially) and nectar for bees (Edlin 1949; Lucas 1960; Mabey 1996; Gale and Cutler 2000). Heather has traditionally been used as bedding for both livestock and people, and as a packing material (for pottery). In some, particularly treeless regions, gorse was traditionally grown and cropped on short cycles (Lucas 1960).

Conclusion

The origin of the charcoal has been attributed to spent domestic fuel, although agricultural uses could not be ruled out. The charcoal analysis indicates that oak (*Quercus* sp.) made up the bulk of the fuel but was supplemented with other species including gorse (*Ulex* sp.), birch (*Betula* sp.), hazel (*Corylus avellana*), holly (*Ilex aquifolium*), blackthorn (*Prunus spinosa*), willow/ poplar (*Salix* sp./ *Populus* sp.), maple (*Acer campestre*) and heather or ling (*Erica* or *Calluna*). The selection of particular species for fuel corresponds to the arboreal distribution on the upper slopes of the hillside, which in the present day is dominated by sessile oak (*Quercus petraea*) coppice of some antiquity. Oak provides excellent wood and charcoal fuel and its consistent use at the settlement could infer that woodland management was well established in Horner Woods by the medieval period, thereby provisioning local needs. The abundant resources of these woodlands appear to have been exploited from an early period (documented from the 16th century but possibly as early as the 13th century) and were worked from peripheral settlements such as Ley Hill.

Radiocarbon Date

One sample of seeds obtained from the floor [10] of Building 7 was submitted to the Scottish Universities Research and Reactor Centre.

TABLE 6 RADIOCARBON DATING RESULTS

Sample	AA-32343
Material	Seeds: Avena sp.
Context	Building 7 on floor [10]
Sample Ref	Leyhill settlement: 115507-98
Delta 13C rel. PDB	-24.8‰
Radiocarbon Age BP	675 ± 45
Calibrated Age Ranges	1σ cal AD 1280-1390
	2σ cal AD 1270-1400

DISCUSSION OF THE EXCAVATIONS

The excavation of the Ley Hill settlement has provided the only archaeological evidence of a 12th- to 14th-century site of this type to date on Exmoor. The buildings represent a small hamlet of two or more farmsteads or cottages with outbuildings. One building excavated (Building 2) was a house which appears to have been originally constructed, at least in part, of cob directly onto the natural subsoil; possibly suggesting an earlier date than those buildings with stone footings. Damp from the steep scarp behind the rear wall may have necessitated the later rebuilding of the south and west walls. The single entrance, nearer the northern end of the front wall, led to the main living area with the probable hearth at that end. As there was no drain in the building, and the house was set on the level along the hillside it was not a longhouse. Neighbouring buildings may have had an agricultural function.

The padstones that presumably supported the original roof trusses, were at 2m-2.5m intervals. The front wall of cob was probably matched by an original cob rear wall against the back scarp where the rear padstone [201] was found. The south end wall may also have been cob as the stone footings in that position are over charcoal and part of post hole [190], it is therefore possible that the house was first built of cob resting on the ground, and that using stone footings was a later development. No trace of an internal partition was found but the floor was worn and there was interference by roots, so evidence for one may have been destroyed.

The presence of a hard layer [30] on the yard in front of building 2 suggested that it was used by stock, the hard layer being interpreted as the result of animal dung deposits. As this was over the post and stakeholes the division of the yard by fencing seems to have been part of early stock management, with later more general use of the area for animals, perhaps when the house was no longer occupied. The pottery does not refine periods of use. The first phase of Building 2, at approximately 11m x 5m internally, compares in size to some of the smaller medieval houses that have been excavated on Dartmoor and in West Devon (Henderson and Weddell 1994). These are longhouses and therefore have a shippon included in their measurements. The living accommodation in these varies from about 11m long to 15m, while their overall lengths vary from 14m to 19m.

The later phase of Building 2 and the lower Building 7 were of cob on stone footings. Phase 1 of Building 2 had padstones for roof trusses but padstone [201] was outside the phase 2 rear wall. The front padstones could have been used as phase 2 roof timber supports but the rear truss blades, as the roof structure of building 7, probably rested on the wall footings. Either sawn timbers

Fig. 16 East Lynch Cottage, front elevation from the south-east, 18th/19th century barn on the right

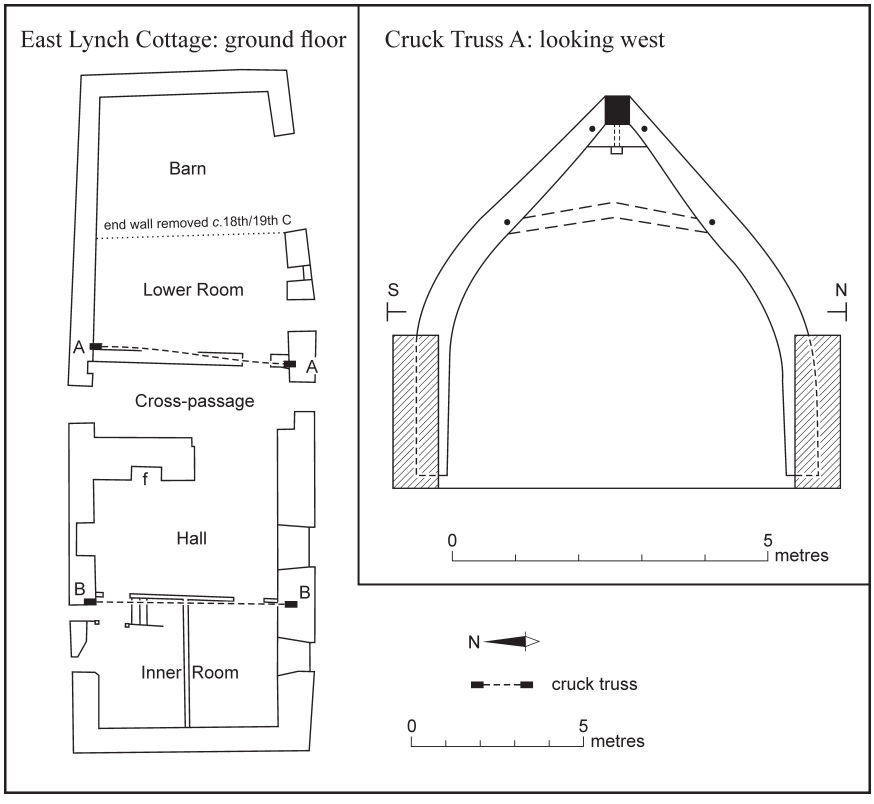

Fig. 17 Plan and roof truss of East Lynch Cottage

or roundwood from the local trees would have been used for the roof construction. The covering would have been thatch of oat or rye straw with possibly heather or gorse from the moorland above used as a base coat.

The form of Building 7 suggests strongly that this was a barn. There was no evidence for a hearth or a drain and with few finds of pot, 13 local sherds, it was not lived in nor did it hold stock. It was therefore likely to be storage space for crops. The cleanliness of the floor implies that it was regularly swept to keep pests at bay and to prevent contamination of one year's crops by those of previous years.

The clean floor of Building 7 suggests that the flint [S.F. 114] found just over a metre inside the doorway was placed there deliberately when the building went out of use. Selection of prehistoric tools by the medieval inhabitants may explain why the flint collection contains mainly tools. Deliberate deposition also probably applies to the plano-convex knife [S.F. 198] found in the cob on the south side of the entrance to Building 2.

A drain downslope of the long axis of Building 4 and a possible hearth site at the upper end (Papworth 1999) suggested that this building was a longhouse. Building 6, also unexcavated, is similar. Not many longhouses are known on Exmoor, but three have been recorded on the Holnicote Estate. It is interesting that the hollow-way kinks round Building 4 as if respecting the site,

Building 2 can be usefully compared with East Lynch Cottage (Figs 16, 17), a surviving cross-passage house on the south slopes above the Vale of Porlock, built of cob on stone footings and thatched (Richardson 1995). The full cruck roof timbers, yoke and square set ridge are heavily smoke-blackened and have been dated by dendrochronology to 1315 (Penoyre and Penoyre 1999), a time when the Ley Hill settlement was occupied.

THE AGRICULTURAL ENVIRONMENT

The soil would have tended to be acidic and thin, the site was east-facing and probably was slower to warm up in the spring than south-facing fields in the vicinity, such as those round East Lynch Cottage. Field lynchets survive on the steep hillside to the south and east of the settlement (Fig. 2). The field boundary extending from the east end of building 7 becomes a lynchet over 1m in height, suggesting a significant period of cultivation. The extent of the land bounded by the lynchets, and within the banked field boundaries, covers an area of around 14 ha. It is unlikely that all this land was cultivated every year, probably some lay fallow each season, particularly the off-fields (Rippon *et al*. 2014).

The plant remains suggest that the most frequently grown grain was oats, with rye an important second crop. Oats will grow on poor hill land and can be harvested before it is properly ripe, in fact it has to be gathered in relatively early otherwise the grain will shed from the ear. Rye can be ground to make bread, oats are more likely to be used for oatcakes cooked on a griddle, or be used in pottages (vegetable or meat stews). Both crops were suited to the hilly situation and the thin acid soil, as oats will respond well to wet conditions and rye will tolerate dry free-draining situations. Growing both varieties of grain was an insurance policy against crop failure.

Other crops such as barley and beans, the latter rich in protein, were likely to have been much more common than indicated by the remains found, as beans do not need to be heated to keep them for the winter. Very little evidence for bread wheat was found so the small amount recovered could have been purchased, or grown on a patch of ground lower down the hillside where the climate was a little less severe.

The animals kept have to be deduced from the circumstances as the acid soils did not allow bone survival. One find does suggest that chickens were kept, this is a flint [SF 200] which Quinnell (see above) suspects came from a chicken's gizzard. Chickens would have provided meat and eggs and would have sustained themselves from the surroundings. Other likely stock would have been a pair of oxen shared between the inhabitants of the hamlet for ploughing, with probably a few cows for milk and calves, while sheep and goats could have grazed on the open moorland above the hamlet. Stock would probably have been herded onto the stubble after harvest, to benefit from the weeds. In the Domesday entry for both Luccombe and Selworthy the list of livestock includes all the above, except the chickens, with pigs and one cob. It is unlikely in a poor settlement that a pony was held. One or two pigs are very probable as they reproduce well, twice a year, and the piglets could forage around the buildings, in the woods and on the moor. The sows were probably driven down to the boar when they were in season, rather than the villagers going to the expense of keeping a large animal of limited use on the hill. The numbers of livestock were probably not very high, but unfortunately no organic evidence from them such as leather, bone or horn has survived in the acid soil.

The woods were also an important resource. Horner Woods were compartmented and held by local tenants, this is documented from the mid sixteenth century onwards when in 1558 George Harrison is recorded as holding seven parts of West Luccombe Manor including Cloutsham Woods (Richardson 2008). Twelve years later he was fighting John Bowyer of Cannington to retain his hold on the woodland and the rewards that particularly timber brought to him (Chadwych Healey 1901).

Nevertheless the use of the woodland by the villagers is clearly similar to the later recorded usage (Gale,

above). Evidence for heartwood and coppiced wood was recovered from the site and suggests that the woodland was being used in many ways as in the later records, for building, firewood, tools, hurdles, charcoal and tanning, among other uses. The greater proportion of the charcoal was oak, and the Horner Woods are primarily oak wood now, with sessile oak and ancient oak stools dominating the present woodland. The importance of wood to people in the medieval period, including access to sufficient fuel, building materials and wood for working was as essential as having sufficient food.

DESERTED SETTLEMENTS ON EXMOOR

Ley Hill was not identified until 1994, but other deserted settlements on Exmoor were recorded much earlier (Riley and Wilson-North 2001). There are only five known deserted hamlets: Badgworthy in Oare parish, Mansley Combe in Cutcombe, Grexy Combe in Minehead Without, and Sweetworthy and Ley Hill in Luccombe. All except Badgworthy are on the eastern side of the moor but the latter is the best known and the only one with its name still in use. It has more buildings apparent than the other four and was occupied for a longer period. All the five deserted settlements were established above 200m, three – Badgworthy, Mansley Combe and Sweetworthy – above 300m. This siting suggests pressure on land and possibly a warmer climate than at present.

These settlements are haphazard in their arrangement, the buildings have been fitted in as the lie of the land allowed and from the remains it is not easy to differentiate houses, or longhouses, from barns or other farm buildings. Where two buildings can be seen to form sides of a possible yard it suggests that one is a dwelling and the other storage and/or stock provision. Only Ley Hill has a definite route through it, leading up from the Horner Valley through Rey Combe to the open moorland and on to Stoke Pero and eventually to Exford.

There are several deserted single farmsteads on the moor, such as Bagley (NGR SS 8819 4254), which was a Domesday Manor and is close to a prehistoric hill-slope enclosure. This farmstead was abandoned in the middle of the nineteenth century. In contrast Nutscale Farmhouse (NGR SS 8556 4287) was recorded as roofless by 1699 (Richardson 2001). Not one of these farmsteads has been excavated. A number of them exist near prehistoric sites, suggesting possible continuity of use or re-use of the more favourable land.

A farmhouse just off the moor, Thorne Farm in Bratton Fleming parish (NGR SS 647 413), was excavated in the late 1950s (Brooke 1959) and was found to be of 13th- to 14th-century date, possibly earlier, a similar date range to Ley Hill. The pottery however was virtually all North Devon ware and does not relate to the Ley Hill fabric (Alison Mills pers. comm.). The finds are now held in the North Devon Museum in Barnstaple.

The Ley Hill pottery is predominantly from a local, unknown site and is dated to the late 12th to mid/late 14th centuries. There is some pottery production known in the area from the 18th and early 19th century as a pottery and two kilns are recorded in the Manor of Bossington (Chadwyck Healey 1901, 320), at Pools Wood. A gradiometer survey (Papworth 2008) identified a possible kiln site and nearby building (NT site no 115402, NGR SS 8958 4717). It is less than 3km from the Ley Hill settlement and indicates that at least later there was pottery production in the vicinity; this is a subject for future investigation.

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