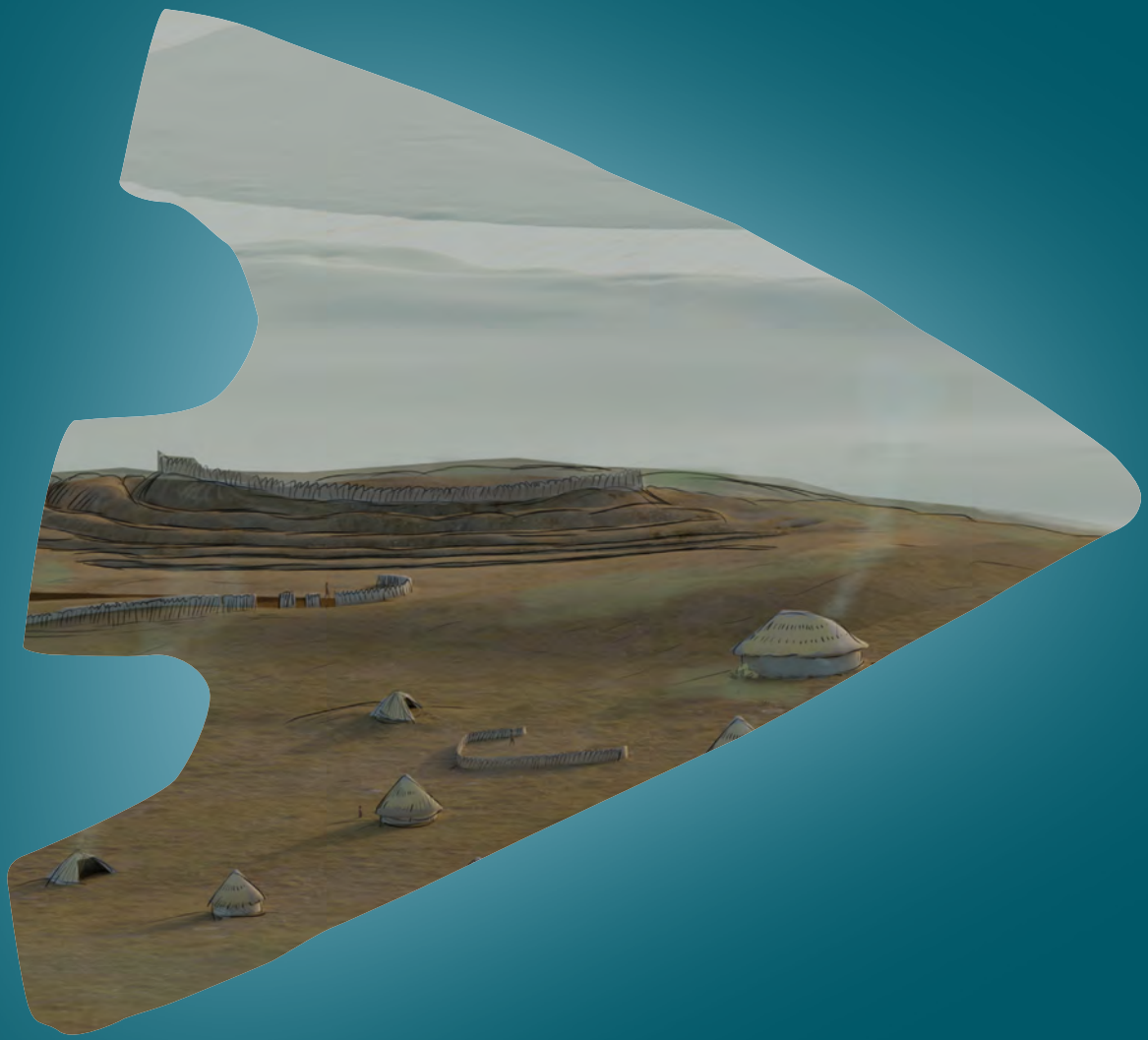
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ARO61: Guardbridge, Fife: A multi-period settlement with a multi-vallate fort

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Published by GUARD Archaeology Ltd, archaeologyreportsonline.com

Editor Beverley Ballin Smith

Design and desktop publishing Gillian Sneddon

Produced by GUARD Archaeology Ltd 2025.

ISBN: 978-1-0686870-3-7

ISSN: 2052-4064

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Summary

The archaeology discovered during GUARD Archaeology's excavation at Guardbridge spanned 12,000 years from the Late Upper Palaeolithic and Mesolithic, to the Neolithic, continuing into the Bronze Age and the Iron Age when the fort was built, to the Medieval period and into the modern era when new homes were built by Persimmon Homes North Scotland.

The excavations revealed evidence of Late Upper Palaeolithic flint scatters and a temporary Mesolithic campsite where a small tent was located by a fire-pit. A small flint knapping area centred around this fire-pit represents traces of where a small group of hunter gatherers once replenished their supply of stone tools with which to hunt and fish.

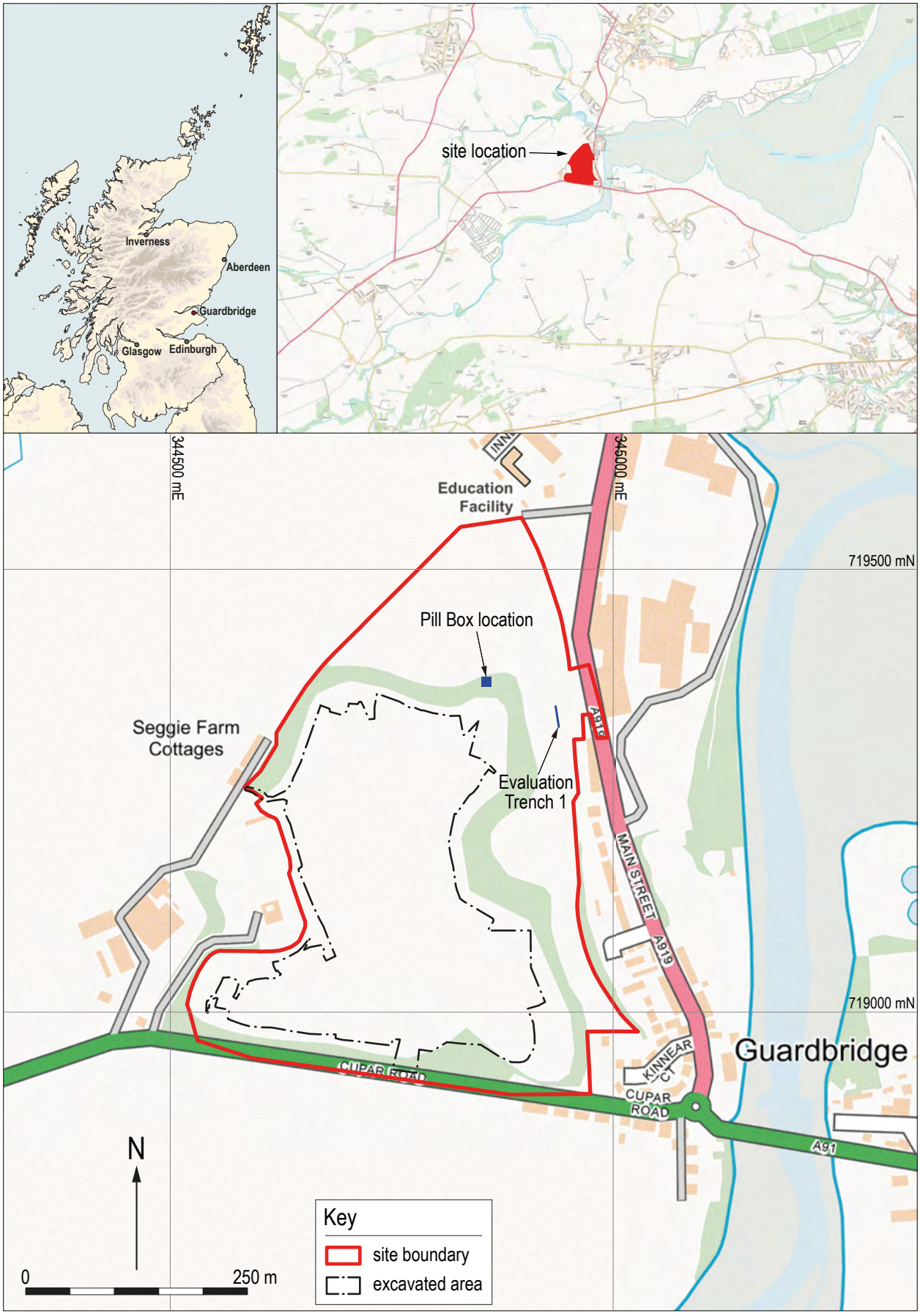
The site was also used during the Neolithic by some of the first farmers of Fife who left many pits across this site, containing burnt cereal grains, saddle querns and pottery sherds but no trace of their houses.

During the Bronze Age, much more substantial roundhouses were built from which an assemblage of pottery sherds and animal bones were recovered. Metalworking was also carried out here during the late Bronze Age as rare casting moulds for a sword blade and a socketed gouge - a tool used in carpentry – were found.

Near the north-east corner of the site the ditches of a multivallate fort at the edge of the escarpment overlooking Guardbridge and the Eden Estuary were excavated. While most of this fort was left intact, the excavation revealed that the fort likely originated during the late Bronze Age and continued through much of the Iron Age until the early centuries AD. Spindle whorls and loom weights attest to the weaving of woollen cloth by the fort's inhabitants while fragments of shale bracelets demonstrate personal adornment.

Several medieval corn-drying kilns were also found. The different construction techniques apparent shows how these kilns changed over time, improving in design and size to meet the growing demand from a growing population.

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Figure 1: Location of the investigated area.

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Introduction

This publication sets out the results of the archaeological excavation undertaken by GUARD Archaeology, on behalf of Persimmon Homes North Scotland in advance of a housing development at Seggie Farm, Guardbridge, Fife (Figure 1).

In 2017 a desk based assessment and walk over survey took place, which revealed a number of cultural heritage sites within the development area (Araboalaza 2017). This was followed by a trial trench evaluation where 85 machine dug trenches were positioned across the area (Kilpatrick 2017). The outcome of the evaluation confirmed that archaeologically sensitive deposits existed within the area of the previously known promontory/hillfort fort cropmark elsewhere on site, especially in the south-western part of the development area.

A total area amounting to 20.14 hectares was stripped of topsoil and overburden, and a large number of archaeologically significant features and artefacts were uncovered and excavated between July 2019 and July 2021.

Landscape setting

The project area is located at the eastern end of Seggie Farm, immediately west of, and overlooking, the small Fife village of Guardbridge that sits at the mouth of the River Eden. It comprised two arable fields, surrounded by mature trees (Figure 1) centred at NGR: NO 44789 19233. To the north of the site are agricultural fields, Seggie Farm Cottages and to the west further arable land. The main road, the A91, between Cupar to the west and St Andrews to the east forms the southern boundary of the development area. Further housing and the A919 road lay to the east.

The larger of the two fields of the project area were approximately 26 m OD from which the ground level slopes gently downwards in all directions except in the east where the ground slopes steeply towards the Eden Estuary with the water's edge at 7 m OD. In times past and without the tree cover, the site had a commanding eastwards view across the Eden estuary.

The solid geology beneath the site consists of Glenvale Sandstone formation formed during the Devonian Period. This is overlain by Devensian Raised Marine deposits comprising clay, silt, sand and gravel together with additional sedimentary deposits formed during the Quaternary Period (BGS Online Viewer 2025). The hinterland around the site is more complex geologically and this has had significant influence on the activities taken place there.

Archaeological background to the project area

Previous aerial surveys had revealed crop marks of a quadruple ditched fort in the north-east corner of the largest field of the development area (Figure 2). The cropmark site lay outside the development area and was protected during construction works by temporary fencing. A survey of the demarcated area along with a pre- and post-start photographic record was undertaken by GUARD Archaeology. On completion of the development no new tree planting or landscaping will take place within this area and the surface level will be maintained in its current state.

A basic building recording was also carried out on a WWII pillbox situated near the northern end of the cropmark, involving a photographic survey of the exterior and interior (where accessible) of the built remains, although they were not directly impacted by the development. However, they were deemed important enough to warrant a basic recording prior to further deterioration (Figures 3 and 4)

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Figure 2: Location of archaeological features.



Figure 3: Pill box from south-west.



Figure 4: Pill box from the north.

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The archaeological evidence

The Late Upper Palaeolithic and Late Mesolithic periods

By Jordan Barbour

Late Mesolithic occupation was represented by knapping deposits close to the western border of the site, along with two large pits to the south of ST11. Further faint traces of Mesolithic activity are suggested by Ballin (see *The Lithic Assemblage,* below) on the basis of isolated lithic finds scattered across the north of the site (Figure 5).

Late Upper Palaeolithic/Late Mesolithic scatters

The majority (95%) of the lithic assemblage appeared to be in situ, and was recovered from two deposits (2907 and 2945). Deposit (2907) had been truncated by the ring-ditch of the later ST13, and 5% of the assemblage was recovered from these later contexts, presumably having been redeposited during the construction of ST13 (Figure 6 and 7). The inclusion of numerous blades within the assemblage strongly suggests that the lithic assemblage is not contemporary with this Bronze Age structure, but rather pre-dates it.

A total of 457 individual pieces were recovered, comprising 441 pieces of debitage, five cores and ten tools. The majority of the assemblage comprised flint (94%), with a minority of chalcedony (5%) and other materials such as quartz (1%). Knapping activities appear to have been focussed on the production of blades detached from cylindrical opposed-platform cores, and are diagnostic of the Late Upper Palaeolithic (LUP). (Figure 8). Also recovered from deposit (2907) was a possible hammerstone or pounder (SF 1675, see *Worked Stone*, below).

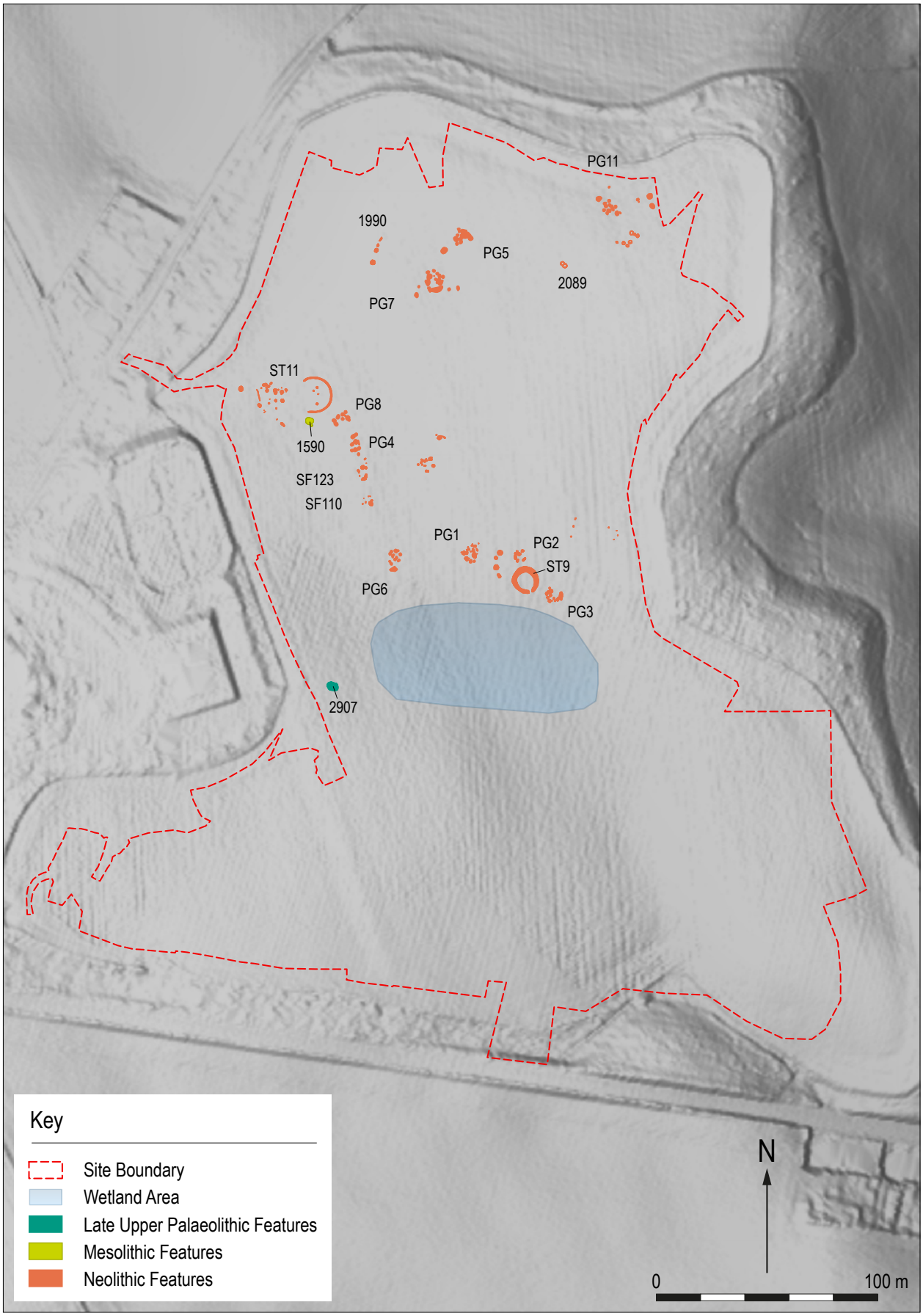
Deposit (2907) was sub-oval and consisted of greyish-brown silty sand, measuring c. 4.6 m by 3.9 m in diameter and c. 0.1 m in depth. Within this was a smaller sub-oval deposit (2945) consisting of dark brown silty sand. Archaeobotanical analysis showed that deposit (2945) contained small amounts of alder and birch charcoal, whilst the surrounding deposit (2907) contained only trace amounts of charcoal. Deposit (2945), with its relatively higher content of carbonised material, can be interpreted as the likely location of a hearth. A sample of carbonised birch recovered from the hearth deposit (2945) provided a radiocarbon date range of 4320 – 4051 cal BC (UBA-51760), indicating late Mesolithic activity, almost 6,000 years later than the main Late Upper Palaeolithic visit to the site. A sample of alder was also submitted, providing a date range of 4231 – 4054 cal BC (UBA-54739) and confirming its late Mesolithic origin.

Analysis of the distribution of burnt lithics within the assemblage lends credence to the presence of a hearth with burnt lithics clustering within this deposit. The general distribution of lithics within the LUP scatter gave further indications of the character of the occupation there. It was noted that their distribution created a distinctive star-shaped pattern, and this potentially indicated the presence of a tent-like structure in which the knapper operated (see *The Lithic Assemblage,* Figure 92). Indentations within the distribution may represent the location of the stakes which supported the dwelling. No direct evidence of stake holes was encountered, though the shape of deposit (2907) gave some indication of the extent of this possible structure, and the activities that took place there.

Mesolithic pits

Approximately 3 m to the south of ST11 were two large pits (1590 and 1604). Pit (1590) was sub-circular, and measured 2.8 m by 2.2 m in diameter and 0.3 m in depth with an irregular, flattish base. Pit (1590) contained three fills: a basal fill (1613) located within the centre of the pit and consisting of blackish grey silty sand; a second basal fill (1592) around the edges of the pit consisting of light brown grey silty sand; and an upper fill (1593) of light blackish grey silty sand. Fills (1613 and 1593) contained significant quantities of oak charcoal, which suggests that burning occurred within the pit. Fill (1592) contained only small amounts of mixed charcoal, suggesting that it may be the product of initial silting up of the pit when it was open.

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Figure 5: Distribution of Late Upper Palaeolithic, Mesolithic and Neolithic features.

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Several lithics were recovered from its upper fill (1593), comprising two chalcedony flakes, one flint flake, and one flint microblade, suggesting Mesolithic activity. All of these lithics were recovered from the lowermost portions of the fill. A sample of birch recovered from basal fill (1592) provided a radiocarbon date range of 6904 – 6594 cal BC (UBA-54727), corroborating a late Mesolithic date.

Pit (1604) was located to the immediate south of pit (1590). It was sub-circular, measuring 1.2 m in diameter and 0.2 m in depth. It contained a single homogenous fill consisting of dark orangey brown silty sand, from which were recovered only small amounts of mixed charcoal and traces of hazel nutshell. The fill also contained one chalcedony single-platform blade core, which potentially also indicates Mesolithic activity (see *The Lithic Assemblage,* Figure 100).

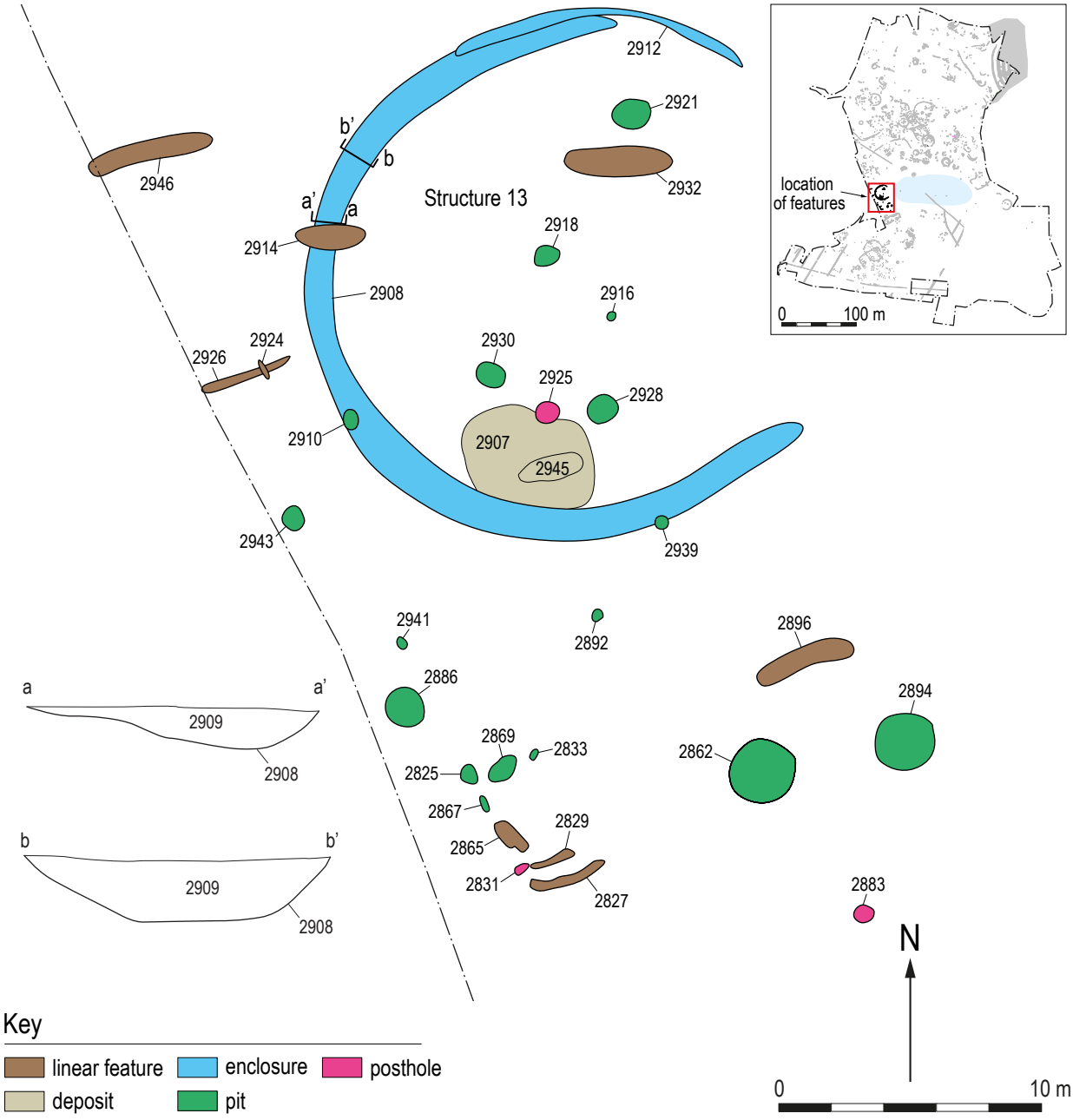


Figure 6: The location of deposits (2907 and 2945) within ST13.

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Figure 7: The location of the Late Upper Palaeolithic flint scatter (between the figures) in its setting.



Figure 8: Excavating the Late Upper Palaeolithic flint scatter.

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Mesolithic background traces

Further evidence for late Mesolithic occupation across the excavated area was extremely limited. Radiocarbon dating of hazel nutshell from the basal fill of the hillfort ditch (2507) provided a date range of 7765 – 7586 cal BC (UBA-51753). This material, however, is clearly intrusive in this Iron Age context (see *Iron Age* below).

The remainder of potentially Mesolithic activity comprised faint background traces consisting of 117 rolled (water smoothed) lithics, mostly of chalcedony. The assemblage contained no strictly diagnostic elements, though the predominance of chalcedony could suggest a Mesolithic date (see *The Lithic Assemblage,* below). None of these appear to have been recovered from their primary contexts, and were universally recorded in features of later date across the northern half of the site. These traces of rolled material led Ballin (see *The Lithic Assemblage,* below) to speculate that the site had been inundated during the Storegga tsunami event, which occurred c. 8200 years BP (c. 6200 BC) (Bondevik *et al.* 2006). In this interpretation, the rolled lithics would have been carried and re-deposited by the tsunami from what are now submerged Mesolithic sites out in the North Sea to the east. Evidence for this tsunami, both geological (Smith 2004) and archaeological (Nyland *et al.* 2021, 6-7) has been found across the eastern coast of Scotland, and it would have constituted an incredibly destructive event, with both the loss of life and the destruction of coastal bases. The archaeological remains at Guardbridge do not allow for any detailed analysis of this event, but they can contribute to wider studies on the Storegga event.

Neolithic

ST9 and associated pits

ST9 (Figures 9 and 10) was located adjacent to the eastern border of the site, and comprised a substantial penannular ring-ditch with rounded terminals (315). The ring-ditch was c. 1.5 m in width, with a total diameter of c. 13 m, and encompassed an area of c. 70 m². Its depth was between 0.3 m and 0.8 m, with the deepest sections to the north, reflecting the substantial truncation of the ring-ditch downslope to the south. Towards the southern extent of the ring-ditch was a narrow entranceway c. 1.4 m in width. No evidence of packing stones or postholes was encountered within the fill or base of the ring-ditch and its interior did not contain any surviving features.

The fill of the ring-ditch appeared as a homogenous mass, which lacked evidence of the processes by which the ditch was infilled (Figure 11). Its single fill (316) comprised orangey-brown silty sand, with few inclusions. Two lithics (CAT 172 and 175) were recovered from the fill and one severely degraded rim sherd of prehistoric pottery of indeterminate date (V109). Samples taken from the fill also contained a single carbonised barley grain along with small amounts of alder charcoal. Radiocarbon dating of an alder fragment returned a date range of 3320 – 2920 cal BC (UBA-51743), indicating a middle to late Neolithic date.

The ring-ditch was truncated by later activity in four places. Curvilinear channel (285) measured c. 13 m in length, 0.65 m in width, and c. 0.2 m in depth, and was dug across the eastern arc of the ring-ditch (315). Small amounts of heather type and willow charcoal with traces of barley and emmer wheat were recovered from its fill (316), along with a single small chip of pitchstone. Knapped pitchstone is often associated with Neolithic activity (see *The Lithic Assemblage,* below), though it is impossible to say whether the fragment ultimately derived from the fill of ring-ditch (315).

A substantial pit (339) truncated the eastern terminus of ring-ditch (315). The pit measured c. 3.4 m by 1.2 m in diameter and 0.37 m in depth, and contained a single fill (340) of greyish-brown silty sand from which was recovered several degraded fragments of burnt bone (SF 191), unidentified but likely to be mammalian, and a pottery sherd (SF 201) of uncertain date. A second substantial pit (352) was dug into the centre of ring-ditch's (315) eastern arc. It measured 1.4 m by 1.2 m in diameter and 0.25 m in depth, and contained a single fill (353) of greyish-brown silty sand, from which was recovered small amounts of hazel, heather and oak charcoal, with traces of barley grains.

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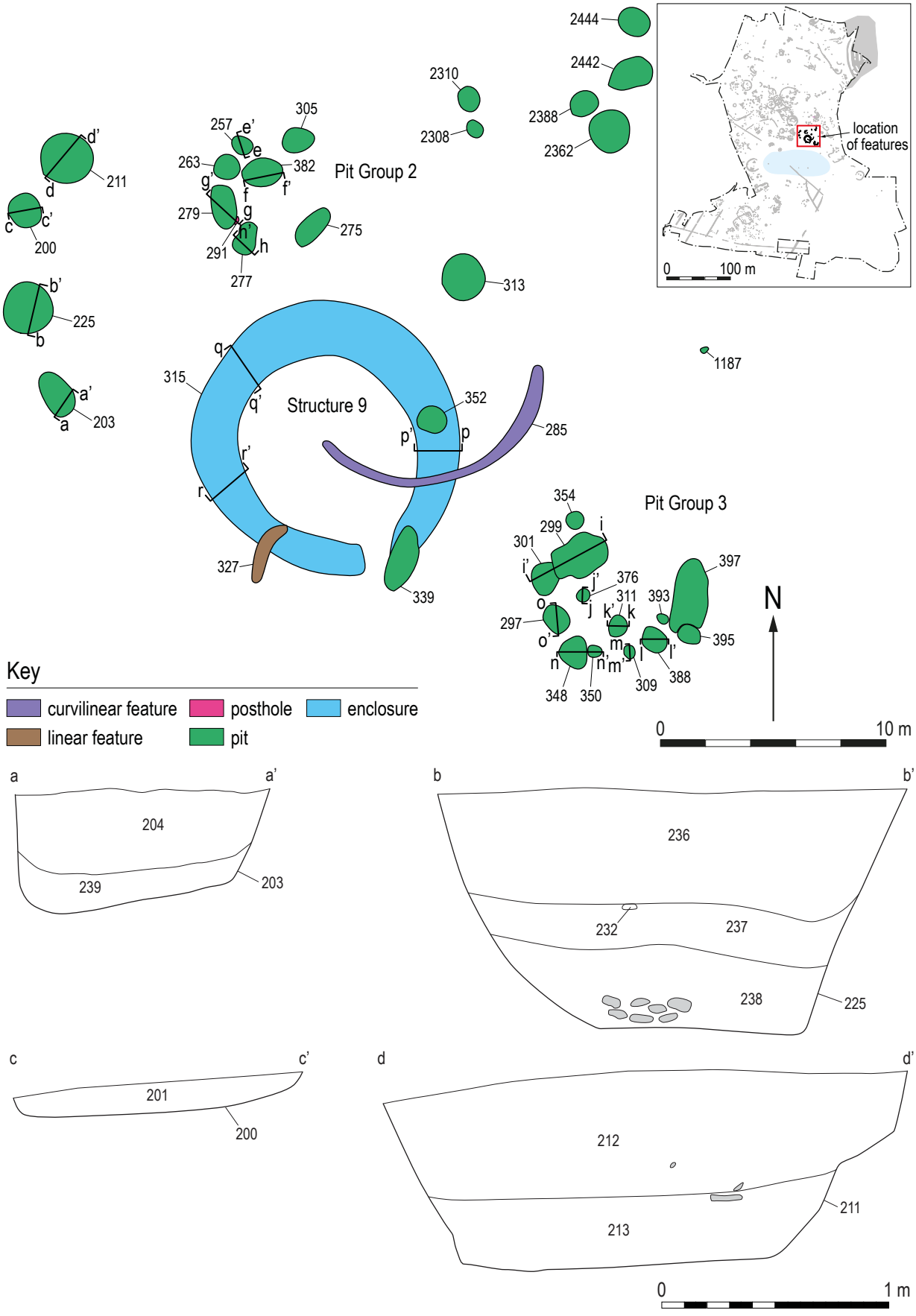


Figure 9: Plan of ST9 and its associated pits and section drawings, with PG2 and PG3.

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Figure 10: Aerial view of the outline of the curved ditch of ST9.



Figure 11: The excavated enclosure ditch to ST9 showing its infilling deposits.

Approximately 6 m to the west of ST9 was a curvilinear alignment of four substantial sub-circular pits (200, 203, 211 and 225), oriented roughly north/south (Figure 12). The pits had an average diameter of 2.5 m and depths between 0.7 m and 1.2 m. Pit (200) was slightly smaller at only 1.5 m in diameter, and substantially shallower at only 0.2 m depth.

Pit (200) contained only a single fill (201) of dark blackish-brown sandy silt, whilst pits (203, 211 and 225) (Figure 9) were more stratigraphically complex. Pit 203 contained an upper fill (204) of dark brown silty sand and a lower fill (231) of dark-blackish brown sand, each of which produced oak and heather type charcoal along with a few grains of barley and one possibly of wheat. A burnt polished stone axe (SF 110) of Cumbrian tuff suggesting an earlier Neolithic date (see *Stone Artefacts,* below), was recovered from the upper fill (204) along with several fragments of burnt, degraded and unidentifiable bone. Pit (211, Figure 9) also contained two fills (212 and 213) both of dark greyish-brown silty sand. The upper fill (212) contained heather type charcoal along with traces of alder and fragmentary bone. Pit (225) (Figure 9) had three fills: an upper fill (226) of dark orange-brown sandy silt, a compact intermediate fill (227) of dark brown clayey silt, and a compact lower fill (238) of mid orangey-brown clayey silt.

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ST9 was also associated with two pit groups, PG2 and PG3. Both of these pit groups proved difficult to definitively phase, as neither were subject to radiocarbon dating. PG2 was located to the north of ST9, and comprised eight pits (257, 263, 275, 277, 279, 291, 305 and 382, Figures 9 and 13). Pits (263, 272, 275, 291, 305 and 382) were similar in character, sub-circular to sub-oval in form, between 1 m and 2.1 m in diameter, and between 0.3 m and 0.4 m in depth. They each had fills of dark orangey to greyish-brown silty sand. Archaeobotanical material was limited, with pit (263) producing only traces of mixed charcoal and a few unidentifiable cereal grains. From pit (291) was recovered more significant amounts of cereal grain, much of which was identifiable as barley, with traces of emmer wheat.

These pits also produced artefacts of contradictory character, which may suggest that they are a product of separate phases of activity. From pit (291) a fragment of shale bracelet (SF 192), was recovered, which Hunter (see *Cannel Coal and Oil Shale*, below) identifies as a distinctively Iron Age example. In contrast, a finely retouched flint piercer implement (see *The Lithic Assemblage,* below) came from pit (382), which would seem to contradict an Iron Age date unless it was intrusive to the context. Pit (277) produced a stone spindle whorl (SF 163, see *Stone Artefacts*, below), not strictly diagnostic, but which may better corroborate a Bronze Age or Iron Age date, as they are more typically recovered from later prehistoric contexts.

PG3 was located to the south-east of ST9, and comprised twelve pits (297, 299, 301, 309, 311, 348, 350, 354, 376, 388, 395 and 397). Pits (297, 299, 301, 309, 311, 348, 350, 376 and 388, Figures 9 and 13) were of similar character, sub-circular, generally between 1 m and 2 m in diameter and between 0.1 m and 0.5 m in depth. They generally contained homogenous fills of dark greyish-brown silty sand, were similar in form to those recorded in PG2, and may have had a common function. Only pit (348) contained artefactual evidence, comprising a single fragment of stone spindle whorl (SF 197, see *Stone Artefacts*, below).



Figure 12: Large pits 203, 225, 200 and 211 to north-west of ST9 before excavation.

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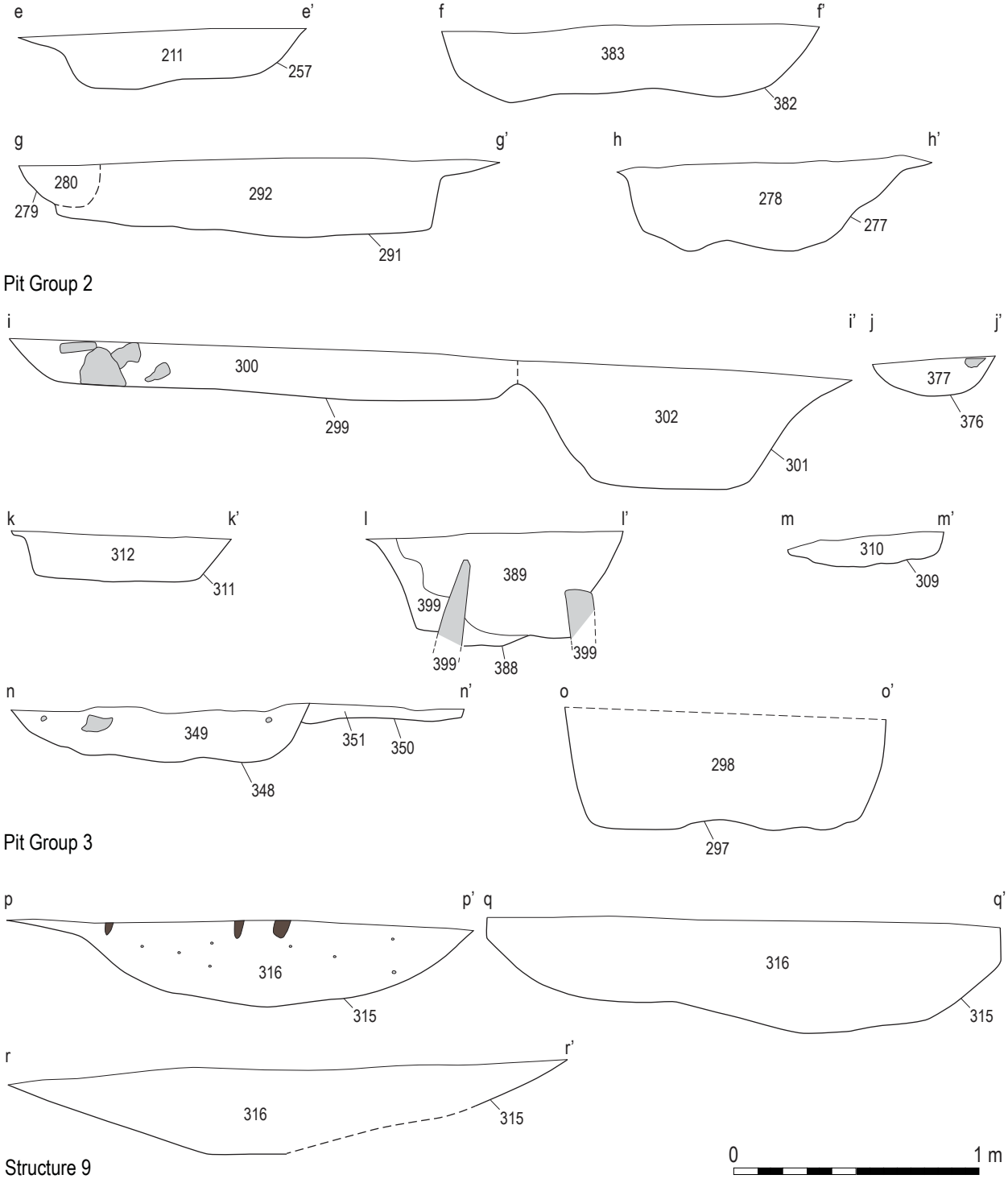


Figure 13: Section drawings through pits associated with ST9, PG2 and PG3.

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ST11 and associated pits to west and south

*ST11 (*Figures 5 and 14) was located in the north-west of the site, close to the western edge of the excavated area, and comprised a large circular ring-ditch (1665) with a large opening towards the west. The ring-ditch was c. 0.6 m in width, with a U-shaped profile, and between 0.2 m and 0.3 m in depth. In total, the ring-ditch measured 30 m in diameter, enclosing an area of c. 162 m² but without evidence of post - or stake-holes in the base of the ditch. The ring-ditch contained a single fill of dark orangey brown silty sand with few inclusions, from which was recovered small amounts of birch, hazel, willow and heather type charcoal, with a few carbonised barley grains and a single seed belonging to the pea family. Radiocarbon dating of willow charcoal returned a date range of 3344 – 3021 cal BC (UBA-51750), indicating a middle Neolithic date.

Within the interior of the ring-ditch were five pits (1677, 1827, 1829, 1833 and 1835, Figure 14). These were between 0.7 m and 1.1 m in diameter and between 0.1 m and 0.3 m in depth, with each containing single fills of dark greyish to orangey brown silty sand. Pits (1827 and 1829) both produced small amounts of heather type charcoal and hazel nutshell. A sample of hazel nutshell from pit (1829) returned a radiocarbon date range of 3624 – 3372 cal BC (UBA-53315), indicating an early Neolithic date. Material culture proved to be relatively sparse, though two sherds of early Neolithic pottery were recovered from upper part of the fill of pit (1827) (V12).

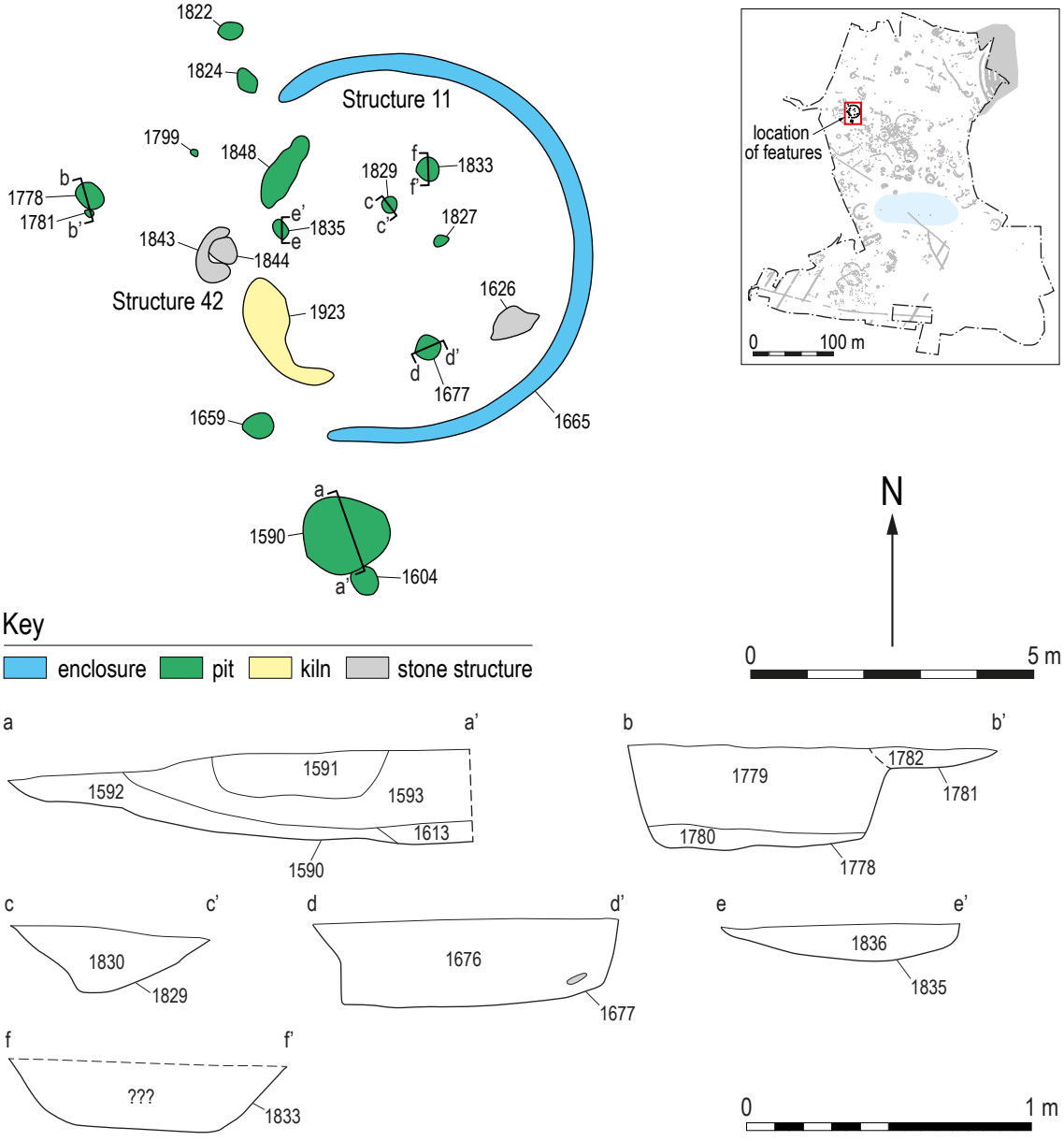


Figure 14: Plan of ST11 and section drawings through features.

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Initial interpretations of the interior pits had suggested that they may represent postholes with supporting posts for a structure. They also contained no clear evidence of post packing, and the archaeobotanical material recovered, consisting solely of heather charcoal and hazel nutshell, is not particularly indicative of structural material. Consequently, it appears more likely that the ring-ditch represents the remains of a foundation trench for possibly a walled enclosure.

Accurately phasing the structure also proved problematic. Radiocarbon dating of material from the ring-ditch indicated a Neolithic date, though its form closely mirrors that of ST13 to the south, which radiocarbon dating indicated belongs to the later Bronze Age (see *Bronze Age,* below). There is some possibility for earlier Neolithic material to have been re-deposited within the ring-ditch, given the structure's close proximity to a firmly dated early Neolithic pit cluster to the west. It may be the case that pit (1827), which contained early Neolithic pottery, is unrelated to the construction of ST11.

Approximately 6 m to west of ST11 was a cluster of sixteen pits (1768, 1772, 1774, 1776, 1778, 1783, 1786, 1789, 1802, 1807, 1811, 1815, 1817, 1820, 1831, 1837 Figures 5 and 15). The pits were circular to oval, c. 1 m diameter on average, and were shallow, with an average depth of c. 0.2 m. Most contained single fills of greyish-brown silty sand, although pits (1778, 1783, 1786, 1807 and 1817) were more stratigraphically complex, containing multiple fills (Figure 16). No intercutting of these pits was observed, and it would appear that each pit respected the others.

A substantial amount of early Neolithic material culture was recovered from the fills of the pits (see *Prehistoric Vessels,* below). A portion of an early Neolithic vessel (V3) was recovered from pit (1772) along with a scale-flaked knife, CAT 88 (see *The Lithic Assemblage,* below). Fragments of three early Neolithic vessels (V4, V5 and V6) were recovered from pit (1776), with fragments of three early to middle Neolithic vessels (V7, V18 and V19) from pit (1802). From both the upper (1818) and lower (1819) fills of pit (1817) fragments of an early Neolithic vessel (V10) along with further fragments of V3 were recovered. From the intermediate fill (1809) of pit (1807) came fragments of two early Neolithic vessels (V8 and V9) and an early Neolithic cup (V11) was found in pit (1820).

Pit (1786) was the most unusual element within the pit cluster in that it contained evidence of in situ burning. Its lower fill (1788) consisted of dark greyish-brown sand, which contained a circular arrangement of blackened stones. Within the centre of this apparent stone setting were fragments of five early Neolithic vessels (V13 to V17).

Aside from pit (1817), the pits contained very sparse amounts of archaeobotanical material. Fills (1818 and 1819) of pit (1817) produced significant numbers of hazel nutshell fragments along with traces of hazel and heather type charcoal, which may also indicate that burning occurred within the pit.

Amongst these pits were six smaller pits of different character (1770, 1781, 1793, 1795, 1797 and 1812). They measured between 0.3 and 0.4 m in diameter, between 0.07 and 0.23 m in depth, had steeply sloping sides, and contained single fills of greyish-brown silty sand. These small pits truncated the larger pits in two places, with pit (1781) truncating pit (1778) and pit (1812) truncating pit (1811). Pit (1812) contained an *in-situ* post or stake comprised of severely degraded wood. Aside from this, these pits contained no material culture, and therefore their dating is problematic.

Structure ST12

In the central western part of the excavated area ST12 comprised a circular ring-ditch (1448) with a large opening to the north-east (Figure 17). The ring-ditch measured 0.4 m in width and was very shallow at only 0.12 m depth. In total, it measured 5.2 m by 4.7 m, with an internal area of 24 m². The ring-ditch contained a single fill (1449) of greyish-brown sand from which was recovered a possible whetstone (SF 565, see *Stone Artefacts,* below). Also recovered were fragments of alder and heather type charcoal along with hazel nutshell. Radiocarbon dating of alder charcoal recovered from this fill returned a date range of 3010 – 2880 cal BC (UBA-51749), indicating a late Neolithic date. The recovery of a whetstone with a Neolithic date makes dating the structure problematic and suggests that either the whetstone or the dated material is intrusive to the context.

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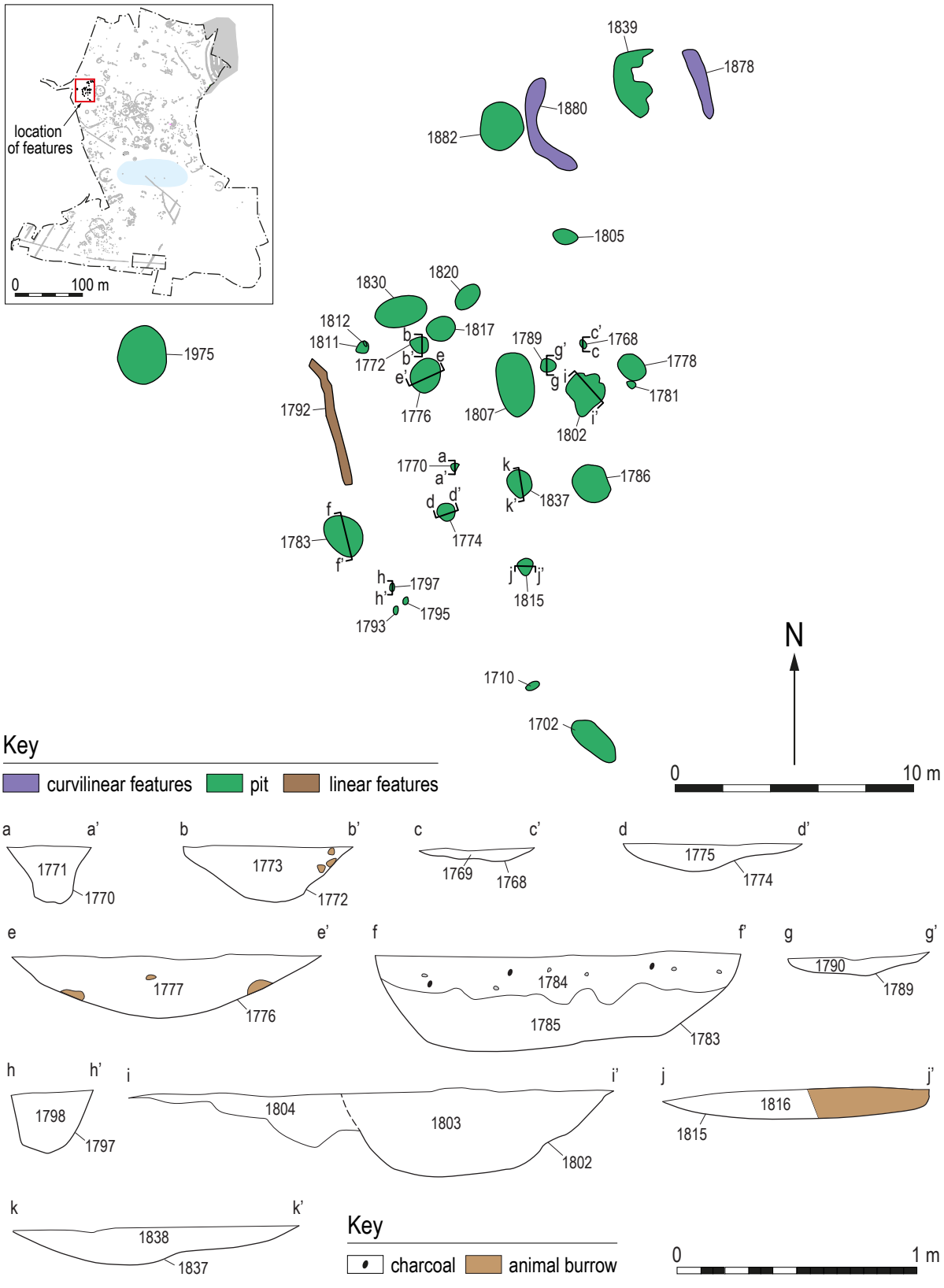


Figure 15: Plan of pits west of ST11.

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Figure 16: Section through pit (1772).

Within the interior of the ring-ditch were three large sub-oval pits, (1453, 1459 Figure 17, 1479), measuring between 0.9 m and 2 m in diameter and around 0.3 m in depth. They each contained fills of dark greyish-brown silty sand. Within the base of pit (1459) was a shallow circular depression c. 0.4 m in diameter, which is potentially indicative of a truncated posthole. In addition, in the interior there were four smaller sub-circular pits (1457, 1464, 1486 and 1488), measuring between 0.4 m and 0.55 m in diameter and between 0.1 and 0.4 m in depth. These pits, along with the shallow depression recorded at the base of pit (1459) are tentative potential postholes. Archaeobotanical material recovered from the fill (1487) of (1486) comprised small amounts of alder, heather type and oak charcoal along with trace amounts of unidentified cereal grains, whilst the fill (1465) of (1464) contained traces of oak and heather type charcoal along with carbonised rhizomes and grassland weeds. Possible posthole (1488) contained a single sherd of prehistoric pottery, identified as either late Bronze Age or Iron Age. The return of a Neolithic radiocarbon date alongside the recovery of later prehistoric pottery and a likely whetstone presents difficulties in accurately phasing ST12.

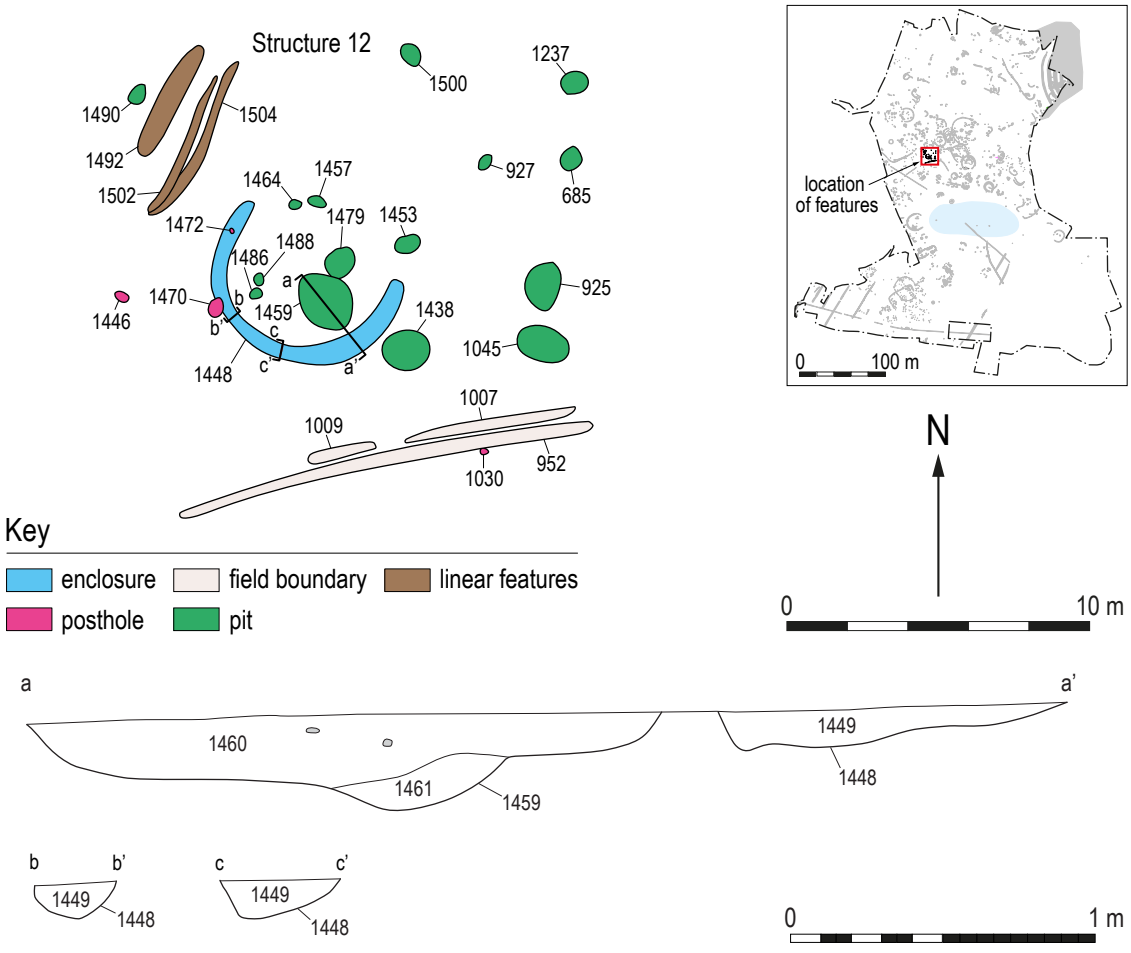


Figure 17: Plan of ST12 and section drawings through features.

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Pit Group 1 and Neolithic activity underlying ST41

PG1 (Figure 18) was located to the north-west of ST9, and comprised seventeen pits (209, 214, 216, 218, 222, 228 (Figure 19), 234, 236, 242, 245, 247, 249, 251, 254, 256, 259 and 287). Five of these pits (216, 218, 234, 236 and 242) were particularly substantial at between 2.3 m and 1.6 m in diameter, depths between 0.51 m - 1 m, and with steeply sloping sides and flat bases. The majority of these contained single fills of dark greyish-brown silty sand, although pit (242) contained a more complex stratigraphy, which indicated that it had been recut. Its basal fill (241) consisted of greyish-brown silty sand, into which a pit had been dug containing dark blackish-grey silty sand (240). At the interface of the re-cut was a thin lens of charcoal, which probably indicated in situ burning. This lens was described by the excavator as being distinctly greasy in texture, and appears to have contained a fatty residue, presumably given off from whatever materials were burnt within the pit. A radiocarbon date was obtained from hazel charcoal from within the greasy lens, which provided a date with early Iron Age of 242 – 411 cal BC (UBA-54717).

Evidence of material culture was absent from the majority of these pits aside from pit (234), from which was recovered one broken polished stone axe head (SF 123), one perforated and heavily burnt stone identified as a likely tuyere (SF 123b, see *Stone Artefacts*, below), five sherds of unidentified prehistoric pottery and several fragments of fragmentary bone. The polished stone axe head is indicative of earlier Neolithic activity. It is made from local Old Red Sandstone, and was re-used as a hammerstone.

The remainder of the pits (209, 214, 222, 228, 245, 247, 249, 251, 254, 256, 259 and 287) in this group measured between 0.45 m and 2.4 m in diameter, between 0.15 and 0.6 m in depth, and generally contained single fills of dark greyish-brown silty sand. The majority of them were devoid of material culture, although pits (251 and 256) each contained several fragments of unidentified prehistoric pottery. Pit (247) contained fragments of several prehistoric pottery vessels (V2, V81, V82 and V83) identified as middle Neolithic Impressed Ware Bowls (see *Prehistoric Vessels,* below) along with very large quantities of hazel nutshell and three whole hazel nuts.

To the south of PG1 was a revetted sunken semi-circular structure (ST41), likely to be Bronze Age in date (see *Bronze Age*, below). Pit (510) underlay deposit (407) within ST41, and was an irregular sub-oval shape c. 0.95 m by 0.7 m in diameter and 0.6 m in depth. An alder charcoal fragment recovered from its fill provided a radiocarbon date range of 3516 – 3362 cal BC (UBA-54720), suggesting Neolithic activity prior to the construction of ST41. The fill (662) of pit (661), also located within the interior of the sunken structure, contained a pitchstone microblade, which hinted at earlier Neolithic activity. However, it was noted that stones from the revetment had slumped into the pit, indicating that it could have been contemporary with ST41. Subsequently, it seems more likely that this microblade is intrusive to the context.

Pit Group 4

PG4 was located to the south-east of ST11, and comprised eight pits (1529, 1536, 1542, 1551, 1554, 1574, 1594 and 1596, Figure 5). All of them were sub-oval and fairly substantial at between 1.1 m and 1.6 m in diameter and between 0.15 m and 0.65 m in depth. They generally contained single fills of dark greyish-brown silty sand.

A scale-flaked knife knapped from Yorkshire flint (CAT 261, see *The Lithic Assemblage*, below) came from the fill (1552) of pit (1551). Although none of the archaeobotanical material recovered from PG4 was subject to radiocarbon dating, the inclusion of a scale-flaked knife within a constituent pit perhaps suggests a Neolithic date (Ballin 2021a, 54). The remainder of the pits within PG4 were devoid of material culture, though several contained archaeobotanical material. Pit (1551) produced traces of oak and heather type charcoal, pit (1574) produced a mixed charcoal assemblage of alder, hazel, heather type and oak charcoal, with traces of barley, and pit (1596) contained small amounts of hazel and heather type charcoal with single grains of naked barley and wheat.

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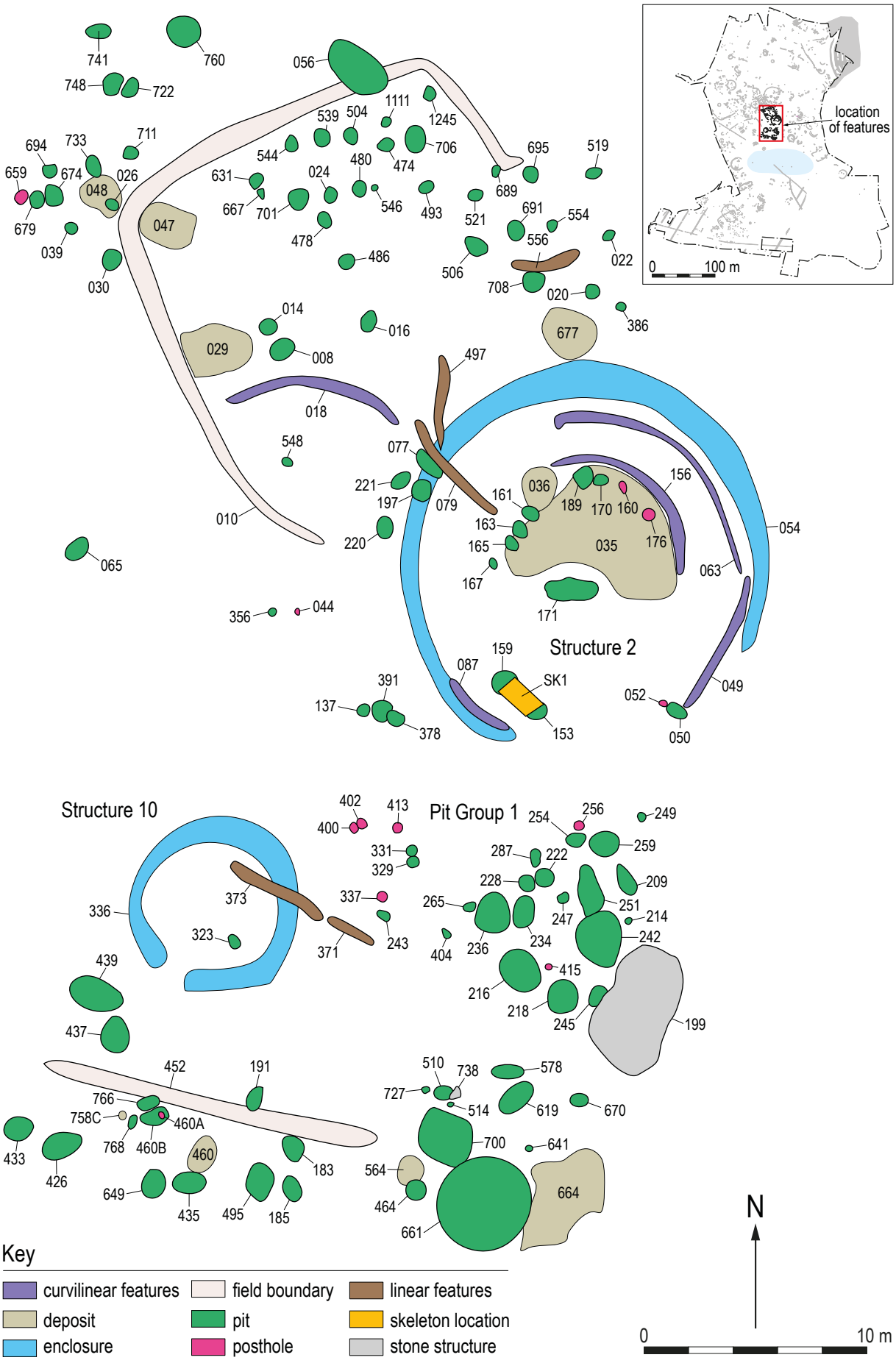


Figure 18: Plan of PG1 with ST2 and ST10.

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Figure 19: Overhead view of pit (228) during excavation.

Pit cluster within ST18

Segmented roundhouse ST18 (Figure 5) proved particularly difficult to phase, as its features provided contradictory radiocarbon dates. A carbonised willow sample recovered from a section (789) of the structure's ditch provided a date range of 3626 – 3375 cal BC (UBA-51747), indicating an early Neolithic date. A sherd of pottery identified as an early Neolithic vessel was also recovered from its fill, and corroborated this date.

The interior of ST18 was similarly confusing, as it contained an array of pits which proved difficult to disentangle from potential structural elements of ST18 (067, 069, 780, 786, 820, 822, 825, 827, 841, 843, 858, 860, 903, 907, 1210, 1212, 1214, 1218, 1226, 1227, 1229, 1231, and 1242). These pits proved to be almost devoid of material culture, although pit (780) contained two undiagnostic prehistoric pottery sherds Archaeobotanical analysis was similarly unenlightening, with pits (067, 069, 827, 1227 and 1231) producing only traces of mixed charcoal, with heather types present in most fills. A carbonised willow sample recovered from pit (1227) within the northern arc of ST18 provided an early Neolithic radiocarbon date range of 3641 – 3519 cal BC (UBA-53311). However, a small pit (067) in the northern part of the structure provided a radiocarbon date range of 1262 – 1054 BC (UBA-54715), indicating a late Bronze Age date and contradicting the radiocarbon dates recovered from elsewhere in the structure.

Given the clear similarity in form of ST18 to the more somewhat more firmly dated ST17, and the radiocarbon dating conducted on material recovered from a pit it seems reasonable to conclude that ST18 is probably Bronze Age in date (see *Bronze Age,* below). The problem of residuality, however, was also apparent with ST17, with a willow sample recovered from the fill of its ring-ditch providing a date range of 2873 – 2621 cal BC (UBA-54719), again indicating a (late) Neolithic date. The inclusion of Neolithic pottery and radiocarbon results indicating an early Neolithic date are probably best explained as the result of re-deposition: the foundation trench of the structure having been dug into a series of Neolithic deposits. Neolithic material culture was, admittedly absent from most pits within the interior of ST18 although it was recovered in substantial quantities from pits within the immediate environs of the structure (see below).

Pits within the environs of ST18

A pit cluster to the immediate south of ST18 comprised fourteen pits (722, 729, 731, 739, 741, 749, 757, 758, 760, 770, 772, 876, 886 and 887 Figure 5). These shallow pits were between 0.6 and 1.8 m in diameter, and between 0.1 m and 0.4 m in depth. They each contained single fills of dark greyish-brown silty sand. The majority of the pits appeared to respect the location of others, although a small amount of intercutting was observed, with pit (757) truncating pit (749) and pit (758) truncating pit (876).

Pit (739 and 741) contained a few prehistoric pot sherds of uncertain date along with several small bone fragments. Pit (760) also contained a few prehistoric pottery fragments of uncertain date. Pit (722) contained one fragment of pottery identified as a fragment of middle Neolithic vessel (V92, see *Prehistoric Pottery*, below). Pits (749 and 757) contained four sherds of prehistoric pottery representing three vessels (V98, V103 and V104). Of these, only V104 was identifiable

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as late Neolithic Grooved Ware. The remainder of these pits were devoid of material culture, and archaeobotanical material was sparse. Only pits (749 and 757) contained mixed charcoal with traces of cereals, some of which was identified as wheat.

A further two pits that contained Neolithic material culture were located to the immediate north-east of ST18. Pit (992) measured 2.3 m by 1.9 m, was 0.3 m in depth, and had an upper fill (913) of compacted dark brown slightly clayey sand and a basal fill (995) of dark brown silty sand. Twenty-four sherds of pottery representing at least two vessels (V90 and V93) were recovered from the upper fill (913), and identified as early Neolithic vessels (see *Prehistoric Vessels*, below). Also recovered were two struck flint flakes, one struck quartz flake, and one struck chalcedony flake, along with a few animal teeth in very fragmentary condition.

To the immediate north-west of pit (992) was a second, smaller pit, (847). This pit measured 0.7 m by 0.5 m in diameter, 0.15 m in depth, and contained a single fill of dark blackish-brown silty sand. A single sherd of prehistoric pottery (V92), identified as a fragment of middle Neolithic vessel, was recovered from it.

Further Neolithic activity was apparent to the immediate north-west of ST18. Pit (765) measured 3 m by 2.6 m by 0.63 m in depth. The pit featured a gradually sloping step around its circumference, turning into near vertical slopes with an abrupt to a broad flat base. Its fill (764) consisted of homogenous middle grey silty sand. Forty-five fragments of vitrified material identified by as fuel ash slag (see *Slag and Metalwork*, below). This is indicative of high temperature burning, however, no clear stratigraphic evidence of this within the pit. A sample of alder charcoal 2461 – 2208 cal BC (UBA-54721), indicated a late Neolithic date.

Pits within interior of rectangular enclosure ditch ST19

Within the south-western interior of the enclosure of this later enclosure ditch (see *Iron Age,* below) was a series of twenty-one small pits (3156, 3165, 3167, 3171, 3181, 3183, 3187, 3189, 3195, 3217, 3220, 3222, 3341, 3507, 3509, 3511, 3513, 3748, 3756, 3758, and 3887). These were generally sub-circular, between 0.25 m and 0.6 in diameter, and between 0.1 m and 0.2 m in depth. A sample of alder charcoal recovered from pit (3511) provided a radiocarbon date range of 3619 – 3371 cal BC (UBA-53326), indicating a middle Neolithic date. No material culture was recovered from these features.

Pit alignment to the north-west

In the north-west of the excavated area was a linear arrangement of four sub-circular pits (1945 1858, 1990 and 1993), oriented north-east to south-west (Figures 5 and 20). Pits (1945, Figure 21, 1958 and 1993) were particularly substantial, between 1 m and 2.3 m in diameter and between 0.6 and 0.8 m in depth, and each contained homogenous fills consisting of greyish-brown silty sand.

A substantial quantity of vitrified material identified as fuel-ash slag fragments (see *Slag and Metalwork*, below) came from pit (1945), which potentially indicates high temperature burning activities within the pit. Direct stratigraphic or archaeobotanical evidence for in situ burning was absent, though the presence of small amounts of burnt and fragmentary bone was noted by its excavators.

Pit (1990) was distinctly smaller, at 0.5m by 0.5 m in diameter and 0.15 m in depth. It contained a darker fill of greyish-black sandy silt from which was recovered substantial quantities of alder and willow charcoal strongly suggestive of in situ burning. A sample of willow charcoal recovered from this pit provided a date range of 3369 – 3102 cal BC (UBA-54729), the middle Neolithic.

These pits ascended in order of size, from the smallest in the north-east to the largest in the south-west. The functions of shallow pit (1990) and the other more substantial pits appears to have been distinct, with only pit (1990) displaying direct evidence of being utilised as a fire-pit.

Neolithic occupation traces

ST38 was a small group of mainly pits and postholes surrounding a small curvilinear feature (3505) in the south-west of the site. Pit (3511) adjacent to (3505) provided a date within the late Neolithic period of between 3619 – 3371 BC (UBA-53326) implying all the features may have been contemporary.

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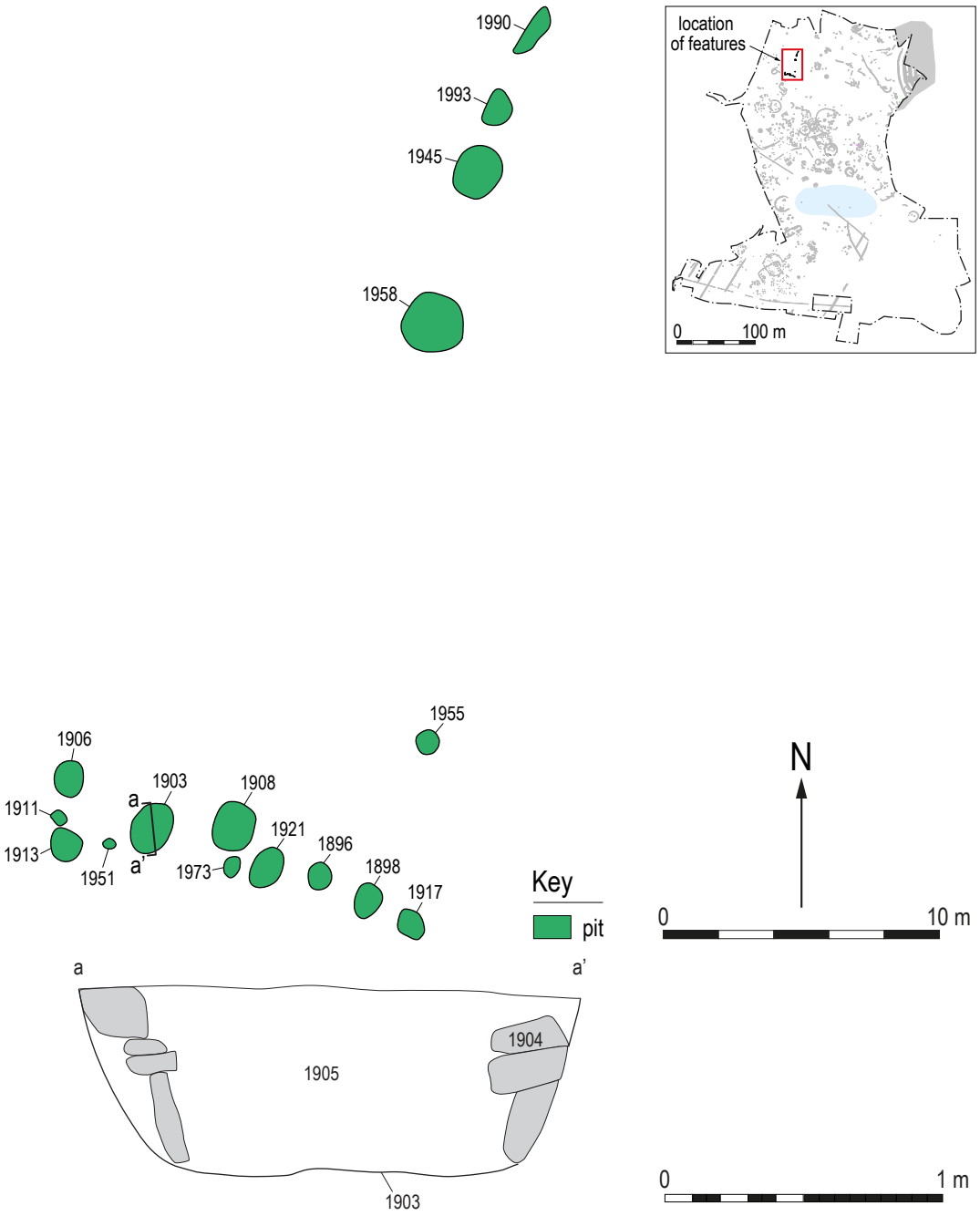


Figure 20: Plan of pit alignment in north-west with section through pit 1903.



Figure 21: Section through pit (1945).

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Near the eastern border in the middle of the excavated area was an arc of four possible severely truncated postholes (1177, 1183, 1187 and 1191), which may tentatively indicate the remains of a post-built structure (ST36). These features were all sub-circular, between 0.3 and 0.5 m in diameter, and between 0.1 m and 0.3 m in depth. They contained single homogenous fills consisting of greyish-brown silty sand. Posthole (1183) produced traces of barley grain and alder charcoal, a sample of which provided a radiocarbon date range of 2868 – 2576 cal BC (UBA-54725), indicating a late Neolithic date. No material culture was recovered from any of these features.

Within the north-east part of the excavated area was another series of seven pits with some evidence of a Neolithic origin (2277, 2279, 2281, 2316, 2123, 2326 and 2345). From pit (2277) sherds of a vessel identified as late Neolithic Grooved Ware (V30, see *Prehistoric Vessels,* below) were recovered. Pottery sherds identified as fragments of a middle Neolithic Impressed Ware bowl came from the outer ditch of the Iron Age promontory fort (see *Iron Age*, below), and presumably represent a residual element.

Pit (2083), also in the north-east, was sub-circular in shape, and measured c. 1.7 m by 1.35 m, 0.75 m in depth. It contained two fills: an upper fill (2084) of greyish-brown silty clay, and a lower fill (2089) of blackish-grey silty clay. From lower fill (2089) a polished stone axehead (SF 294) was recovered. This was located lying against the base of the pit, which suggests deliberate deposition. Pit (2038) truncated a second similar pit (2042, which was sub-circular in shape, measuring 2.1 by 1.7 m by 0.8 m in depth. It contained two fills: an upper fill (2043) of orangey-brown sandy silt; and a lower fill (2081) of light greyish-brown clay. Archaeobotanical material was recovered in very limited quantities from the fills of both pits, with only traces of heather type charcoal present.

There were several other pit groups on site (PG5-PG11) which unfortunately did not provide any datable evidence although they are presumed to be prehistoric in origin.

Bronze Age

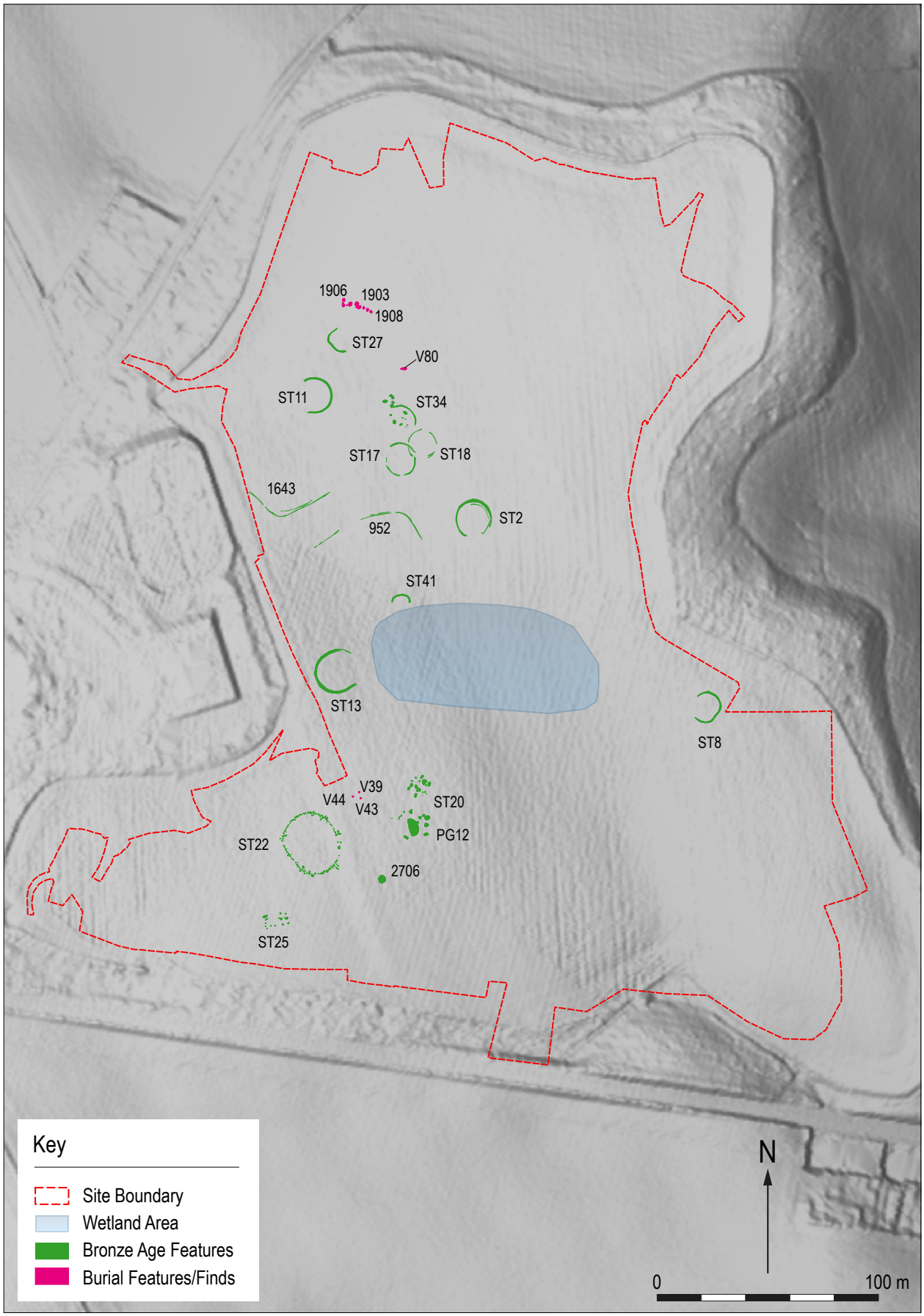
By Thomas Muir

Evidence for the Bronze Age uncovered at Guardbridge was mainly characterised by a handful of structures and small pit groups (Figure 22). As with all the evidence for other archaeological periods found on the site, Bronze Age structures were generally found in very close proximity to both earlier and later features, making it often hard to distinguish them securely. There was sufficient artefact and radiocarbon date evidence recovered from the excavation to identify at least some of the structural activity as Bronze Age.

Structure ST2

Some of the earliest Bronze Age settlement was located in the central area of the site. A ring ditch enclosure ST2 (054) (Figures 18 and 23), measured approximately 17 m in diameter with an internal space of 173 m², and was found to the south of palisade enclosure ST1 (796). The perimeter ditch of the enclosure measured 0.25 m - 0.7 m in width and its depth was 0.43 m. The widest and deepest sections of the ditch were towards the north. It gradually became narrower and shallower towards the south, following the natural topography in this area, which sloped downwards to the south. The fill (055) of the ditch (054) contained traces of heather and oak charcoal with a few cereal grains (Figure 24). A large c. 7.75 m wide entranceway was located in the southern part of the enclosure and a stone-lined pit (197) cut the western part of its ditch. A sample of willow charcoal from its lower fill (202) provided an early Bronze Age date of 2192 – 1962 cal BC (UBA-53303). Below the stones was a grey greasy silty layer that was also found in pit (242) in PG1, where an early Iron Age of 795 – 411 BC (UBA-54717) was obtained. Within this pit the greasy deposit was characterised by, not a smooth layer as it appeared in pit (197) but as several lumps. This deposit was also found as a lumpy fill in pits (2698 and 2997) and although it was analysed for lipids (see *Lipid Analysis*, below) it was not possible to date it.

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Figure 22: Distribution of Bronze Age features.

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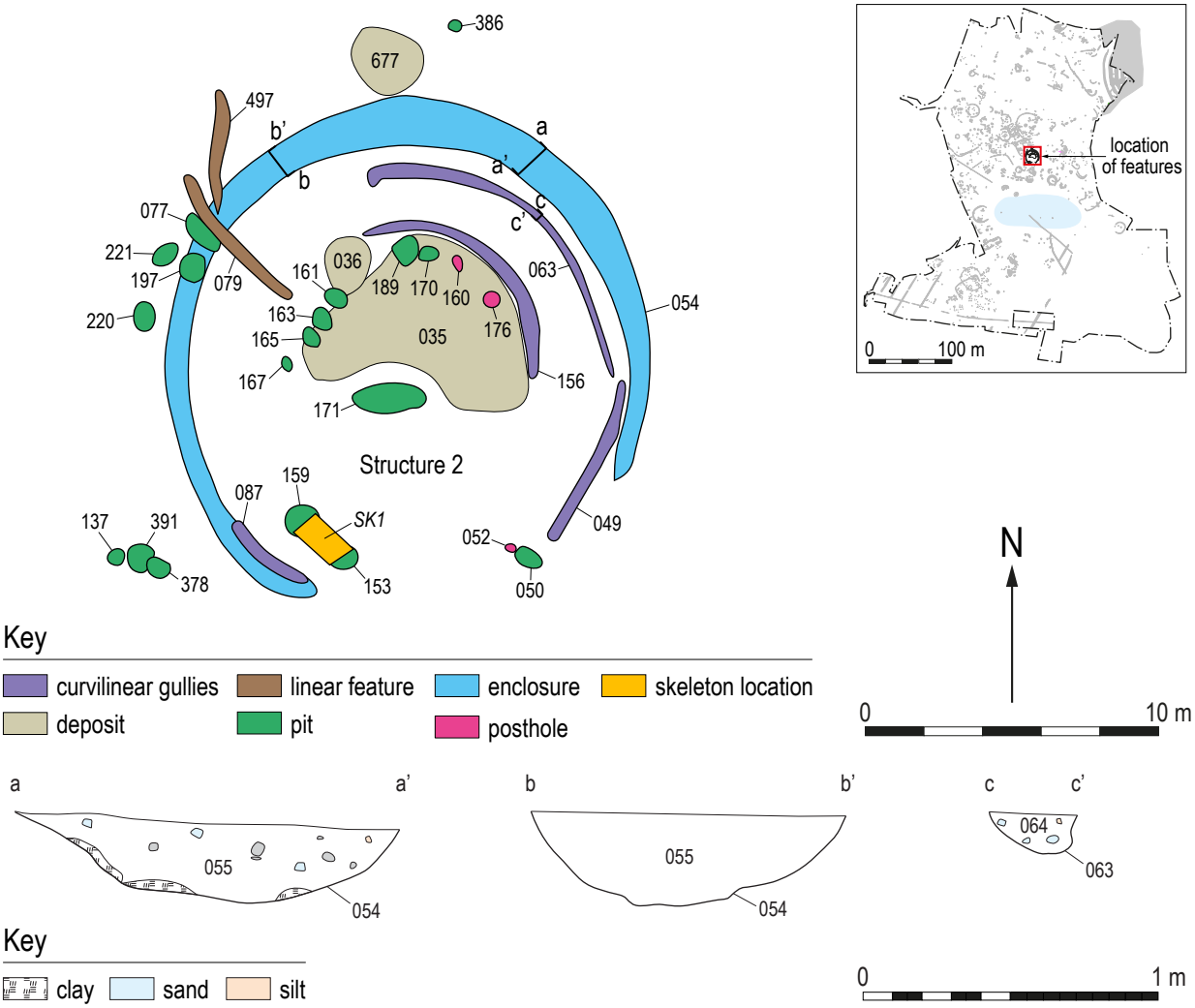


Figure 23: ST2 section drawings through ditch 054 and gully 063.



Figure 24: Aerial view of the excavation of ST2.

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Inside the ring ditch enclosure, were two narrow curvilinear gullies (049 and 063) on its eastern arc, with a similar curvilinear gully (156) running parallel but more internally within the structure. Another small and similarly narrow curvilinear gully cut the ring ditch (054) in the south-east (Figures 18 and 23). These features contained only small traces of mixed alder, hazel, heather type and oak charcoal as well as a few carbonised cereal grains, likely from scattered hearth waste. Near the centre of the enclosure was a large, shallow pit (169), measuring 4.2 m by 3.4 m and 0.7 m in depth. A sample of alder charcoal from its fill (035) provided a late Bronze Age date of 923 – 817 cal BC (UBA-51742). The pit fill (035) contained many fragments of prehistoric pottery (SF 3, 42, 46, 47, 70, 71, 74, 75, 78, 79, 81, 85, 89, 103 and 104), only one of which was identifiable as Iron Age in date (V89), suggesting the pit or its contents were due to a later disturbance. The pit also contained a fragment of cattle tooth SF 44, an ungulate tooth SF 45 and a lithic fragment SF 83. Several postholes (160, 161 and 175) were excavated within the central area of the ring ditch, which might represent the remnants of a small ring of posts, but these only contained mixed charcoal, with no evidence of posts burnt in situ.

Structures ST17 and ST18

To the north-west of ST2, were two overlapping segmented enclosures or roundhouses ST17 and ST18 (Figures 25 and 26), both consisting of a series of curvilinear ditches enclosing internal spaces, which contained pit and postholes, although it was impossible to determine what cut what. To the west side, ST17 comprised four curvilinear ditches (446, 461, 466, and 726) with evidence of re-cutting (468), although this possible re-cut contained charcoal with a late Neolithic date of 2873 – 2582 cal BC (UBA-54719). This is likely the result of later activities disturbing Neolithic features when constructing ST17. More expectedly, a sample of hazel nutshell from the mixed charcoal deposit recovered from the fill (447) of ditch (446) provided an early Bronze Age date of 1686 – 1546 cal BC (UBA-51745). A small amount of possible Bronze Age pottery (V97) was recovered from ditch (461). ST17 had an internal diameter measuring 5.8 m by 5.4 m, enclosing an internal space of 26.42 m^2. The three largest ditches were curvilinear in plan, and measured on average 9 m in length, 0.2 m to 0.38 m in width, and with depths of between 0.2 m and 0.34 m. The smallest of the ditches (724), measured 2.48 m in length and 0.13 m in depth. ST17 contained four openings around the perimeter, with the largest facing the north-west.

While no features were found associated with the north-west entrance of ST17, several pits/postholes were identified at the west, south, and east entrances, which may represent post supports for entrance structures. Pits/postholes (454, 456, 483, 753, 762 and 814) were found at the east entrance. Three pits (562, 774, and 863) and a posthole (470) were located at the southern entrance and may represent supports for a gateway structure. External to the western entrance was a small group of six postholes (108, 784, 794, 792, 799 and 947) that may represent a porch type entranceway, with posthole (108) containing nine lithic flakes or chips (CATs 2, 3, 5, 6, 7, 8, 9, 10 and 815) and an irregular core (CAT 4), indicating flint knapping was taking place in the area. The fills (109 and 119) of posthole (108) contained significant amounts of heather type charcoal as well as a few grains of wheat and barley and occasional weed seeds, suggesting crop processing took place in the area. The posthole group is relatively circular in shape and may represent a separate post-built circular structure with the north-east portion lost to construction of ST17. However, at only 2.4 m in diameter, this would have been very small. Another pit (484) within the terminal of enclosure ditch (472) possibly represented a contemporary support post. Interestingly, alder charcoal collected from the fill (764) of a large pit (765), immediately to the north of ST17 and abutting its ditch provided an early Bronze Age date of 2461 – 2208 cal BC (UBA-54733), but this pit is not obviously directly connected to ST17. Instead, it may belong to ST34 to the north of ST17 (Figure 22). This mainly consisted of a roughly north-east to south curvilinear ditch measuring 16 m in length by 0.2 to 0.6 m in width and 0.15 m to 0.3 m in depth, not too dissimilar from the ditches of ST17 and ST18 below, however, no evidence was collected to demonstrate this structure was Bronze Age.

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Within ST17, a possible post ring may be represented by seven postholes (528, 530, 532, 680, 712, 716 and 723) and a stakehole (719). These measured on average 0.3 m in diameter with depths between 90 mm and 0.21 m. They contained mixed charcoal including alder, birch, heather type, oak and some blackthorn, which possibly represented scattered hearth waste rather than remains of posts burnt in situ. An alder charcoal sample from the fill (713) of posthole (712) provided a late Bronze Age date of 898 – 825 cal BC (UBA-53306), which dates the post ring at least 500 years later than the dating evidence recovered from the northern ring gully (446). Seven pits (517, 526, 534, 535, 537, 671 and 703) were also found within the ST17 interior. Although varying in size, they were generally between 0.7 m and 1 m in diameter, with one larger pit (703), measuring 1.4 m in diameter,. Their depths varied from 88 mm in pit (534), to 0.35 m for pit (535). A sample of birch charcoal from the fill (864) of pit (863) near the south entrance provided a late Bronze Age date of 975 – 840 cal BC (UBA-53307). The charcoal recovered from ST17 contained a range of heather, alder, ash and oak, and wheat, barley and seed grains, indicating crop processing took place there, however, there was no evidence for any posts burn in situ.

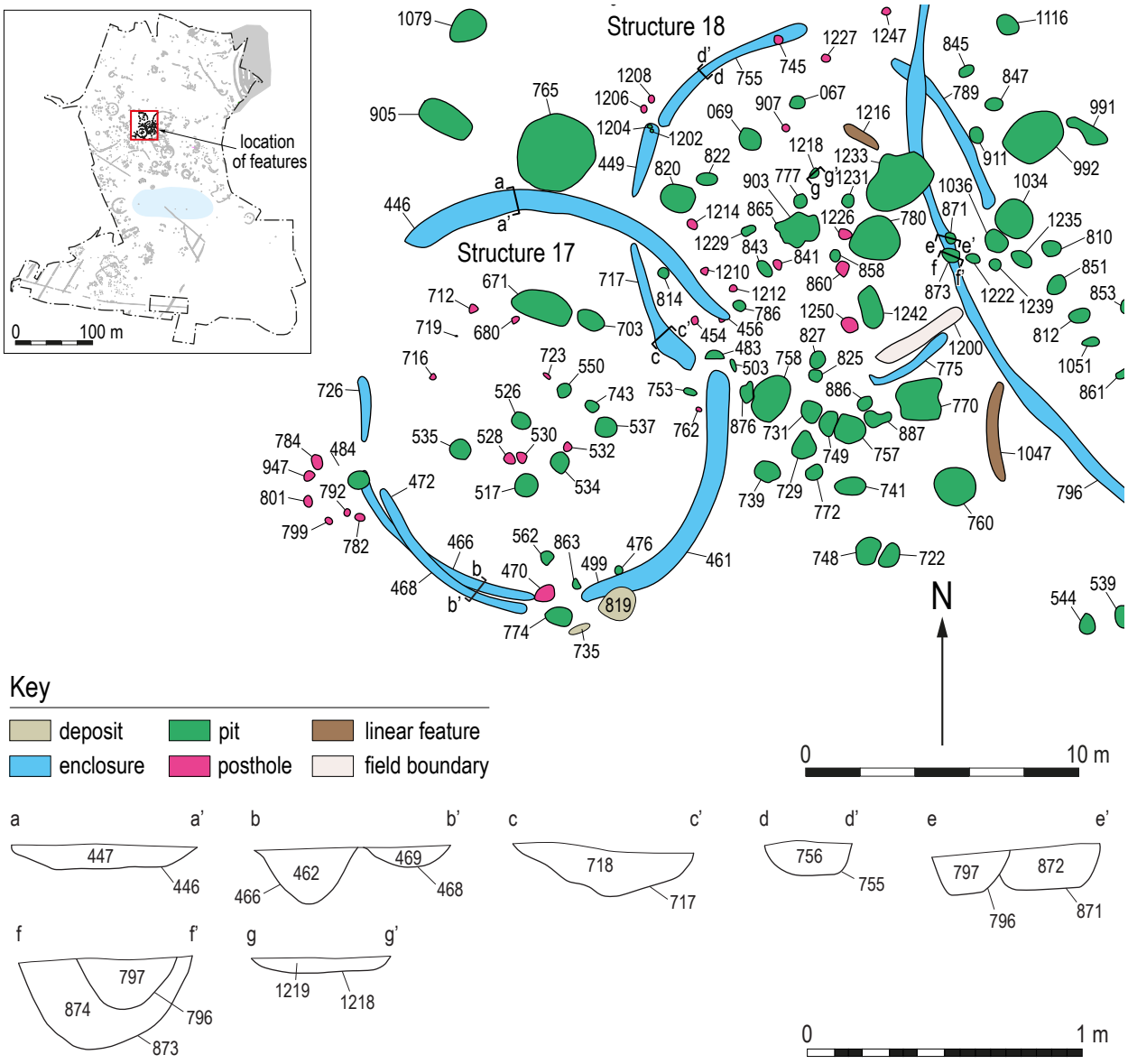


Figure 25: Plan of ST17 and ST18.

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Segmented roundhouse ST18 was located immediately east of ST17 with one ditch from each structure overlapping. As with ST17, ST18 comprised four segmented curvilinear ditches set out in a circular plan which measured 13 m in diameter with an internal space of approximately 132.75 m^2. The enclosure ditches (717, 755, 775 and 789) varied between 5 m and 8 m in length with widths of between 0.22 m and 0.7 m, and depths of up to 0.18 m. As with ST17, four openings were identified, with the largest to the south, indicating the construction of ST18 was very similar to ST17 and may indicate a number of closely related rebuilding events over the course of the Bronze Age. The ditch sections contained mixed charcoal with traces of barley and wheat grains, similar to the ring-ditch sections in ST17.

Within ST18, no obviously structural patterning was identified, and many of the large number of pits within and around the structure may actually date to the Neolithic period (see *Neolithic* above). In the centre of ST18 however, hazel charcoal from fill (866) of pit (865) provided a middle to late Bronze Age date of 1256 –1022 cal BC (UBA-53308). The charcoal from (866) contained traces of alder, hazel, heather, oak, barley grain and a tuber of tuber oat grass, and likely represents a domestic hearth waste fill at the centre of ST18. It is difficult to assess the Bronze Age evidence from the remaining features within ST18 as many may not be related, but the similarity of the structure to ST17 and the dating may suggest a rebuilding of the latter structure on a similar plan during the Bronze Age.



Figure 26: Aerial view of ST17 an ST18 after excavation.

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Structure ST13

On the western boundary of the excavated area and to the south-west of roundhouses ST17 and ST18, ST13 seems likely to also be Bronze Age in date (Figure 6). A penannular ditch (2908) enclosed an internal space of 244.18 m^2 was 1 m in width and between 0.1 m and 0.32 m in depth (Figure 27). Hazel charcoal recovered from its fill (2909) providing a late Bronze Age date of 1109 – 922 cal BC (UBA-53321). Internally, six pits were identified (2916, 2918, 2921, 2925, 2928 and 2930). Although no material culture was recovered from them, small amounts of mixed charcoal were recovered including oak, alder, heather and willow from the fill (2929) of pit (2918), which may be waste from cereal processing. Also, the fill (2922) of pit (2921) produced a large amount of alder charcoal, with birch, hazel and oak. This likely indicates a deliberate dumping of hearth waste into the pit.



Figure 27: Section through ditch (2908) of ST13.

Structure ST22

ST22 (3332) is possibly the largest and most impressive of the Bronze Age structures (Figures 28 and 29) on the excavated area and dominates the Bronze Age activity in the south-west. ST22 was a large oval shaped post-built structure measuring 27.4 m NW/SE by 22.5 m NE/SW, with an internal space of 590m². It was built with 76 postholes with a large south-west entranceway measuring 4.8 m in width. Several large postholes in this area may represent a formal entranceway but this was not proven. The only artefact recovered from the postholes was a lithic chip (CAT 1118) from posthole (2404), but three radiocarbon dates were obtained. In the north of ST22, the fill (3197) of posthole (3196) provided a middle to late Bronze Age date of 1208 – 1012 cal BC (UBA-51761) from cherry type charcoal. In the south-west of the structure the fill (3405) of posthole (3404) provided a late Bronze Age date of 1011 – 840 cal BC (UBA-51762) from birch charcoal, and in the east the fill (3271) of posthole (3270) provided a middle to late Bronze Age date of 1047 – 903 cal BC (UBA54741) from hazel charcoal. In addition to these dates, small amounts of mixed charcoal were obtained from postholes (3196, 3270, 3284, 3318, 3404, 3648, 3698 and 3695), and a significant amount of hazel charcoal was recovered from posthole (3126), which may suggest the presence of hazel wattle in the construction of ST22. This is the closest evidence available to understanding the construction of the structure based on the mixture of different charcoal obtained.

Internally the timber enclosure contained numerous small pits and postholes, although it is unknown if they are contemporary with the enclosure. A small curvilinear group comprising 11 postholes (3394, 3396, 3398, 3497, 3659, 3661, 3663, 3685, 3687, 3716 and 3718), which measured approximately 4 m in diameter, was located in the south-eastern area of the enclosure. It contained four postholes within its internal area (3636, 3665, 3667 and 3677) and could represent a small structure. Three postholes (3398, 3663 and 3667) contained mixed charcoal, with posthole (3398) containing a large amount of oak charcoal which might represent a post burnt in situ, and one wheat grain seed which might be an intrusive element.

As with most features on the excavated area, ST22 is truncated by a later rectangular enclosure ST19, and possibly a circular post-built structure, ST21 to the south-west. The layering and overlapping of structures in this area makes determining what internal features belong to ST22 difficult. This is compounded by the lack of artefacts or dating evidence, which would have aided the understanding of the nature of the Bronze Age occupation here. There is a possibility that ST21 is an internal feature of ST22 but the 11 postholes around a central posthole indicate a separate roofed structure. The presence of Iron Age pottery (V127) nearby in pit (3318) may be an indication that this is a later, Iron Age feature built after ST22 was abandoned, but with the lack of dating evidence these features cannot be confidently attributed to the Bronze Age structure.

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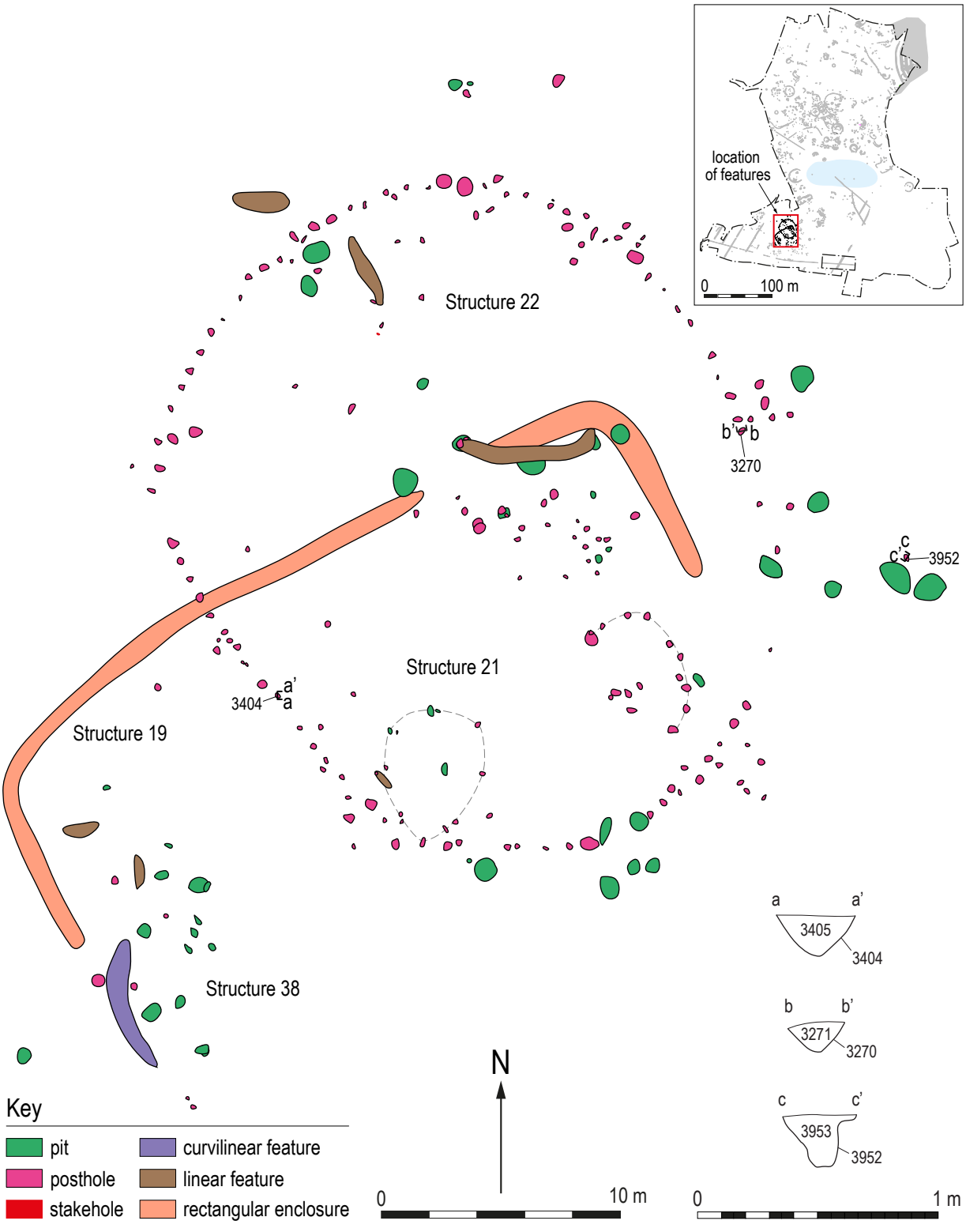


Figure 28: Plan of ST22 with ST19, ST21, SF23 and ST38.

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Figure 29: Aerial view of ST22.

Structure ST25

To the south-east of ST22 (Figure 30), was a small rectangular post-built structure, ST25. This was roughly rectangular in shape, measuring 10.07 m by 8.64 m, with an internal space of 59.23 m². It comprised 13 postholes (3308, 3310, 3330, 3335, 3501, 3497, 3332, 3746, 3326, 3740, 3742, 3744 and 3333) and was oriented east/west. A date obtained from hazel nutshell charcoal, providing a date of the middle to late Bronze Age of 1211 – 988 cal BC (UBA-53327), indicating some contemporaneity with ST22 to the north.

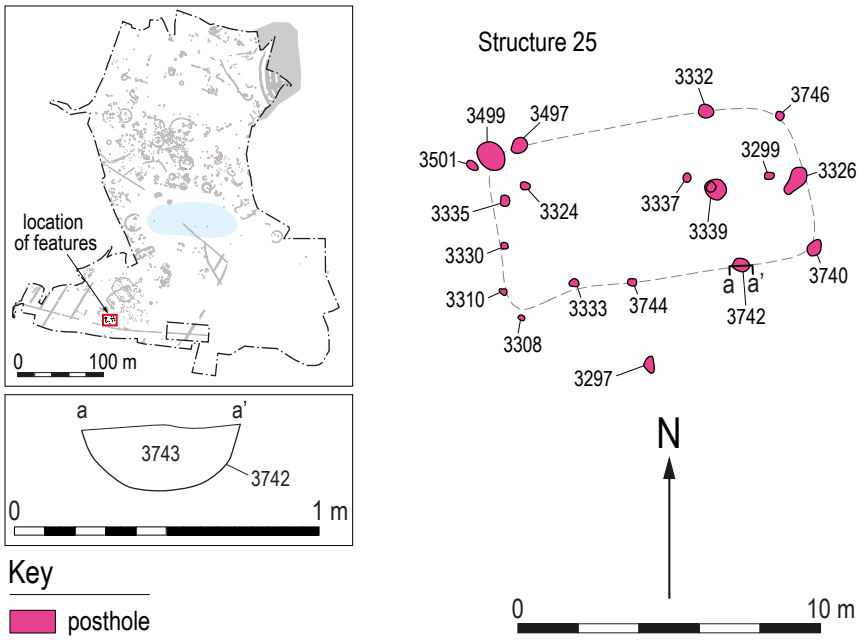


Figure 30: Plan of ST25.

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Immediately to the south of ST22 and just north-east of ST25, was a cluster of 10 pits in a roughly double north to south alignment. Within these, pit (3282) contained two fragments of what seemed to be Bronze Age pottery (V49 and V51). A sample of charcoal from pit (3282) provided a date of the middle to late Bronze Age of 1257 – 1049 cal BC (UBA-53325). However, just to the north-west, pit (3272) contained Iron Age pottery (V48), thereby complicating the issue of how many of these pits relate to the Bronze Age settlement in the area.

Structure ST20

To the west and slightly north of ST22 (Figures 31 and 32) Bronze Age activity comprised ST20 and PG12. ST20 was a post-built timber roundhouse defined by a series of 11 postholes (2981, 3042, 3038, 3044, 3032, 3027, 3003, 3021, 3028, 3012 and 2971) that measured 6.7 m by 6.5 m on plan with an internal space of 35m². The only artefact recovered from the postholes was CAT 238, a scraper/knife. There were three large pits within the interior of ST20, ranging in size between 1.15 m and 1.95 m in length, and between 0.23 m

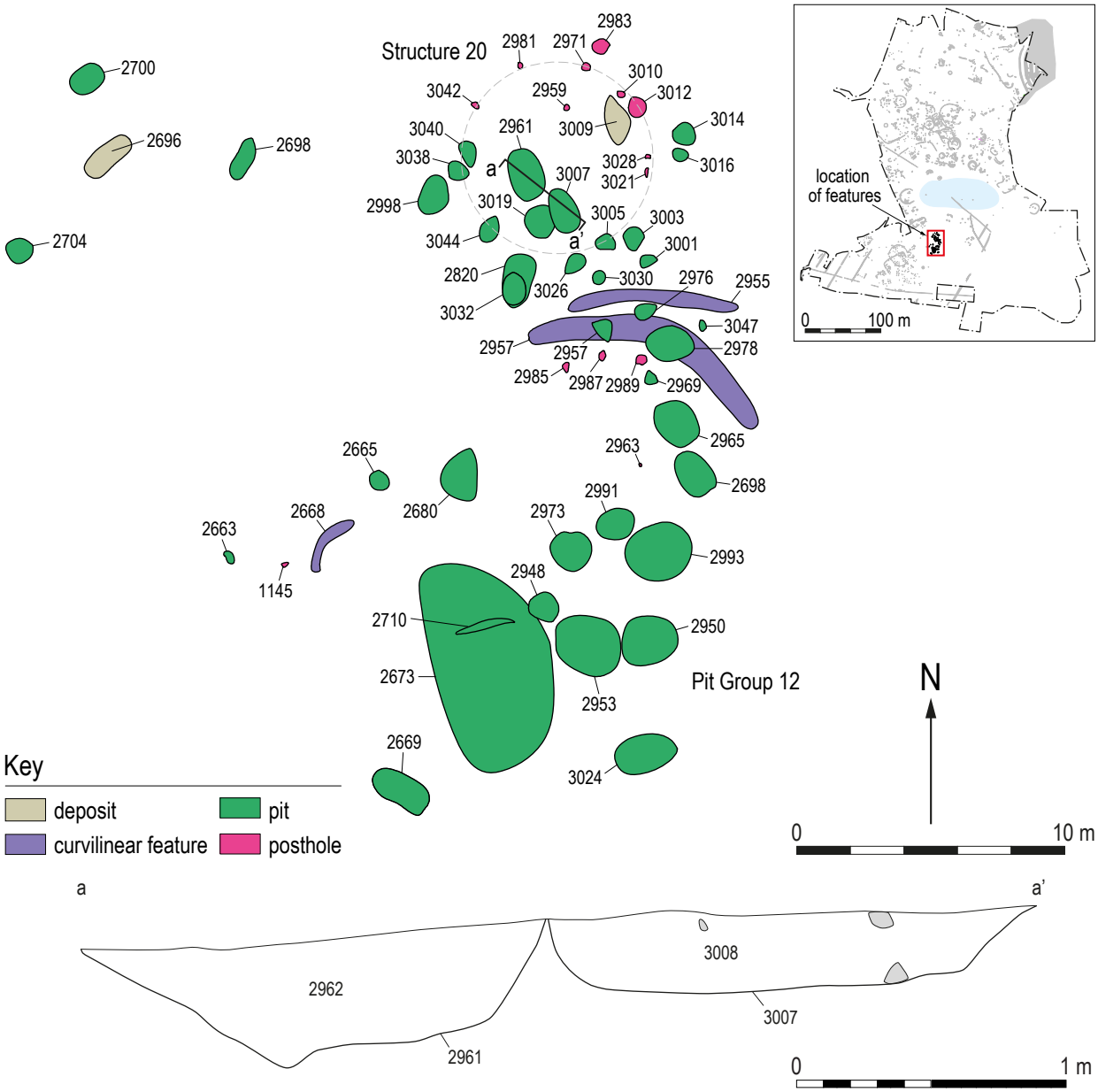


Figure 31: Plan of ST20 and PG12.

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and 0.4 m in depth. Possible Bronze Age pottery fragments V37, were recovered from fill (3008) in pit (3007) and V35 from fill (2962) in pit (2961). These two pits contained mixed charcoal, which may be from midden or hearth waste, and a sample of alder from the latter pit provided a late Bronze Age date of 1109 – 920 cal BC (UBA-53323). Possible Bronze Age pottery V35, was also recovered from pit (2998) to the immediate west of the timber circle. Most interesting, are the two ceramic mould fragments (SF 1468 and SF 1713) recovered from the same pit (2961). SF 1468 may be part of a mould for a sword, and SF 1713 is a ceramic mould gate fragment for a socketed gouge. Both are consistent with a late Bronze Age date and suggest that non-ferrous metalworking took place on the site. These pits may be part of PG12, which extends south from the southern part of ST20.

Pit Group PG12

PG12 (Figure 31) comprised of a mix of 30 small to large oval pits, generally between 0.65 m - 2.65 m in diameter, with one large but shallow semi-circular pit measuring 8.1 m by 4.1 m and 0.18 m near the south end of the pit group (2673). Pottery sherds from V34 from pit (2637), V31 and V32 from pit (2953), and V33 (2669) to the south, indicated that at least part of PG12 was Bronze Age in date, although the presence of possible Iron Age pottery in pits (3044 and 3026) both V38, may throw doubt on all pits in the group dating to the Bronze Age. A stone spindle whorl, SF 1463, was recovered from the lower fill (2952) of pit (2953), indicating that wool was spun into yarn in the area possibly associated with ST20. A mixture of charcoal was recovered from PG12 but apart from the possible hearth waste in pits (3007 and 2961), there was no other material evidence to suggest use.



Figure 32: Aerial view of ST20 with its circle of postholes.

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Pits (2965 and 2698) were both filled with a greasy sand deposit. Unfortunately, there was no datable evidence within the pits. However, pit 2698 underwent lipid analysis which suggested the source of the greasy substance was vegetable based fats (Figure 33; see *Lipid Analysis*, below).



Figure 33: Greasy substance in pit (2698) in PG12.

Structure ST8

On the east side of the excavated area, was ST8 (Figure 34). This was possibly a circular ring-ditch roundhouse measuring 14 m by 12 m with an internal area of approximately 130 m^2. The structure had a large entranceway to the west. Its surrounding perimeter ditch or gully was between 0.45 m and 0.7 m in width, and was very shallow at between 70 mm and 0.2 m in depth. A split cobble SF 307, which had been used as a grinding stone was recovered from the ditch fill (533), along with a scattering of lithics including a bipolar core (CAT 57), a flake fragment (CAT 58), an indeterminate piece (CAT 60), two chips (CAT 61 and 851) and a crested flake or blade (CAT 62). Some heather type charcoal and wheat grain was also recovered. The roundhouse interior contained pits (558, 560 and 570), which all contained heather type charcoal. Pit (560) also contained traces of hazel, oak, carbonised grains of oat, barley and wheat, suggesting domestic hearth waste. Hazel charcoal collected from pit (560) provided a late Bronze Age date of 1187 – 933 cal BC (UBA-53305). A fourth pit (572) was located at the northern terminal of the ring-ditch (552), which may represent the remains of a badly truncated posthole. A further posthole (608) was found within the perimeter ditch and may have been used for a structural support of the roundhouse.

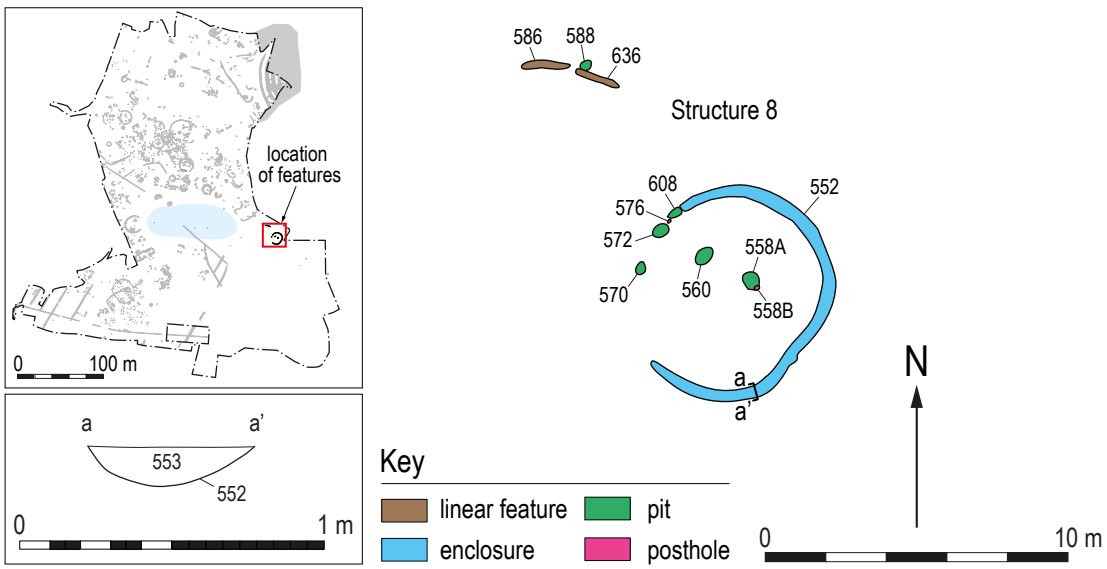


Figure 34: Plan of ST8.

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Structure ST27

ST27 (Figure 35) may also be Bronze Age in date. This possible structure was located towards the north-west of the excavated area, north of ST17 and ST18. It comprised a curvilinear ditch (1895) to the south and west 10.8 m by 9.2 m and between 0.13 and 0.27 m in depth. The northern terminus of the ditch truncated a large sub-oval pit (1928), 4.12 m by 3.44 m and 0.26 m in depth that predated the structure. Two other pits (1919) and the smaller (1998) occupied the interior of ST27, along with seven postholes (1884, 1886, 1915, 1919, 1925, 1935 and 1943) in no obviously structural pattern. Within the fill (1895) from ditch (1894), three flint chips (CATs 111, 113, 114, 932), seven flakes (CATs 110, 112, 426, 428, 429, 431 and 1089) and a blade (CAT 427) were recovered. The ditch fill also contained heather type charcoal, indeterminate cereals and hazel nutshells, indicating scattered domestic hearth waste. The fills of postholes (1884 and 1915) also contained mixed charcoal as well as traces of oats and barley. A sample of alder from fill (1916) of posthole (1915) provided a middle Bronze Age date of 1202 – 1000 cal BC (UBA-53317).

Other structures

There are also traces of earlier structures below later structures. The fill (2438) of a small circular posthole (2506) contained oak charcoal and barley and other grains likely to be scattered hearth waste. This provided a late Bronze Age date of 990 – 832 cal BC (UBA-51752). This posthole measured 0.65 m by 0.6 m and 0.29 m in depth, was found within ST40, an Iron Age stone roundhouse, and contained a modest amount of pottery. This may indicate that an earlier Bronze Age structure occupied the area before being re-occupied in the Iron Age. Some of the other un-dated postholes in the area may also relate to an earlier Bronze Age structure, while other evidence may simply have been lost below the later Iron Age settlement.

ST41, to the south-west of ST2 may also have Bronze Age origins (Figure 36). This structure consisted of the remains of a roughly east to west curvilinear feature measuring 8.4 m by 8 m and 0.29 m in depth. Its northern section survived best as it had been dug c. 1 m into the surrounding subsoil and had the remains of a stone revetment wall supporting it (Figures 37

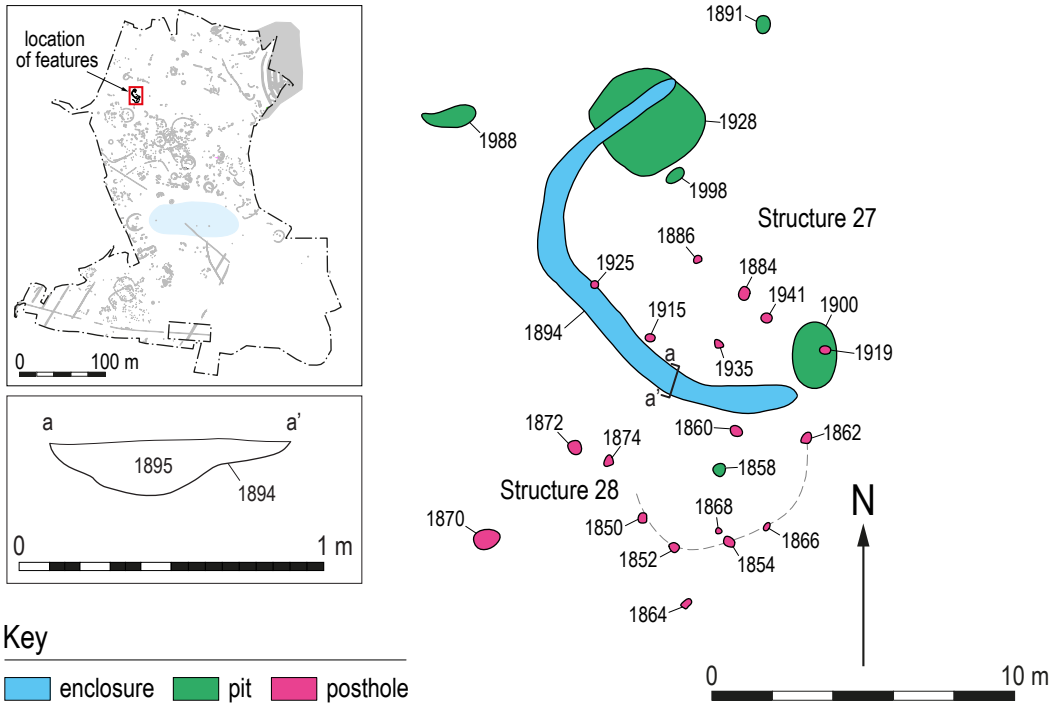


Figure 35: Plan of ST27 and ST28.

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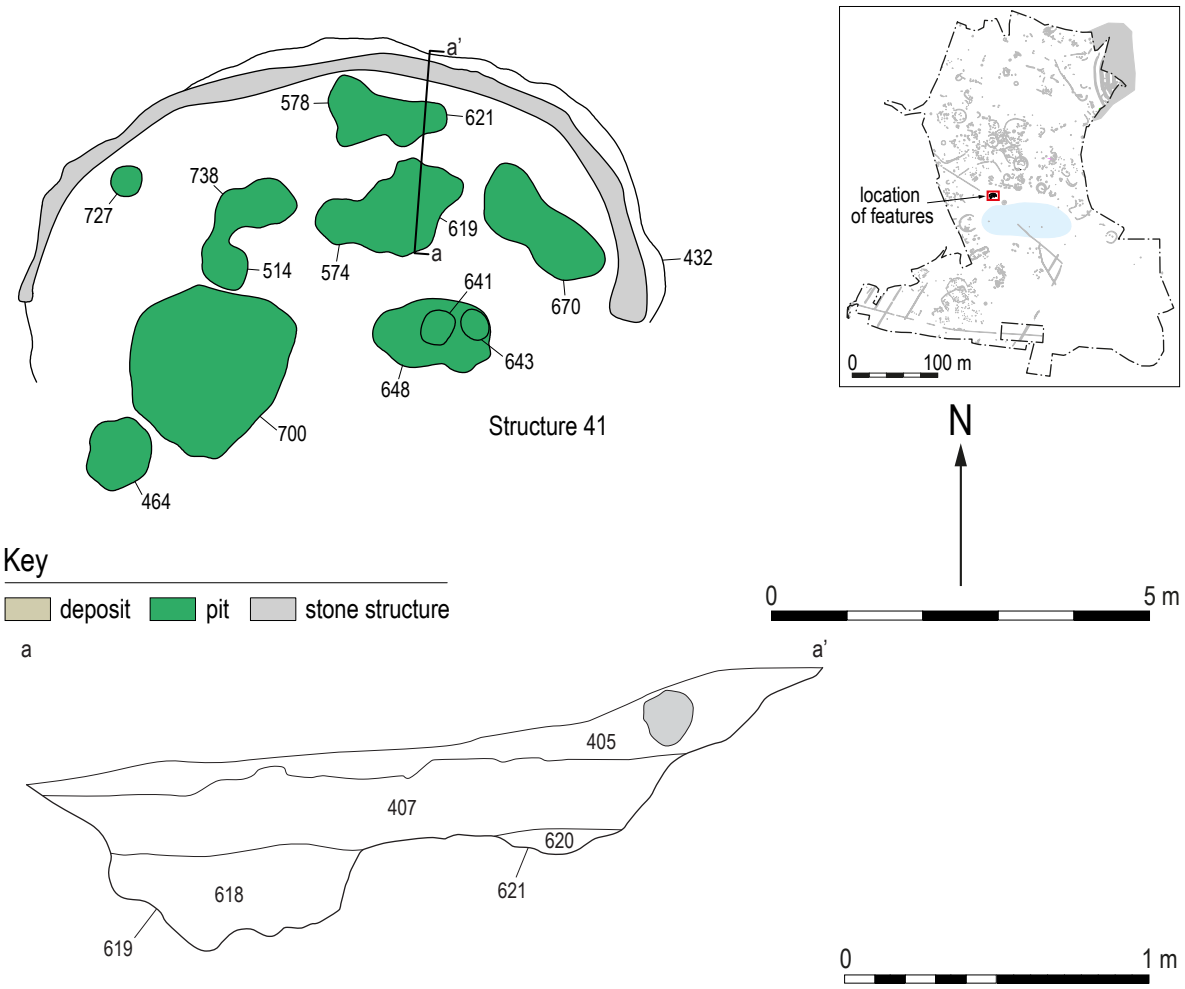


Figure 36: Plan of ST41.



Figure 37: View of ST41 as revealed and before excavation.

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and 38). Two deposits (406 and 407) covered the structure and the wall which on the surface appeared as a crescent shape, with 11 shallow pits identified within it. Deposit (407) provided a late Bronze Age radiocarbon date of 1084 – 901 cal BC (UBA-54718). One pit (510) contained a small fragment of Bronze Age pottery V106. However, the fill (465) of nearby post-pit (464) within the structure contained a shale bracelet fragment (SF 278) and charcoal which gave a later Iron Age date of 751 – 412 cal BC (UBA-51746). This may suggest a Bronze Age structure was truncated by one of Iron Age date.

To the east of Structure 23, was (2706) that was originally suspected as being a large pit, but may well be the remains of another Bronze Age structure due to its similarities with grubenhauser, or pit-houses which were small buildings dug into the subsoil. This feature measured 3.96 m by 3.3 m by 0.4 m in depth, with steep sides and a flat base. It was filled with a black-brown clay sand deposit (2707) which included a small number of medium and large flat stones around the edges and on its base. Its fill contained two fragments of Bronze Age pottery (V42), as well as hearth waste charcoal which produced a middle to late Bronze Age radiocarbon date of 1258 – 1051 cal BC (UBA-54737).

A group of 11 oval-shaped pits (Figure 20) in a roughly linear, east to west alignment to the north of ST27 ranged from 0.52 m by 0.46 m by 0.15 m in depth for the smallest (1951), to 2.08 m by 1.9 m by 0.44 m in depth for the largest (1908). Some of these pits (1903, 1906 and 1908) were stone-lined and each contained a few lithic chips (Figures 39 and 40). They may have once been used as cists but no evidence was found to prove this. Samples collected from the pits show mixed charcoal deposits of hazel and hazel nutshell, as well as heather type and oak in pit (1906). The material is likely to be midden waste that had been dumped into the pit. Hazel charcoal from the fill (1909) of pit (1908), provided a middle Bronze Age date of 1409 – 1232 cal BC (UBA-53316).



Figure 38: Aerial view of ST41 during excavation.

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Figure 39: View of pit alignment in NW of site with stone-lined and -capped pits.



Figure 40: View of pit 1908 in pit alignment.

Although no evidence was recovered to confirm these oval pits were used for burial and were a small cemetery, there is evidence that Guardbridge inhabitants were buried on the excavated area. To the north of ST34, the fill (1142) of an oval-shaped pit (1141) contained the remains of a highly decorated early Bronze Age Beaker (V80, see *Prehistoric Vessels*), used in a burials. This pit was to the south-west of the above mentioned oval pit alignments and its completeness (c. 70%) may suggest the pot was disturbed in situ, and may represent a burial pit. Another fragment (V43) of a Beaker was recovered from posthole (2675) to the east of ST22, which has been moved from its original deposition site, as was fragments of V39, recovered from deposits north of ST20. To the west of ST20, 17 fragments of a middle Bronze

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Age urn (V44) were also recovered from an overburden layer. However, no human remains were found associated with any of the Beaker fragments recovered and most seem to have been removed from their original contexts. It seems likely that portions of the site to the north and south-west were used for burials during the early and middle Bronze Age, with the higher, north-west central area containing oval pits possibly the likeliest candidate for a cemetery. This may further add to the idea of this higher portion of the site being used as a cemetery, similar to the site of North Straiton to the north of Guardbridge (Stronach *et al.* 2006).

A total of 157 sherds representing 30 Bronze Age vessels were recovered across the excavated area, but in addition to these, a number of stray pits also contained evidence of Bronze Age habitation. To the north-east, SF 941 a split and flaked cobble was uncovered. It has a broad curved cutting edge at one end, which may be a digging or agricultural tool. This was recovered from pit (2050) in PG10, and although not from a definite Bronze Age context, shares many similarities with tools from other Bronze Age sites (see *Worked Stone*, below).

Field boundaries

In the western area of the excavated area were two large 'L' shaped field boundaries (1643/1937 and 061/952/1980; Figure 22). They measured 41 m and 47.5 m, in length respectively, with widths of between 0.48 m and 0.6 m and depths between 0.14 m and 0.3 m, and they were filled with brown-grey silty sand. The southernmost boundary contained a large concentration of Bronze Age pottery, SF 431, within its fill. Residue from this pottery provided a date of use within the late Bronze/early Iron Age of 1045 BC – 902 cal BC (UBA-54722).

Iron Age

By Maureen Kilpatrick

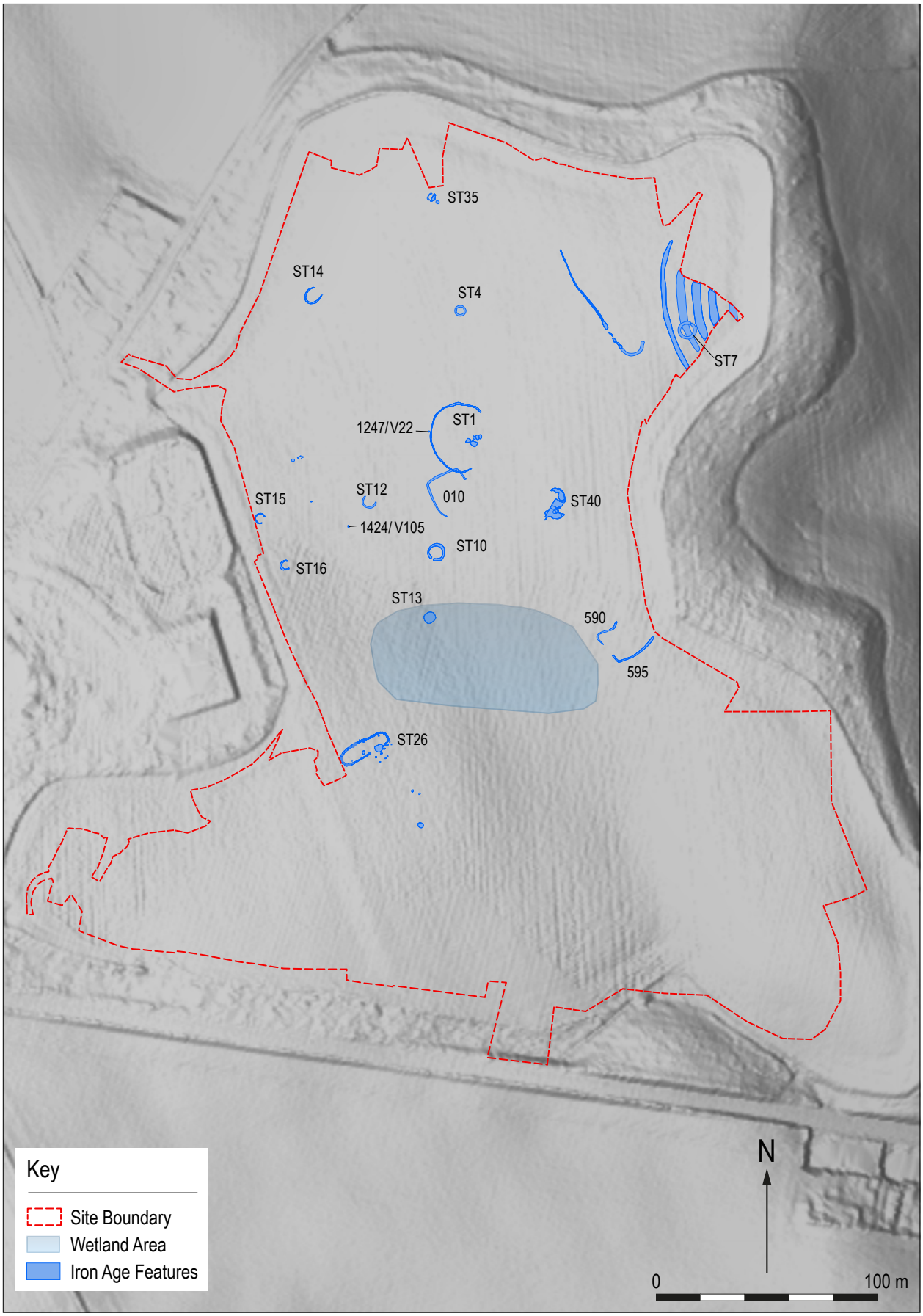
The Iron Age activity at Guardbridge was found across the excavated area, and similar to earlier periods, was located on the raised areas of ground around the 25 m contour line, avoiding the wetland area which was still extant. The structures associated with Iron Age activity included the ditches of a fort, a stone roundhouse, a rectilinear building, several small enclosures and field boundaries (Figure 41). These activities and structures date from the end of the late Bronze Age through to the late Iron Age.

The fort

In the north-east extent of the excavation an aerial photograph (Figure 42, Canmore NHRE) revealed the presence of four concentric ditches that enclosed an area that overlooked the River Eden Estuary to the north-east (Figure 43). Only those sections of ditch within the field were observable on the photograph due to the tree belt surrounding the field that obscured their full extent. During the excavation only 30% of the full extent of the ditches were excavated, the remainder was preserved in situ. A further internal ditch, the fifth, was also discovered during the investigation (Figure 44).

Deep overburden deposits (Figure 45) approximately 1 m in depth were found above the ditches and were mechanically removed to reveal their extent within the development area. Truncating the ditches was a small double ring ditch enclosure (ST7; Figure 44), while above and within the deep overburden deposit was the remains of a large stone-built kiln (ST33; Figure 44) which dated to the beginning of the 2nd millennium AD (see *Medieval and post-Medieval*, below).

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Figure 41: Distribution of Iron Age features.

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Figure 42: Aerial view of the fort ditches with Guardbridge village in the background. © Crown Copyright: HES.



Figure 43: The River Eden esturary as seen from the edge of the excavation.

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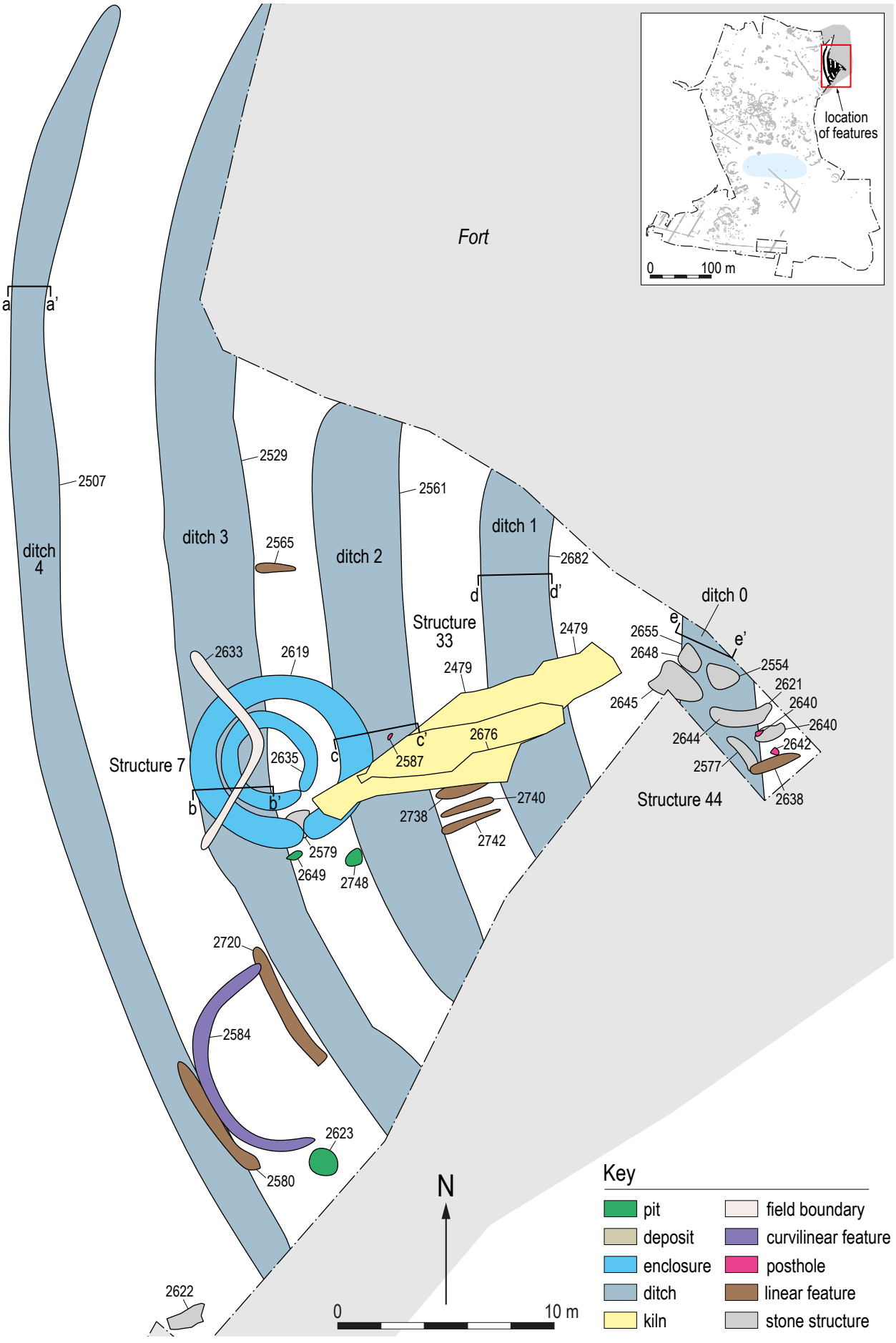


Figure 44: Plan of fort ditches and related structures.

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Figure 45: Deep topsoil deposits over the fort ditches.

The concentric ditches formed a rough 'D' shape were numbered 4 to 0, number 4 being the external ditch to the west and ditch 0 the innermost which was adjacent to the surrounding tree belt to the east. All of the ditches were curvilinear in shape. The outer ditch 4 (2507) measured 62 m in circumference within the limits of the excavation area. It had a width of between 2 and 3 m and a depth which ranged between 0.53 m and 1.11 m. It was U-shaped in profile (Figures 46 and 47 a-a') although the sides became steeper and deeper towards the south (Figure 48). It contained an upper fill (2508) and a lower fill (2599). Both fills comprised silty sand but the upper fill contained sherds of pottery which were identified as a Neolithic Impressed Ware bowl (V1), together with lithic flakes (CAT 314 and 424) and fuel ash slag (SF 1150). Radiocarbon dating of a hazel nutshell fragment provided a date from the early/late Mesolithic period of 7765 – 7585 cal BC (UBA-51753), a residual piece. Unlike the other ditches, a rounded terminal end was situated at its northern end suggesting an entranceway was positioned at this location.



Figure 46: Section across ditch 4.

Inner ditch 3 (2529) measured 41 m in circumference within the excavation, and its width was between 3.8 m and 4.7 m and its depth was 0.88 m to 1.42 m. Like ditch 4, the deepest sections of the ditch were towards the south, with its initial U-shaped profile becoming more V-shaped (Figure 47 b-b'). It contained three fills (2530-2532) of silty sand, but a small lithic flake and an indeterminate piece (CATs 317 and 367) and bone fragments (SF 1145 and 1259) were found within its upper fill (2530). The ditch and upper fill were truncated by a small double ring ditch (ST7). Only traces of heather type, hazel and oak charcoal were recovered from its fills, with a fragment of hazel charcoal from the upper fill, the only datable fragment, producing an early Bronze Age radiocarbon date of 2468 – 2295 cal BC (UBA-54733), again a residual piece.

Inner ditch 2 (2561) measured 27 m in circumference within the excavated area, and it had a width of 3.9 m and a depth of 1.4 m to 1.53 m (Figures 47 c-c', 49 and 50). It also contained three fills (2562-2564). Small lithic flake fragments (CATs 293-295 and 300) and small unidentified bone fragments were found in the fills which comprised silty sand. This ditch was also truncated by the double ring-ditch ST7. Only traces of alder, hazel, heather type and oak charcoal, with a few cereal grains were recovered from its fills. The upper fill, again the only datable fill, provided a radiocarbon date within the late Bronze Age of 1884 BC – 1515 BC (UBA-54735) from a hazel charcoal fragment.

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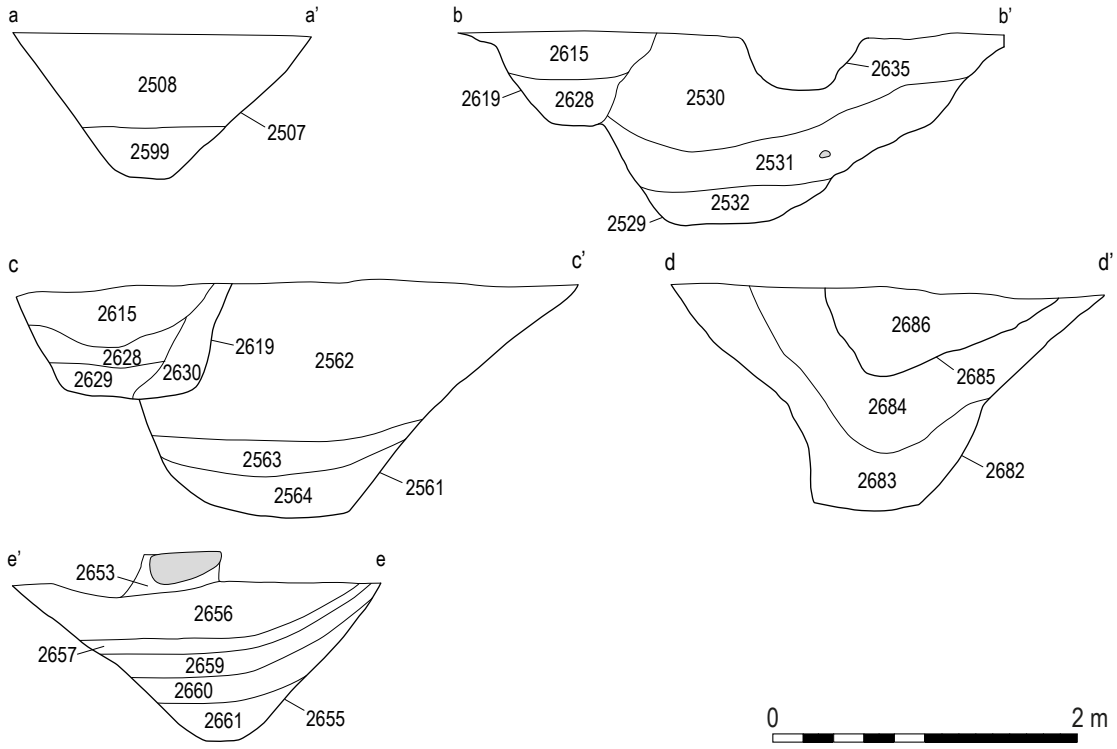


Figure 47: Sections through the ditches of the fort.



Figure 48: Section through ditch 4 to the south.

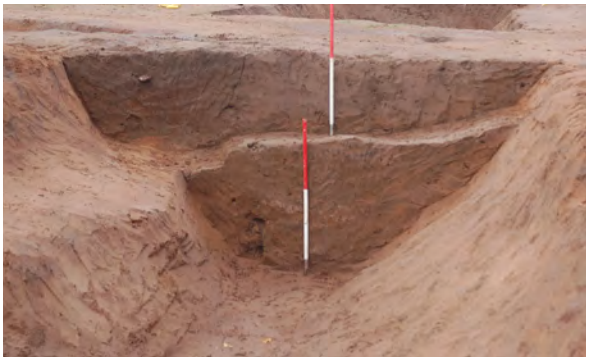


Figure 50: Detail of section c-c' across ditch 2.



Figure 49: General view across the sections cut through ditch 2.

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Figure 51: Inner ditch 1 before excavation.

Inner ditch 1 (2682) measured 17 m in circumference within the excavation, and it had a width of 3 m – 3.8 m and a depth of 1.5 m – 1.75 m (Figure 47 d-d'). It contained two fills (2683 and 2684). Finds were few and included small lithic flakes and a chip fragment (CAT 302-308 and 967), a possible stone pounder (SF 1674) recovered from its basal fill and fragments of fuel ash slag. Also found was a linear band of cobbles (2687), probably rubble which had been deliberately deposited into the ditch during backfilling. Unlike the other ditches this ditch had been partially re-cut along its length. The re-cut (2685) had one fill (2656). This ditch was V-shaped in profile with a slight step or channel at the base (Figures 51 and 52). Only traces of alder, oak and heather type charcoal, with a fragment of hazel nutshell and a few burnt grassland weed seeds were recovered from its fills. The upper re-cut fill was the only one to contain datable material with an early Iron Age date of 770 BC – 489 cal BC (UBA-51757) returned from an alder charcoal fragment.



Figure 52: Inner ditch 1 after excavation.

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The inner ditch 0 (2655) was only partially exposed but was estimated to have a circumference of 3.42 m in as measured within the excavated area (Figure 44). It had a width of 2.48 m and a depth of 1.03 m (Figure 47 e-e'). It contained steep sides with a V-shaped profile and five fills (2656, 2657, 2659-2661; Figure 53) comprising of sandy clay/silt. No artefacts were found in the ditch except an unidentified mammal bone fragment (SF 1217) in its lowest fill, which returned a radiocarbon date of 49 cal BC – cal AD 71 (UBA-54736) All the fills produced small amounts of heather type charcoal, with traces of hazel and oak present in some. A single fragment of hazel nutshell was recorded from the fill (2660).



Figure 53: Ditch 0 during excavation.

A fragment of hazel charcoal found below the remains of a stone structure ST44 (see *Medieval*, below) which was located above the upper fill of this ditch returned a radiocarbon date from the late Bronze Age of 974 – 815 cal BC (UBA-51756), affirming the disturbance which much of the site was subject, due to repeated phases of settlement throughout prehistory and into the medieval and modern periods. An internal area enclosed by this final ditch was estimated to have had an area of 872 m², or measured c. 70 m north/south by 18 m east/west (Figure 54).

Double ring ditch enclosure ST7

A small double ring-ditch enclosure ST7 (2619 and 2635) was found above the fort ditches 2 and 3 (Figures 44 and 55). Both its ditches were sub-circular in shape with the outer ditch (2619) having an outer diameter of 7.75 m. It had a U-shaped profile that measured 1.2 m - 1.9 m in width, a depth of between 0.69 m and 0.9 m, and it contained four fills of silty sand (2615, 2628-2630). Only the upper fill (2615) contained any artefacts. These included lithic fragments (CAT 299 a blade and CAT 301 a flake) and fuel ash slag fragment (SF 1208), which had probably become incorporated into its ditches during later activities. Only traces of heather type charcoal and a single seed of cultivated flax were found within its fills.



Figure 54: Overview of ditch sections located and excvated.

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Figure 55: ST7 cut into the ditches of the fort, in the centre of the image.

The internal ring-ditch (2635) had an internal diameter of 2.2 m - 2.85 m, a width of 0.5 m to 0.65 m and a depth of 0.42 m. As with the outer ditch it had a U-shaped profile but contained one fill (2636) of dark brown silty sand (Figure 47). Only one small lithic chip (CAT 961) with small amounts of birch, heather type and oak charcoal, together with traces of cereal grain were found within its fill suggesting hearth waste. A radiocarbon date within the middle Iron Age was recovered from birch charcoal 170 cal BC – cal AD 43 (UBA-51755).

Both ring-ditches were complete circles with no entranceway. There was no evidence of any features within the internal spaces enclosed by them which could suggest a function. Both were truncated by a linear field boundary and kiln structures ST33.

Stone-built roundhouse ST40

In the central eastern area of the site and situated on a flat, raised area of ground close to the eastern boundary of the excavated area was the degraded and fragmentary remains of an oval-shaped stone roundhouse (ST40; Figure 56), which survived in two sections: a north-eastern one and a south-western one (Figure 57). Its total diameter would have measured c. 14.1 m and it was covered by dark brown-grey silty sand (2001) which was 0.25 m in thickness and contained Iron Age pottery fragments (V58 and V65) and numerous fuel ash fragments (SF 781-783, 825, 839, 858, 862, 863, 868 and 869), which had been deposited there from elsewhere in the locale. This event occurred after the roundhouse had been abandoned and mostly demolished. Several small lithic chip, flake and blade fragments were also recovered (CATs 111, 112, 117 and 121) and small fragments of unidentified animal bone (SF 829). The deposit produced charcoal of alder, hazel, heather type, oak and fragments of cramp, a vitreous slag.

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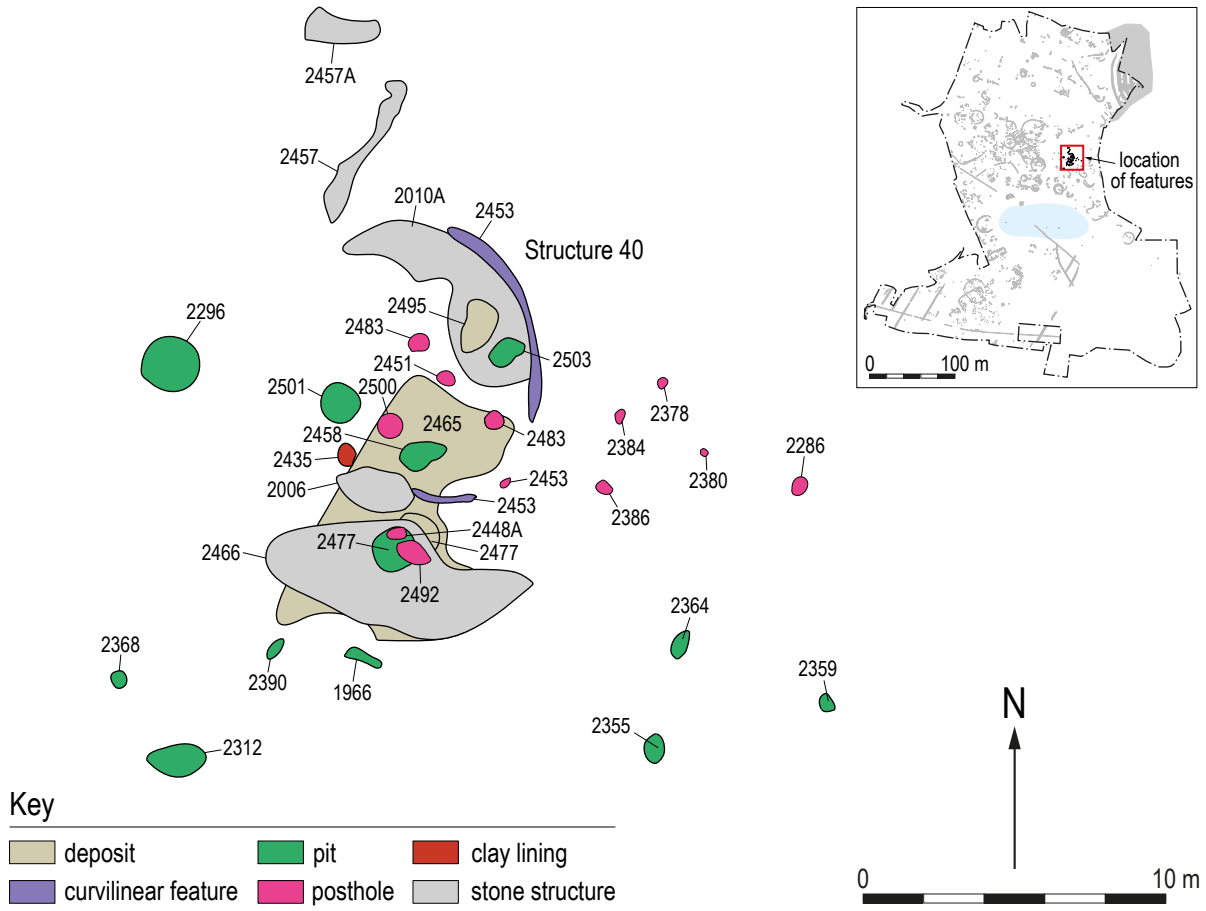


Figure 56: Simplified plan of roundhouse ST40.



Figure 57: Aerial view of roundhouse ST40 from the north-east.

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The northern section comprised two parallel curvilinear walls (2010A and 2439) which only survived as a foundation level. Wall (2010A) measured 9.2 m by 2.4 m by 0.5 m in height. It was exceedingly degraded at its northern extent with only the wall's outer facing stones surviving. The arc of wall was orientated toward the north-east and comprised a line of outer and inner facing stones with smaller cobbles in the centre, which measured 1.6 m in width. The outer line of facing stones had been partially built into a very shallow foundation trench (2453). Fragments of industrial waste fuel ash slag (SF 1064), fired clay fragments and pottery sherds (V58), a hammerstone/whetstone (SF 844), and small lithic fragments had been deposited there following its disuse.

A small section of upright sandstone slabs (2439) abutted the outer edge of wall (2010A) and they could represent a different phase of use, possible relating to the large posthole (2477) within the corresponding southern wall (2466).

The southern wall (2466) was mainly reduced to rubble of cobbles and small boulders. Several possible large stones positioned in a curvilinear alignment might represent facing stones like in the corresponding wall to the north (2010A). A small amount of alder, heather type and oak charcoal, with a single fragment of hazel nutshell was recovered from its surface. A large pit containing flat slabs probably remnants of a large posthole (2477) were recorded adjacent to the internal facing stones within the wall structure. This feature could represent a later insertion into the wall as the structure was altered at a later date during its use. The posthole fill (2476) produced a mixed charcoal assemblage of alder, heather type and oak, with no evidence for a post burnt in situ.

The surviving internal area measured approximately 6 m in diameter and comprised a layer of mottled dark brown, yellow, grey sandy silt (2015), possibly an earthen floor in which a large number of artefacts were recovered including pottery sherds (V58 and V84), a lithic flake (CAT 87), a large number of fuel ash slag fragments and indeterminate mammal bones (SF 1077). It also contained fragments of burnt raw clay on its surface which might be remnants of a waterproof lining for the internal walls, or more likely waste material from nearby metalworking activities which had been dumped there along with fuel ash slag. This deposit contained only traces of alder and hazel charcoal with a single fragment of hazel nutshell. An alder charcoal fragment provided a radiocarbon date at the end of the Bronze Age and the beginning of the early Iron Age of 899 – 789 cal BC (UBA-54730)

Abutting the southern wall and within the internal area of the building was a small section of cobble flooring (2006) which measured 2.38 m by 1.13 m with a depth of 0.12 m. It contained a small unidentified pottery fragment (SF 845) on its surface.

Within the internal space were also two stone-lined postholes (2492 and 2506) that presumably supported internal posts. Both produced small amounts of oak charcoal, but with other types and barley grains also present. These fills are probably from scattered hearth waste rather than evidence for posts burnt in situ. Alder charcoal was. However, radiocarbon dated from posthole (2506) and provided a late Bronze Age/early Iron Age date of 971 – 832 cal BC (UBA-51752), similar to the date of the internal deposit (2015).

A large number of artefacts were found in the general area of the structure and included prehistoric pottery (V59-62, V65, V68, V69, V71-73 and V76), medieval pottery (SF 784) fired clay (SF 781, 847, 856, 857, 864, 867 and 1141) and fuel ash as well as indeterminate mammal bone and tooth fragments (SF 796, 814, 836).

To the immediate south west of ST40 was a small pit (2390) which contained a fine stone burnisher (SF 1049), a tool used during metalworking.

Below the stone structure and sealed by deposit (2015) and stone walling (2010A) were the remains of curvilinear enclosure (2453). It measured 8.9 m in diameter with a width of 0.35 m and had a shallow depth of only 0.11 m. An entranceway was found to the south-west. Associated were several postholes, pits (2451, 2456, 2500, 2501 and 2503) and a deposit (2495). The fill of pit (2451) produced only traces of heather type and oak charcoal, with a possible barley grain, while deposit (2495) only contained traces of heather type charcoal.

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Palisade enclosure ST1

A large, oval shaped palisade enclosure ST1 was located to the west of the fort occupying an area of flat ground (Figure 58). It measured 27.7 m by 27.4 m and enclosed an area measuring 602.7 m². The width of the perimeter ditch (796) was 0.4 m and it was filled with grey-brown silty sand (797). Cobble stones were found intermittently within its fill on the western and southern sides. The northern perimeter, however, contained a large amount of cobbles along its length, which probably acted as supporting stones for upright posts and/or wooden panels. No botanical material was available for dating although a carbonised assemblage comprising of only small amounts of heather type charcoal and a few carbonised grains of barley and indeterminate cereals, reminiscent of scattered hearth waste, were associated with the enclosure. Several small pottery sherds from both the Neolithic and Iron Age were found within its fill (see *Prehistoric Vessels*, below), the Neolithic sherds might be residual finds.

The enclosure had a large open eastern side and contained numerous large and small pits within its internal area, which may or may not be contemporary. Only one pit (1016) was radiocarbon dated and provided a date of 722 – 395 cal BC (UBA-53310).

Rectilinear building ST26

In the southern area of the site was the foundation gully and posthole remains of a large rectilinear building with rounded ends ST26 (Figures 59 and 60). It was constructed on slightly raised ground around the 25 m contour line and measured 24 m by 10 m and enclosed an interior space of 240 m². It comprised a foundation gully measuring between 0.49 m and 0.57m in width with depths of between 0.18 m and 0.23 m. The structure was outlined by 31 postholes positioned at regular intervals along its length. They measured on average 0.45 m by 0.4 m with a depth of 0.2 m and were filled with grey-brown sandy silt. The building was orientated ENE/WSW with an entranceway towards the south-east. Botanical remains recovered from the fills of several postholes contained small amounts of mixed charcoal, with heather type charcoal present. There were also traces of oats and barley grain. The gully (2750) also produced small amounts of heather type charcoal, with traces of hazel and hazel nutshell. Two postholes (2792 and 2752) were radiocarbon dated and produced dates from alder and hazel charcoal within the middle to late Iron Age 43 cal BC – cal AD 116 (UBA-51759) and cal AD 87 – 306 (UBA-51758).

At its entranceway were five postholes (2694, 2696, 2688, 2692 and 2852) suggesting a possible formal entrance structure such as an external porch. Only traces of heather type charcoal and barley grains were recovered from their fills.

As with many of the features on site the structure contained few internal features and several of these were later as they truncating its perimeter (Figure 24). A large, shallow pit (2773) at its entranceway produced a date from the late Bronze Age of 1204 – 1008 cal BC (UBA-54738) from alder charcoal. Posthole (2774) along its northern perimeter contained a fragment of early Bronze Age Beaker (V43), this was similar to another Beaker (V39) to the south-west in a possible post-built Bronze Age roundhouse ST20 suggesting that it could be a residual find.

Field boundaries

Two square ditched field boundaries (Figures 41 and 61) were recorded on the raised ground areas to the north and east of the site (010 and 585/590). They enclosed an area of approximately 64 m² (0.03 ha) and 70 m² (0.03 ha) respectively. Field boundary (010) comprised a U-shaped ditch on three sides only, with the southern side remaining open, the ditch was between 0.69 m - 0.38 m in width and between 0.28 m and 0.5 m in depth. The western side of the ditch contained an 'ankle breaker' channel at its base. Botanical remains from its fill, which comprised dark grey-brown silt, included heather type and hazel charcoal and hazel nut, with the hazel charcoal providing a date of use within the middle to late Iron Age 93 cal BC – cal AD 64 (UBA-51741).

The undated field boundary (585/590; Figure 61), which was located in the eastern part of the excavated area was also only enclosed on three sides with the north-east facing side remaining open. Its ditch measured 0.28 m in width but was only 0.12 m in depth: the ditch showing evidence of later truncation. Botanical remains within its fill comprised only heather type charcoal.

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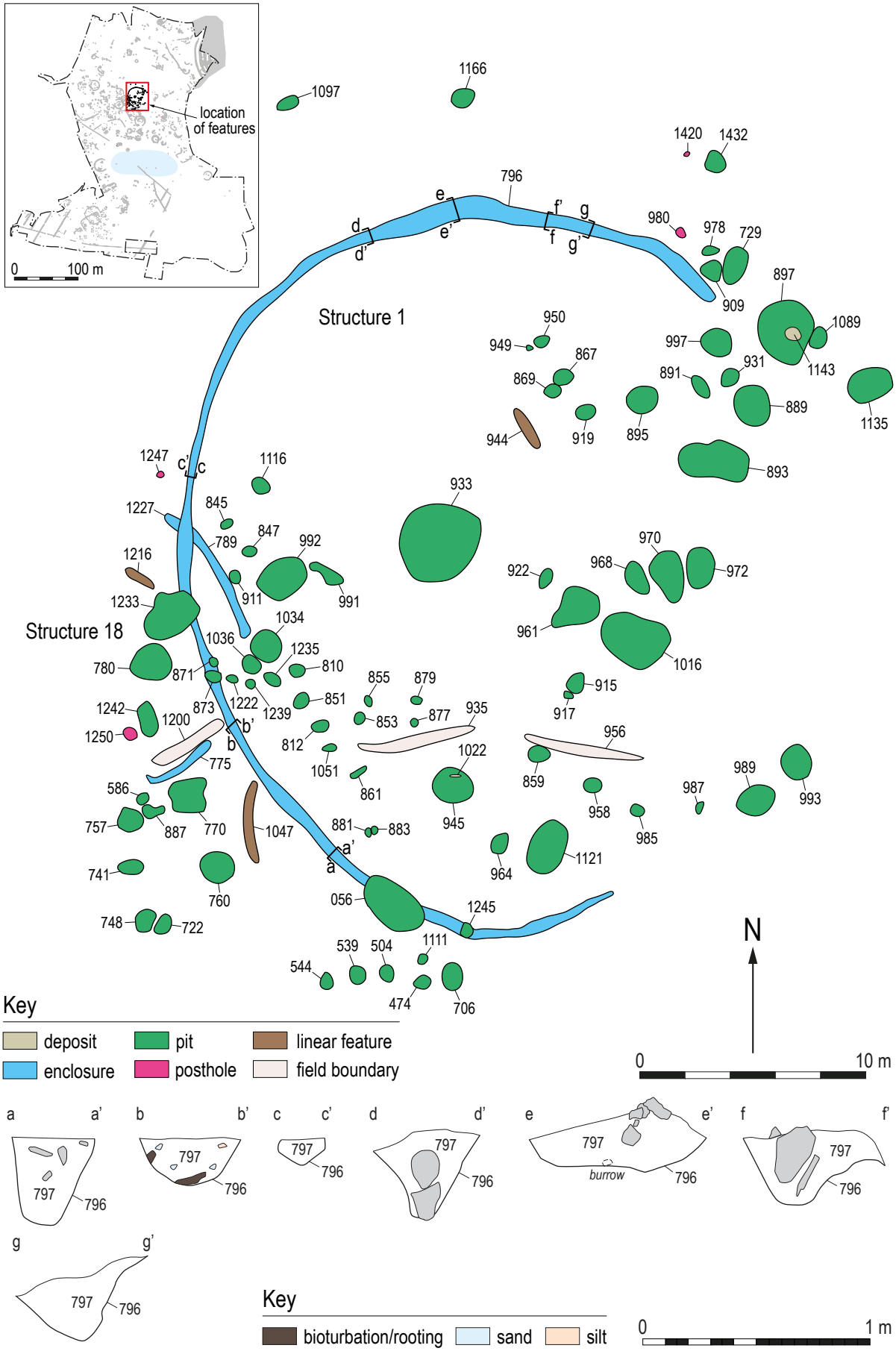


Figure 58: Plan of ST1 and ST18.

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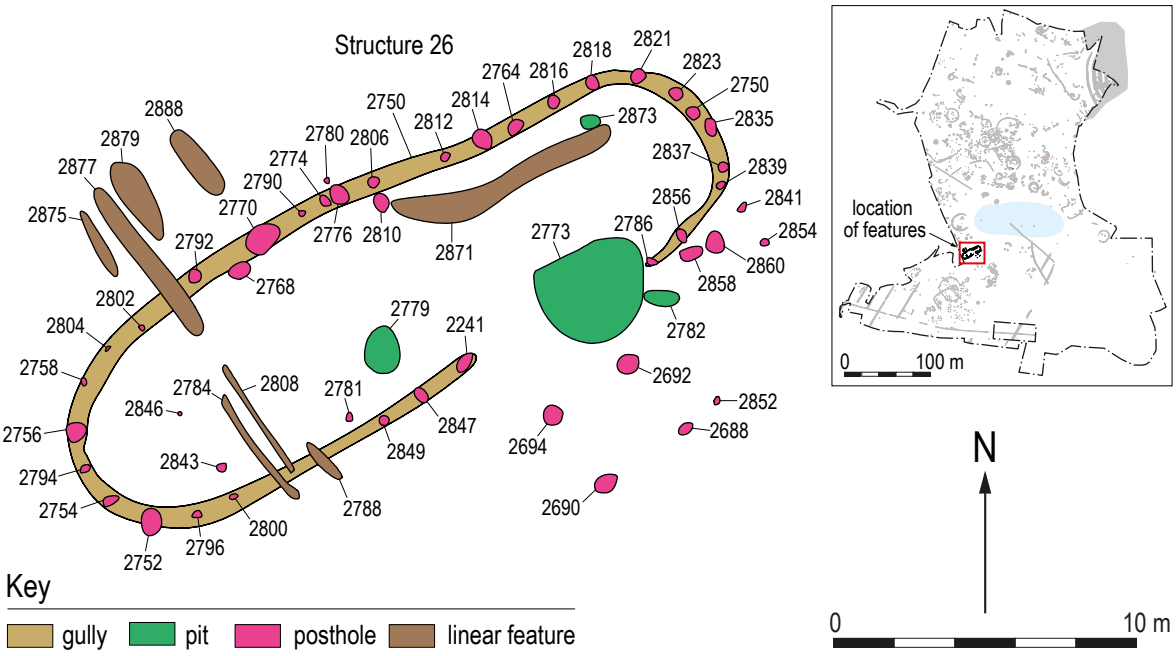


Figure 59: Plan of ST26.



Figure 60: Aerial view of ST26 from the north-east.

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Figure 61: Aerial view of field boundary on the eastern side of the excavated area.

Enclosures

A number of relatively small ring ditches and enclosures were found across the site (STs 3, 4, 5, 6, 7 (discussed above) and 10, 14, 15, 16 and 35). Most remain undated and their functions are unknown due to the absence of internal features and datable material. Three of these structures were radiocarbon dated and include a small ring ditch (ST3) located on the lower-lying ground in the western area of the site, ST4 in the north of the site and ST15 also in the western area of the site.

Structure ST3 differed from the other features on site being located downslope and partially within the wetland area between the 22 m and 23 m contour lines. It measured 14 m in diameter, its U-shaped ditch measured 0.45 m in width and 0.2 m in depth (Figures 62 and 63). It had evidence of flooding, as its ditch was re-cut following its silting. Its fill comprised white-grey clay silt which contained fragments of unidentified mammal bone and botanical remains including traces of heather type and hazel charcoal, with a single carbonised barley grain found within the re-cut fill. Unlike most of the other enclosures it contained three internal pits which produced significant amounts of heather type charcoal, with traces of cereal grain. A stone pot lid was recovered from one of the pits. Radiocarbon dating of hazel charcoal from the primary ditch cut provided a date within the early Iron Age of 752 – 408 cal BC (UBA-51744).

Ring ditch ST4 (Figures 64 and 65) measured 13.5 m in diameter with a perimeter ditch width of 0.55 m - 0.65 m and depth of 0.13 m - 0.2 m. Its fill comprised middle grey-brown silty sand with botanical remains that included alder, heather type and willow charcoal, with a single carbonised cereal grain and single seeds of fathen and heath grass, reminiscent of hearth waste. A fragment of willow charcoal provided a date of 536 – 386 cal BC (UBA-53312) within the early to middle Iron Age.

Structures ST5 and ST6 ring ditches (Figure 66) were both in the west of the site measuring 5.8 m and 3.4 m in diameter with perimeter ditches measuring 0.35 m and 0.45 m – 0.6 m in width respectively. The depth of ST5 was 40 mm – 0.17 m and that of ST6 was between 0.2 m – 0.4 m. The fills comprised of sandy silt with botanical remains including only tiny traces of heather type and oak charcoal in ST5 and traces of burnt heather type stems and indeterminate rhizomes, together with single seeds of cleavers, redshank and a heather seed capsule which could suggest burnt heathy turf in ST6.

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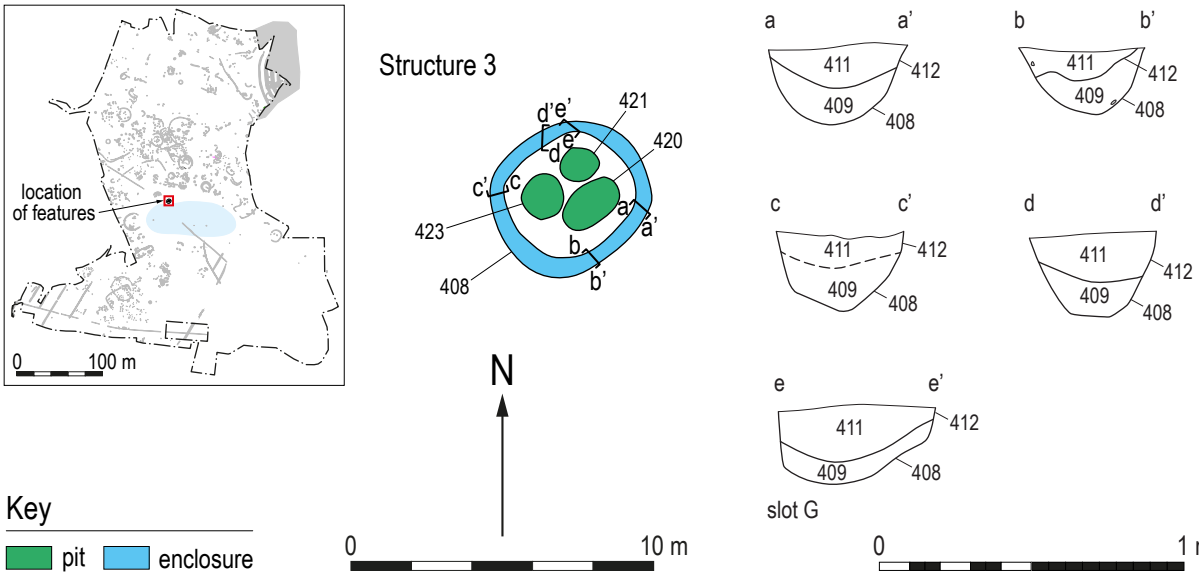


Figure 62: Plan of ST3.



Figure 63: View of ST3 after excavation with three central pits.

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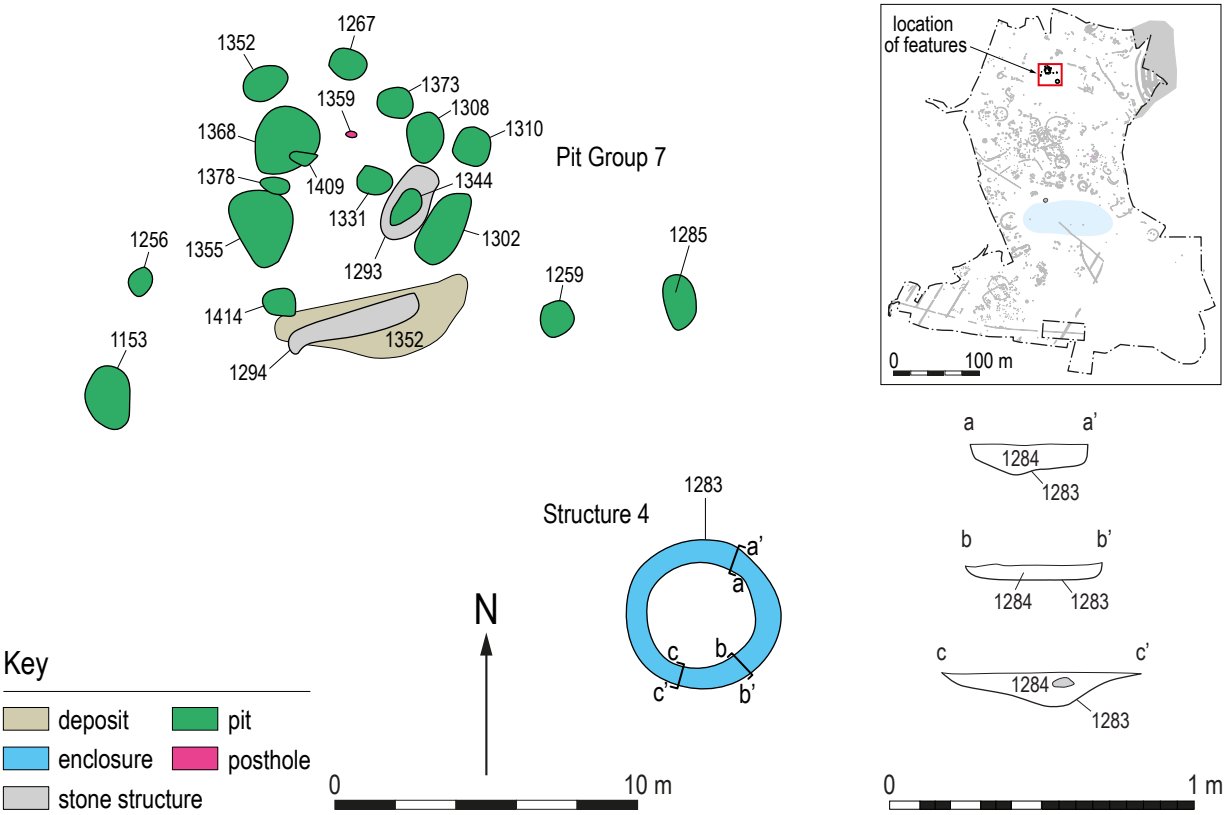


Figure 64: Plan of ST4.



Figure 65: Aerial view of ST4.

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The undated enclosures include *ST10* (Figure 18) which was penannular in shape with a narrow entrance to the south-west. It had a diameter of 8 m and a ditch measuring 0.3 m in width and 0.29 m in depth, enclosing a space of 67 m². Only one pit (323) was found within the internal area. Botanical remains included only a single carbonised grain of barley.

Structure ST14 (Figure 67) was located in the north-west area. It was slightly oval-shaped measuring approximately 7 m in diameter enclosing an internal space of 28.47 m², with a wide entranceway facing north-east. No internal features were apparent. Botanic remains recovered from its sandy silt fill produced only traces of heather type charcoal.

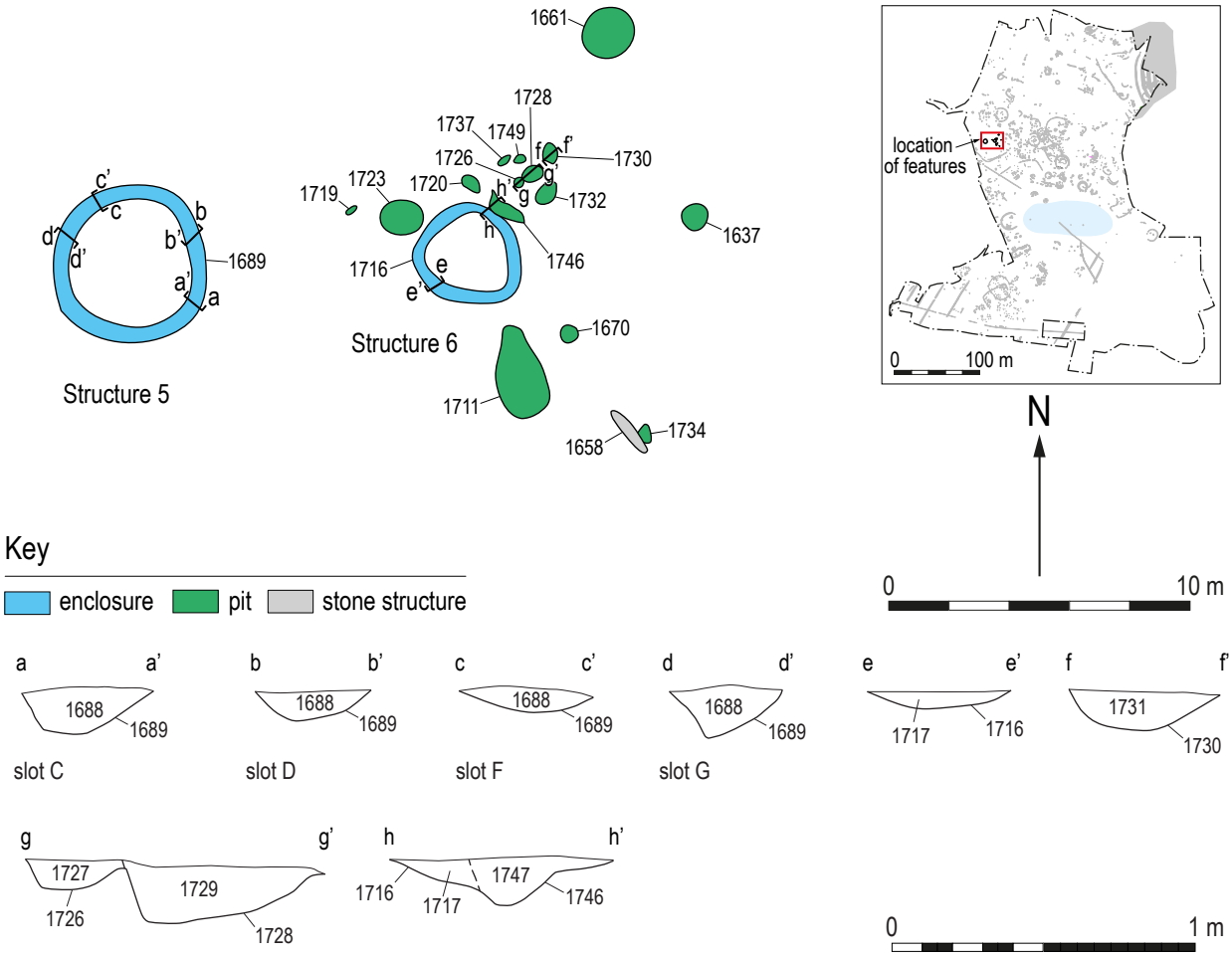


Figure 66: Plan of ST5 and ST6 with section drawings through features.

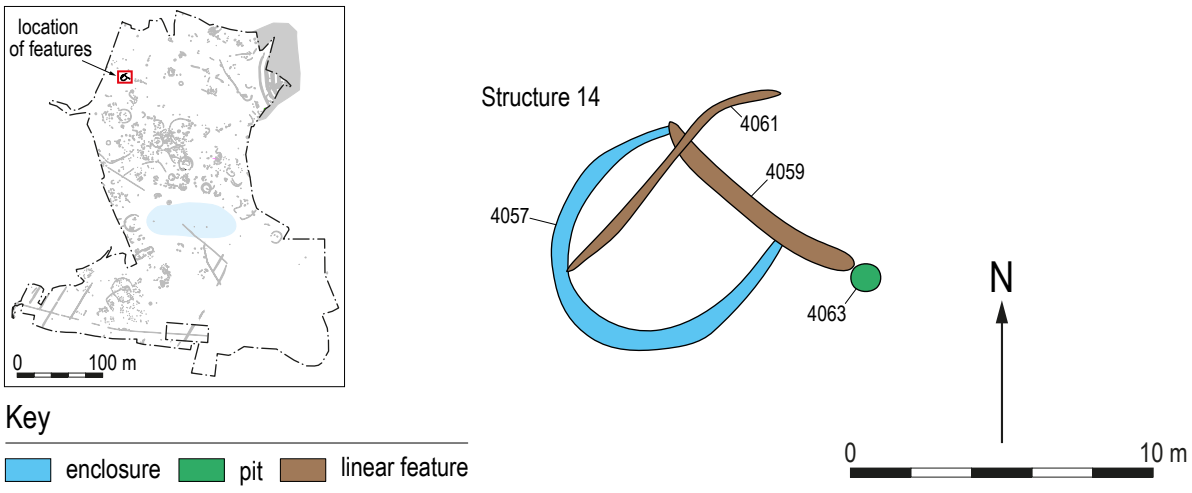


Figure 67: Plan of ST14.

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Structure ST15 was penannular in shape and had no internal features (Figure 68). It had a wide entranceway to the south-east with an internal space measuring 12.11 m² and a perimeter ditch measuring between 0.62 m and 0.77 m in width but was only 90 mm deep, probably a result of truncation by later activities such as agricultural ploughing and field drainage. A stone cundy drain also truncated it. The ditch fill comprised sandy silt but its botanical remains differing from the other features across site as it producing no charcoal but significant quantities of carbonised cereal grain, with emmer wheat and barley present and also naked barley. Radiocarbon dating of a barley seed from the fill of the structure produced an early Iron Age date of 749 – 404 cal BC (UBA-53318)

Structure ST16 was found in the western area close to ST15 and was similar in shape, except its entranceway faced east (Figure 68). It enclosed a space measuring 18.09 m² with no internal features, its perimeter ditch measured between 0.34 m – 0.43 m in width and 0.22 m in depth. Its sandy silt fill produced gorse/broom and heather type charcoal, with a few cereal grains, including some that were identifiable as oats. Radiocarbon dates were obtained from broom charcoal and provided a date within the medieval period of 1438 – 1616 cal AD (UBA-53319) and could have become accidently incorporated into the fill of a much earlier feature.

A *rectangular enclosure ST19* comprised two L-shaped ditches (3052 and 3306) with rounded corners (Figure 28) was found that truncated postholes (3689 and 3691) of ST22 (in *Bronze Age* section). A third small section (3505) may represent a continuation of ditch (3306) along its NW/SE oriented arm. The ditch was present on only three sides, with the long side to the south-east absent. In total it measured 30.6 m externally and c. 9 m in width, with an internal space of c. 251 m². The ditches measured 1 m in width and were shallow at only 0.15 m in depth and contained homogenous fills of greyish-brown sandy silt, from which only a single fragment of undiagnostic prehistoric pottery was recovered. The fills of the ditches contained only a few weed seeds and small amounts of mixed charcoal. A fragment of alder charcoal provided a middle Neolithic radiocarbon date range of 3516 – 3361 cal BC (UBA-53324), but this charcoal is considered intrusive because of the ditch's demonstrable later construction. The presence of Iron Age pottery (Vessel 127) in a nearby pit (3318) may be an indication that this is enclosure is an Iron Age or later feature built after ST22 went out of use.

A small, *segmented enclosure (ST35)* was located towards the northern site boundary of the site (Figure 69). It measured 4 m in diameter with an internal space of 12.5 m² and comprised two curvilinear ditches with parallel entrances to the south-west and north-east. Its fill was like many of the fills across the site of silt sand which produced only traces of oak charcoal with a few fragments of hazel nutshell. Its western edge measured 4.55 m in length with a width of between 0.22 m - 0.36 m and a depth of only 80 mm. The eastern side was slightly deeper at 0.23 m. However, this side had been truncated by a large pit (1314) which obscured much of its perimeter.

Close-by ST35 was a circular pit of over 1 m in diameter with a depth of only 0.16 m. It contained fragments of fire-cracked stone with hazel, heather type, willow with some carbonised rhizomes recovered from its fill. A stone loom weight SF 479 was recovered from the top of its fill.

A crouched inhumation (SK1) was found within a shallow scoop near to the entranceway of ST2, but it was dated to 813 – 772 cal BC (UBA-53328), the early Iron Age period suggesting a later insertion, or re-use if the feature. The remains were oriented NW/SE with the head facing NE and the body in a crouched position with both legs and arms tightly flexed. Unfortunately, the preservation of the remains was very poor that little could be said about the biological sex (see *Human Remains*, below). No burial structure, such as a stone cist, was noted during its excavation. A crucible fragment was also found adjacent to this feature, although it is unknown if it is associated with the inhumation or whether it is a residual find (see *Bronze Age Metalworking Evidence,* below).

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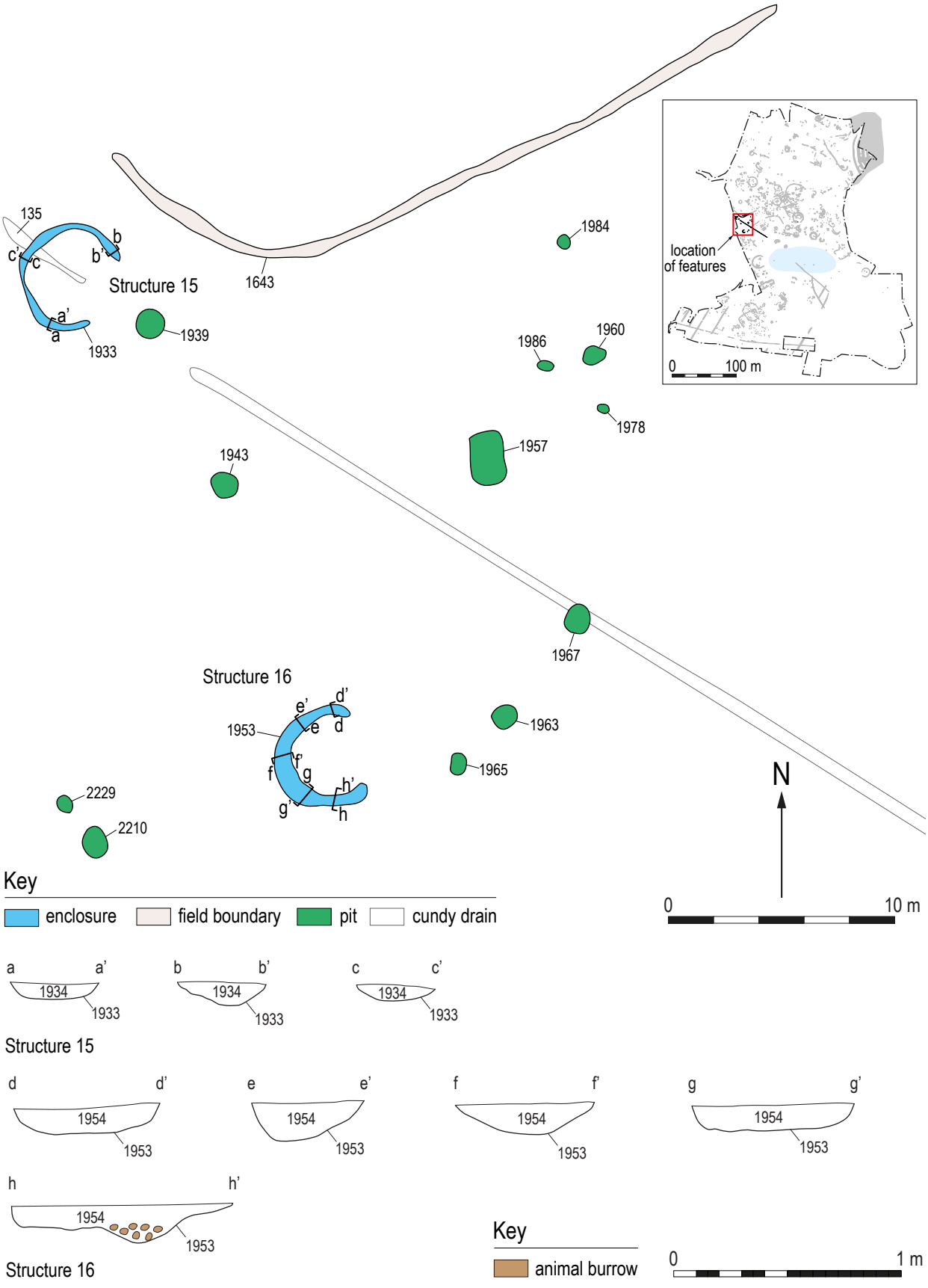


Figure 68: Plan of ST15 and ST16.

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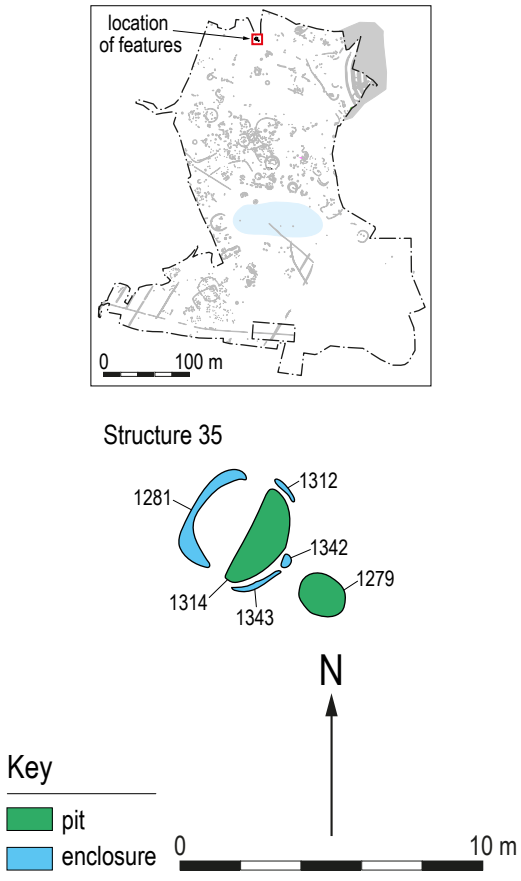


Figure 69: Plan of ST35.

Other Iron Age dated features

Several features also returned Iron Age dates. A pit within PG3 had an early Iron Age date of 736 – 403 cal BC (UBA-53304) and a spindle whorl SF 197 was also recovered from this pit. A posthole (713) within ST17 returned an early Iron Age date of 898 – 809 cal BC (UBA-53306), which also produced earlier dates within the Bronze Age, while pit (943) within ST43 also returned an early Iron Age 750 – 408 cal BC (UBA-53309). This structure also produced medieval pottery sherds (See *Medieval Pottery* below). Both of these dates attest to the difficulty in phasing the site with any accuracy.

Lower fill of pit (1548), which contained a large lump of vitrified material and was located in the north-west of the site returned an early Iron Age date 749 – 407 cal BC (UBA-53313). A large amount of this material was found in ST40, the stone roundhouse, which also returned early Iron Age dates.

Medieval and post-Medieval

By Charlotte Hunter

Medieval

Evidence for one of the final phases of occupation at Guardbridge, the medieval, was sparsely dispersed across mainly the northern half of the site. Structures from this period included a number of different kilns of varying functions as well as evidence of cultivation activities (Figure 70).

Fire-pit (1824)

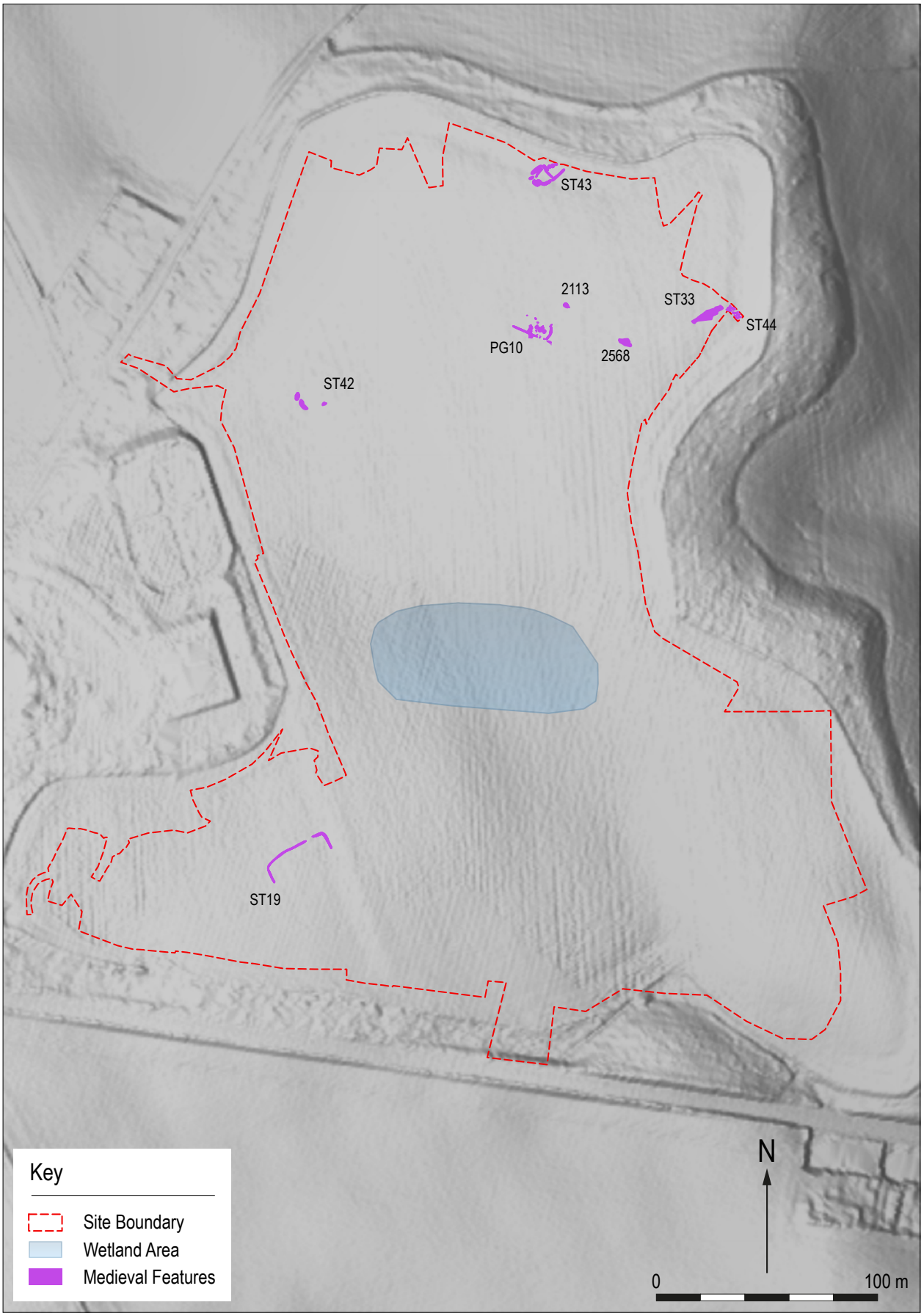
One of the earliest features of the early medieval period was a fire-pit (1824, Figure 71) comprising two fills (1825 and 1826). It was located in the north-west corner of the site near to the terminals of the perimeter ditch (1665) to ST42. A charcoal assemblage collected from its lower fill (1826) contained alder and oak charcoal as well as a large amount of carbonised cereal grain, including oats and barley with a number of carbonised weed seeds. These latter are probably from arable crops and the grain from cereal processing. A sample of alder charcoal from the lower fill of the fire-pit (1826) returned a radiocarbon date of cal AD 708 – 890 (UBA 53314).

The north-eastern part of the excavated area revealed a small collection of kilns possibly differing in functions and spanning an almost 400-year period.

Two-phased kiln ST33

The earliest dated kiln, ST33, was constructed in two phases (Figure 44), and was revealed within the overburden deposit (2480) that overlay the fort ditches (2529, 2561 and 2685). The lower kiln (2611) was orientated north-east/south-west and was lined with stone (2613) and filled with two deposits (2610 and 2603). The primary fill (2610) contained charcoal inclusions, while the upper fill (2603) also contained charcoal but showed signs of extreme heat (Figure 72). The kiln comprised an elongated flue (2631) ending in a relatively narrow rounded bowl-shaped terminal (2011). It measured a total of 9.6 m in length and 2.2 m in width with a depth of between 50 mm and 0.2 m.

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Figure 70: Distribution of medieval and later features.

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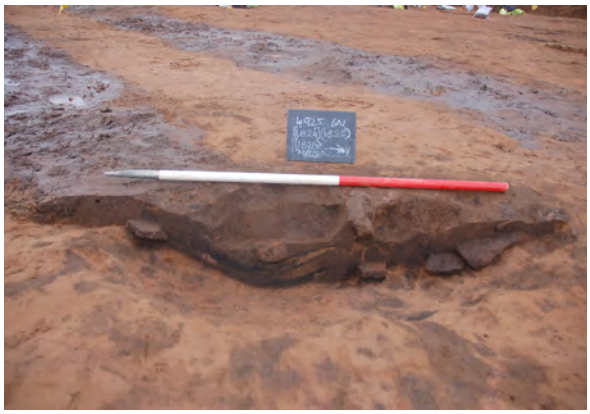


Figure 71: Section through fire-pit (1824).



Figure 72: Upper fill of kiln ST33.



Figure 73: Aerial view of kiln ST33.

Above the lower kiln (2611) was a second or upper kiln (2479). It had a double flue structure with a very degraded bowl forming the central area between the flues (Figure 73). Each of the flues (2617 and 2618) were lined along their length with upright stone slabs, averaging 0.4 m by 0.3 m by 90 mm, alongside smaller cobble-sized stones acting as a revetment on the northern side for the eastern flue (2618). The flues measured 3.8 m and 6.1 m in length and 1.25 m and 2.2 m in width. They also contained patches of sandy silt with charcoal (2603 and 2612), as well as traces of oats and barley in (2612). In addition, degraded fragments of animal bone were found in the layers associated within this structure.

A fragment of hazel charcoal from the lower kiln (2611) produced a radiocarbon date of cal AD 896 – 1025 (UBA-51754), whilst a fragment of willow charcoal from the eastern flue of the upper kiln provided similar dates of cal AD 892 – 1020 (UBA-54737).

Double flue kiln ST32

Located to the west of the fort ditches and dug into the subsoil, was a large oval-shaped double flue kiln (2568), measuring 6.7 m by 2.9 m with a depth of 0.6 m, and oriented north-west/south-east (Figure 74). The reason the kiln was constructed with two flues was probably for optimal use of the wind.

The central bowl of the kiln measured 2.48 m in length by 1.73 m in width and it was 0.5 m deep. The floor of the bowl was lined with light grey clay (2590) which varied in thickness between 0.28 m and 0.44 m. Flat stones (2593) were set into it creating a surface but a number of them were blackened and burnt as a result of repeated firings in the kiln. Lying over and interspersed between the stones was a deposit of charcoal-rich silty sand (2614) with a silty clay layer (2594) with charcoal flecks above. Light grey-blue clay (2591) was located above the stone in the kiln

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base and a deposit of redeposited natural silty sand (2592), 0.2 m thick, infilled over the layers of clay and stone. The sides of the bowl were only partially lined, suggesting that some of the stones may have been robbed from the structure following its abandonment.

The flues (2605 and 2606) projecting from either end of the kiln were relatively short at 2.32 m and 1.56 m in length, and both were lined with stones (2595). They were also filled by almost identical light grey-brown sandy silt deposits (2569 and 2604). Several fragments of medieval pottery SF 1154 were recovered from fill (2569) of flue (2606) and carbonise birch wood from the same filling (2569) was dated to cal AD 1050 – 1222 (UBA-53320). Several fragments of a Scottish White Gritty Ware cooking pot were also recovered from fill (2659).

Corn-drying kiln (2113)

Further to the north-west were the foundations of a keyhole-shaped corn-drying kiln (2113) dug into subsoil (Figure 75). The kiln truncated the south-east end of an earlier undated linear gully (2068) and it measured 3.01 m in length by 1.91 m in width with the main drying chamber to the south-west and a very small flue to the north-east. It was 0.42 m deep and had a thick clay lining (2283) that was filled with three distinct deposits (2114, 2115 and 2144). Each of the fills (2114, 2115 and 2144) and the clay lining (2283) varied in thickness between 0.14 m to 0.42 m.

The primary deposit, the clay lining (2283) lay against the subsoil and above it was fill (2144), which contained significant amounts of alder, hazel and oak charcoal, with emmer wheat, seeds and burnt wood fragments mixed with small stones, indicating that this was most likely the remains of a fire-pit left when the kiln was last cleared out.

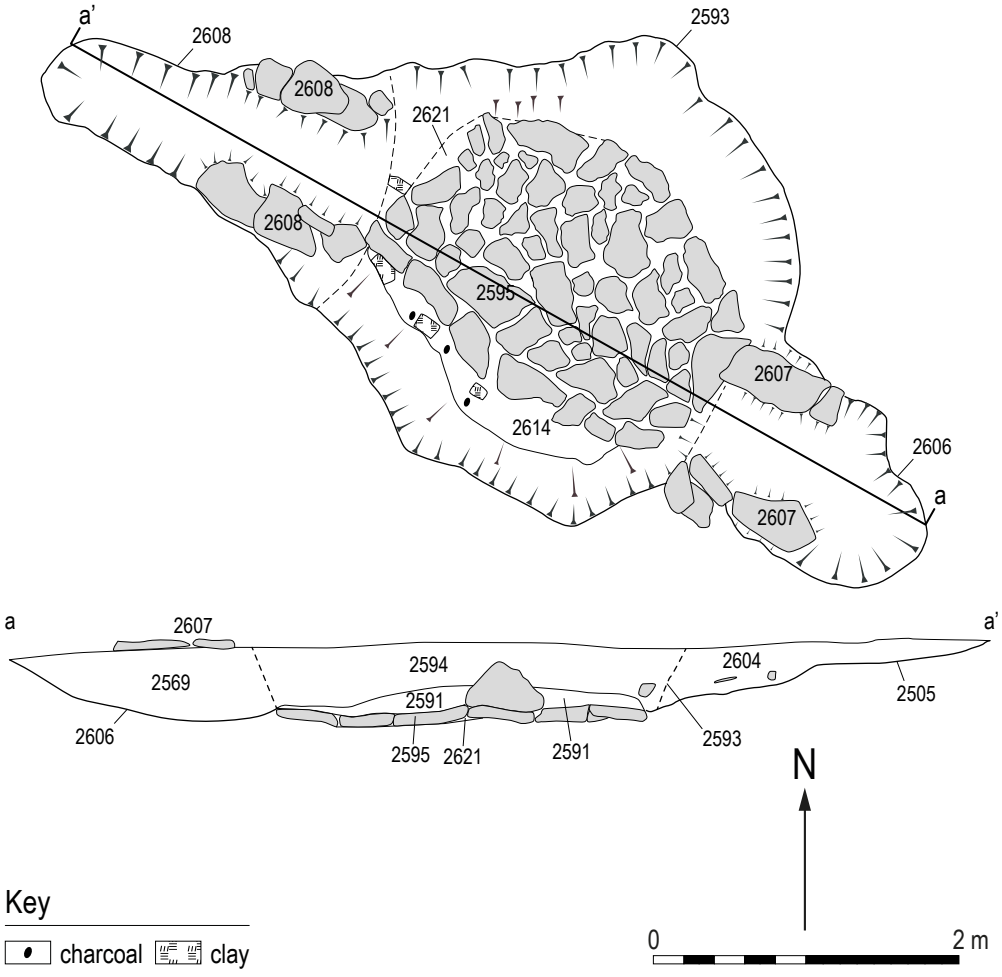


Figure 74: Aerial view of kiln ST32 with its double flue.

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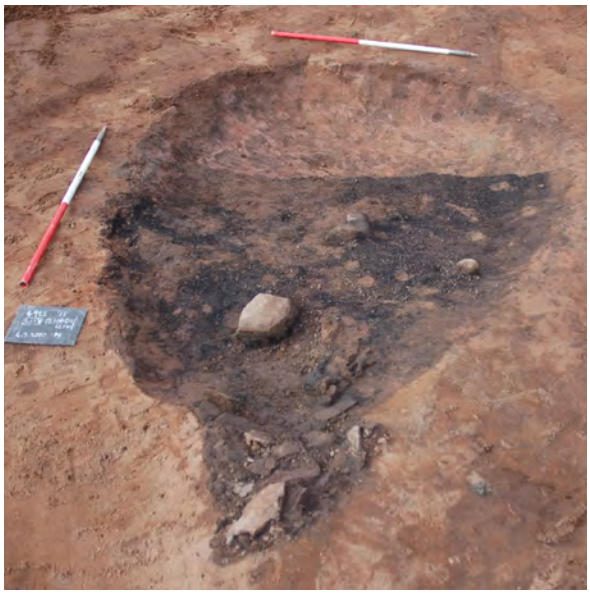


Figure 75: Corn-drying kiln (2113) with carbonised seeds in situ.

The middle fill (2115) contained copious amounts of burnt grain as well as charcoal and burnt wood. The patches of burnt wood are a possible indication of a timber roofed construction which subsequently burnt down. At the north end of fill (2115) there was an indication of a possible stone lining for the flue, similar to the previously mentioned kilns, although as with the rest of the structure, this was badly damaged by the kiln collapse. Clay patches amongst the silty sand upper fill (2114) are a further indication of a possible collapsed roof layer, with the clay and sand on the outside of the kiln falling in as the timbers below burnt down. However, the assemblages collected from thee fills (2115 and 2144) do not provide solid evidence for a wooden roof (see *Archaeobotany,* below).

Radiocarbon dating of wheat grain from the middle fill (2115) of the kiln provided a radiocarbon date range of cal AD 1223 – 1275 (UBA-51751). A fragment of Scottish White Gritty Ware cooking pot sherd SF 967 was found in the lowest fill (2144) reinforcing the medieval date for the structure.

Rectilinear structure ST42

ST42 was an undated rectilinear structure, or the surviving stone floor or foundations of one near the western boundary of the excavated area that was located within the central space of a possible Neolithic enclosure ST11 (Figure 47). It survived as three separate stone deposits within the lower levels of the overburden deposit. Most of the stone structure was probably robbed following its abandonment or removed during later ploughing. The surviving stone on its western side comprised cobbles and small boulders forming a fairly flat surface with one curvilinear side (1923). Towards its north-eastern extent was a small deposit (6 m by 1.5 m) of compacted pebbles forming a metalled surface (1843/1844). Another deposit of stone (1626) measuring 3.1 m by 2.6 m that also contained flat and several upright stones were located to its immediate east. It is unknown if they are contemporary. Several fragments of medieval pottery were recovered from its surface (SF 672 and 673).

A small pit (2276) within pit group 11 (PG11) to the immediate east of ST42 contained a fragment of medieval Scottish White Gritty Ware pottery in its fill (SF 979). However, a radiocarbon date from beech charcoal from this pit also provided a late Iron Age date of 204 – 339 AD (UBA-53314).

Curvilinear drystone structure ST43

A heavily degraded curvilinear drystone structure (ST43) was found near the northern boundary of the excavated area (Figure 76) where it overlay pit group PG9. It comprised three stone walls (1692, 1699 and 1743) 0.2 m - 0.4 m wide constructed of sub-angular stones and cobbles and survived one to two courses high. Its internal area measured 5.37 m across from north to south. In the south-western part of the structure was a possible projecting entranceway which had been blocked with stones. It remains undated but fragments of both prehistoric and medieval pottery, the latter dating to between the thirteenth and fourteenth centuries AD, were found associated with it. These sherds (SFs 670, 671 and 683) comprised Scottish White Gritty Ware cooking pots with evidence of external sooting indicating their use. They were recovered from the upper course or fill of its stone walling (1692).

Stone building above fort ditch 0

Located above the internal fort ditch 0 were the remains of several drystone structures (ST44) (Figure 44 and 77) which had partially subsided into the ditch fill. The lowest structure and positioned directly above the upper ditch fill was a single line of cobbles, one to two courses high and one course thick (2654). Above and covering

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Figure 76: Curvilinear drystone structure ST43 overlying PG9.



Figure 77: Dry stonewalling and paving, ST44 above the innermost fort ditch 0.

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the ditch fill and surrounding area, was a pink-grey clay deposit 2637 probably used to firm the ground for the overlying structures. These stone structures included possible wall foundations (2644, 2645, 2647 and 2646, Figure 78), the latter possibly tumbled stone from degraded wall (2645). Next to wall (2645) were several flat stones (2648), which were also partially covered by tumbled stones. These could be internal or external flagstones used as a floor surface. Above these features was deposit (2621), which contained animal bone fragments, predominantly mandibles (SF 1203 and 1205) and lithic CAT 298, a short-end scraper. Found alongside wall (2645) was an upper portion of a tether stone, SF 1215. During the evaluation phase a pivot stone, SF 002, was also found in this area.

To the south of these features were two postholes (2640 and 2642) and a small curvilinear feature (2638), which was located below drystone wall (2647), and it had truncated fort ditch (2655) showing that it was later than this ditch.

Unfortunately, due to the limits of the development in this area, the full extent of the walls and negative cut features were not fully exposed although the stratigraphic level of the drystone walling and flagstones would suggest that they are similar in date to upper kiln found to the immediate north-west.

Rig and furrow

Across the southern area of the excavated area were a series of north-east/south-west orientated linear rig and furrow cultivation marks (006, 3477 and 3491). Their occurrence further supported the continuation of occupation and use of the area. A rim sherd of medieval pottery SF 001 was found in the fill (007) of one of the furrows. It was a rim sherd of a Scottish White Gritty Ware storage jar which dates to the thirteenth and fourteenth centuries AD.

Shell deposits

A widespread deposit of sand overburden found across the site contained several shell concentrations, consisting of cockle and mussel shells (148-151). Due to the linear arrangement of several of these deposits, it has been suggested that they were used as drainage material within field drains (1559 and 2116). Fragments of medieval pottery (SFs 593-595) and animal bone (SFs 596, 615 and 638) were also recovered from field drain (1559), indicating that these deposits were further evidence of agricultural improvement to the fields during medieval or post-medieval times.



Figure 78: Wall foundations 2644, 2645, 2647 and 2646 of ST42.

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Copper alloy bar mounts

The remnants of seven small copper alloy bar mounts for a belt were investigated close to the terminal of a linear ditch (2101) from which were recovered several medieval pottery sherds (SFs 937-935 and 945). The bar mounts are believed to date to the thirteenth-fourteenth centuries AD (Natasha Ferguson pers. comm. and see *Metalwork*).

Post-medieval

Lime kilns

During the evaluation phase of investigations in 2017, kiln (43003) was revealed in the south-western area of the site and partially investigated (Kilpatrick 2017). It was preserved in situ as there was no further development in that area.

An additional lime kiln (2017, Figure 79) was revealed during the excavation phase and investigated. It survived as a 2.3 m long by 1.25 m in wide pit that was 0.6 m deep, but there was no surviving stonework. This kiln had two sandy silt linings: a 50 mm wide black sandy silt (2018) against the subsoil followed by an orange sandy deposit (2019), also 50 mm wide. The primary fill of lime kiln (2017) was a black-orange to brown-grey sandy silt, with a thickness of 0.25 m that contained fragments of animal bone, coal, shells, iron and wire. At the base of the pit a nineteenth/early twentieth century cast iron bottomless bucket, SF 95, was found. No carbonised botanical remains were recovered from the fills (2018 and 2019). This structure shared similarities with kiln (2017), which would suggest that they are probably contemporary in date.

Cundy drains

Later structural additions to the excavated area were stone-lined and capped drains in the central and southern areas. These drains were located to the north of a series of rig and furrow cultivation marks suggesting the establishment of a probably post-medieval field and drainage system on the site. During the excavation of these drains it was noticed that these areas were the wettest underfoot when it rained, suggesting that drainage was a long-standing issue in these areas.



Figure 79: Lime kiln (2017) during excavation.

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Radiocarbon dating and chronological modelling

By Derek Hamilton[1]

A total of 63 radiocarbon dates are available from samples of charcoal, charred plant macrofossils, human and animal bone, and the carbonised food residue on a sherd of pottery from features excavated at Guardbridge in Fife (Table 1). The samples were all single entities (Ashmore 1999) and submitted to the 14Chrono Laboratory at Queen's University Belfast where they were processed following the methods described on their website (https://14chrono.org/radiocarbon-dating/pre-treatment-analysis/) by sample type and measured by accelerator mass spectrometry (AMS). The results are reported here as conventional radiocarbon ages (Stuiver and Polach 1977) and have been calibrated using the internationally agreed northern hemisphere calibration curve of Reimer *et al.* (2020) and the OxCal v4.4 computer program (Bronk Ramsey 2009). The simple calibrated dates are given in Table 2 as single 95% probability ranges with the endpoints rounded outward to the nearest 10 years, while the results of any statistical modelling discussed in the text are presented in *italics* and with their endpoints rounded outward to the nearest five years.

Methodological approach

A Bayesian approach (Buck *et al.* 1996) has been applied to the interpretation of the chronology of activity at Guardbridge. Although simple calibrated dates are accurate estimates of the radiocarbon age of samples, this is not usually what archaeologists really wish to know. It is the dates of the archaeological events represented by those samples that are of interest. For example, the start and end of Neolithic activity at the site is of interest. The chronology of this activity can be estimated not only by using the absolute dating derived from the radiocarbon measurements, but also by using stratigraphic relationships between samples and the relative dating information provided by the archaeological phasing.

The methodology used here allows the combination of these different types of information explicitly, to produce realistic estimates of the dates of archaeological interest. The posterior density estimates produced by this modelling are not absolute, rather they are interpretative estimates, which can and will change as further data become available and as other researchers choose to model the existing data from different perspectives. The technique used is a form of Markov Chain Monte Carlo sampling and has been applied using the program OxCal v4.4 (http://c14.arch.ox.ac.uk/). Details of the algorithms employed by this program are available in Bronk Ramsey (1995; 1998; 2001; 2009) or from the online manual. The algorithm used in the models can be derived from the OxCal keywords and bracket structure shown in Figures 80-84.

UB No	Sample	Context	Material	Radiocarbon Age BP	Calibrated 1-sigma (68.3% probability)	Calibrated 2-sigma (95.4% probability)	Structure
UBA-51741	022	011 secondary fill of ditch 010	Corylus cf avellana	2023 ± 25	45 cal BC – cal AD 15	93 – 75 cal BC 55 cal BC – cal AD 64	NW of ST2
UBA-51742	112	035 fill of large pit 169	Alnus cf glutinosa	2732 ± 25	900 – 891 cal BC 882 – 832 cal BC	923 – 817 cal BC	ST2
UBA-51743	240	316 fill of enclosure 315	Alnus cf glutinosa	4419 ± 30	3098 – 3010 cal BC 2982 – 2934 cal BC	3320 – 3237 cal BC 3175 – 3161 cal BC 3105 – 2920 cal BC	ST9
UBA-51744	284	409 fill of ditch 408	Corylus cf avellana	2441 ± 32	736 – 694 cal BC 663 – 649 cal BC 546 – 458 cal BC 442 – 418 cal BC	752 – 683 cal BC 667 – 633 cal BC 623 – 611 cal BC 592 – 408 cal BC	ST3
UBA-51745	299	447 spit C 7NW, fill of enclosure gully 446	Corylus cf avellana	3352 ± 26	1686 – 1651 cal BC 1645 – 1610 cal BC 1576 – 1561 cal BC 1554 – 1546 cal BC	1735 – 1717 cal BC 1691 – 1539 cal BC	ST17

Table 1: Radiocarbon dates for Guardbridge.

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UB No	Sample	Context	Material	Radiocarbon Age BP	Calibrated 1-sigma (68.3% probability)	Calibrated 2-sigma (95.4% probability)	Structure
UBA-51746	326	465 fill of post-pit 464	Alnus cf glutinosa	2447 ± 26	742 – 692 cal BC 664 – 647 cal BC 548 – 466 cal BC 436 – 421 cal BC	751 – 683 cal BC 667 – 634 cal BC 622 – 612 cal BC 591 – 412 cal BC	ST41
UBA-51747	707	790 fill of curvilinear feature 789	Salix sp	4715 ± 30	3604 – 3588 cal BC 3529 – 3497 cal BC 3436 – 3378 cal BC	3626 – 3560 cal BC 3534 – 3492cal BC 3463 – 3375 cal BC	ST18
UBA-51748	690	1280 fill of pit 1279	Salix sp	2421 ± 30	659 – 657 cal BC 540 – 526 cal BC 522 – 412 cal BC	747 – 688 cal BC 665 – 644 cal BC 566 – 402 cal BC	ST35
UBA-51749	806	1449 fill of enclosure ditch 1448	Alnus cf glutinosa	4299 ± 31	2919 – 2888 cal BC	3010 – 2976 cal BC 2970 – 2948 cal BC 2939 – 2880 cal BC	ST12
UBA-51750	1041	1666 fill of enclosure 1665	Salix sp	4469 ± 38	3329 – 3218 cal BC 3186 – 3153 cal BC 3120 – 3091 cal BC 3054 – 3034 cal BC	3344 – 3021 cal BC	ST11
UBA-51751	1238	2115 fill of kiln 2113	Triticum dicoccum	783 ± 23	cal AD 1229 – 1245 cal AD 1256 – 1272	cal AD 1223 – 1275	N of PG10
UBA-51752	1496	2438 fill of posthole 2506	Corylus cf avellana	2769 ± 27	971 – 956 cal BC 932 – 896 cal BC 873 – 839 cal BC	990 – 832 cal BC	ST40
UBA-51753	1647	2599 deposit at base of ditch 2057	Corylus avellana nutshell	8657 ± 43	7712 – 7692 cal BC 7678 – 7663 cal BC 7660 – 7594 cal BC	7765 – 7586 cal BC	Fort ditch
UBA-51754	1549	2610 fill of lower kiln 2611	Corylus cf avellana	1067 ± 25	cal AD 903 – 913 cal AD 976 – 997 cal AD 1001 – 1021	cal AD 896 – 924 cal AD 950 – 1025	ST33
UBA-51755	1562	2636 fill of ditch 2635	Betula sp	2079 ± 26	149 – 135 cal BC 113 – 46 cal BC	170 – 38 cal BC 12 cal BC – cal AD 3	ST7
UBA-51756	1571	2656 upper fill of ditch 0 (2655)	Corylus cf avellana	2744 ± 29	910 – 891 cal BC 882 – 833 cal BC	974 – 954 cal BC 933 – 815 cal BC	Fort ditch
UBA-51757	1607	2686 fill of recut 2685	Alnus cf glutinosa	2481 ± 24	753 – 723 cal BC 707 – 682 cal BC 668 – 662 cal BC 651 – 630 cal BC 625 – 610 cal BC 593 – 544 cal BC	770 – 515 cal BC 497 – 489 cal BC	Fort ditch
UBA-51758	1690	2753 fill of posthole 2752	Corylus cf avellana	1851 ± 31	cal AD 131 – 141 cal AD 158 – 190 cal AD 201 – 235	cal AD 87 – 92 cal AD 120 – 248 cal AD 298 – 306	ST26
UBA-51759	1685	2793 fill of posthole 2792	Alnus cf glutinosa	1986 ± 26	34 – 15 cal BC cal AD 6 – 65	43 – 7 cal BC 3 cal BC – cal AD 84 cal AD 96 – 116	ST26
UBA-51760	1738	2945 deposit	Betula sp	5339 ± 34	4246 – 4222 cal BC 4200 – 4163 cal BC 4130 – 4060 cal BC	4320 – 4294 cal BC 4258 – 4152 cal BC 4144 – 4051 cal BC	
UBA-51761	1901	3197 fill of posthole 3196	Prunoideae	2910 ± 28	1189 – 1179 cal BC 1157 – 1146 cal BC 1127 – 1047 cal BC 1027 – 1021 cal BC	1208 – 1139 cal BC 1134 – 1012 cal BC	ST22
UBA-51762	2004	3405 fill of posthole 3404	Betula sp	2792 ± 27	983 – 906 cal BC	1011 – 895 cal BC 876 – 840 cal BC	ST22
UBA-53303	153	202 lower fill of pit 197	Salix sp	3680 ± 27	2134 – 2082 cal BC 2060 – 2027 cal BC 1991 – 1985 cal BC	2192 – 2181 cal BC 2142 – 2009 cal BC 2002 – 1873 cal BC 1966 – 1962 cal BC	ST2

Table 1 (continued): Radiocarbon dates for Guardbridge.

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UB No	Sample	Context	Material	Radiocarbon Age BP	Calibrated 1-sigma (68.3% probability)	Calibrated 2-sigma (95.4% probability)	Structure
UBA-53304	249	349 fill of pit 348	Salix sp	2415 ± 26	536 – 532 cal BC 516 – 412 cal BC	736 – 695 cal BC 663 – 649 cal BC 546 – 403 cal BC	PG3
UBA-53305	354	561 fill of pit 560	Corylus cf avellana	2873 ± 25	1110 – 1091 cal BC 1085 – 1065 cal BC 1058 – 1008 cal BC	1187 – 1180 cal BC 1153 – 1148 cal BC 1125 – 972 cal BC 956 – 933 cal BC	ST8
UBA-53306	449	713 fill of posthole 712	Alnus cf glutinosa	2718 ± 28	898 – 866 cal BC 855 – 825 cal BC	913 – 809 cal BC	ST17
UBA-53307	524	864 fill of pit 863	Betula sp	2772 ± 29	975 – 953 cal BC 934 – 896 cal BC 872 – 840 cal BC	998 – 833 cal BC	ST17
UBA-53308	540	866 upper fill of pit 865	Corylus cf avellana	2941 ± 27	1214 – 1113 cal BC	1256 – 1247 cal BC 1227 – 1048 cal BC 1026 – 1022 cal BC	NW area
UBA-53309	612	943 fill of ditch 942	Corylus cf avellana	2439 ± 29	732 – 697 cal BC 663 – 650 cal BC 545 – 458 cal BC 441 – 418 cal BC	750 – 684 cal BC 667 – 635 cal BC 620 – 614 cal BC 590 – 408 cal BC	ST34
UBA-53310	593	1015 fill of pit 1016	Betula sp	2399 ± 27	514 – 501 cal BC 485 – 405 cal BC	722 – 707 cal BC 662 – 651 cal BC 544 – 398 cal BC	ST1
UBA-53311	716	1228 fill of pit 1227	Salix sp	4787 ± 33	3635 – 3617 cal BC 3586 – 3529 cal BC	3641 – 3519 cal BC	ST18
UBA-53312	691	1284 fil of ring ditch 1283	Salix sp	2356 ± 28	459 – 440 cal BC 418 – 390 cal BC	536 – 534 cal BC 516 – 386 cal BC	ST4
UBA-53313	869	1550 lower fill of pit 1548	Betula sp	2435 ± 26	721 – 707 cal BC 662 – 652 cal BC 544 – 455 cal BC 444 – 417 cal BC	749 – 686 cal BC 666 – 639 cal BC 588 – 581 cal BC 570 – 407 cal BC	Pit west of PG4
UBA-53314	1065	1826 lower fill of fire-pit 1824	Alnus cf glutinosa	1201± 25	cal AD 775 – 776 cal AD 782 – 790 cal AD 804 – 810 cal AD 821 – 879	cal AD 708 – 721 cal AD 773 – 890	N of ST11
UBA 53315	1038	1830 fill of pit 1829 within the ring ditch 1665	Corylus cf avellana	4704 ± 31	3524 – 3496 cal BC 3452 – 3445 cal BC 3439 – 3378 cal BC	3624 – 3577 cal BC 3568 – 3563 cal BC 3533 – 3486 cal BC 3472 – 3372 cal BC	ST11
UBA 53316	1129	1909 fill of ?cist 1908	Corylus cf avellana	3060 ± 26	1387 – 1338 cal BC 1320 – 1279 cal BC	1409 – 1259 cal BC 1243 – 1232 cal BC	
UBA 53317	1086	1916 fill ofposthole 1915	Alnus cf glutinosa	2893 ± 26	1118 – 1044 cal BC 1033 – 1017 cal BC	1202 – 1142 cal BC 1131 – 1000 cal BC	ST27
UBA 53318	1092	1934 fill of curvilinear feature 1933	Hordeum Vulgare sl	2429 ± 30	717 – 710 cal BC 661 – 654 cal BC 542 – 415 cal BC	749 – 685 cal BC 666 – 638 cal BC 588 – 580 cal BC 570 – 404 cal BC	ST15
UBA 53319	1114	1954 fill of curvilinear feature 1953	Cytisis/ Ulex	411 ± 22	cal AD 1447 – 1475	cal AD 1438 – 1499 cal AD 1600 – 1616	ST16
UBA 53320	1531	2569 fill of flue 2606	Betula sp	880 ± 23	cal AD 1163 – 1182 cal AD 1185 – 1213	cal AD 1050 – 1080 cal AD 1153 – 1222	
UBA 53321	1754	2909 fill of curvilinear 2908	Corylus cf avellana	2844 ± 25	1047 – 1027 cal BC 1021 – 974 cal BC 954 – 933 cal BC	1109 – 1092 cal BC 1085 – 1066 cal BC 1058 – 922 cal BC	ST13
UBA 53322	1772	2954 upper fill of pit 2953	Corylus cf avellana	2456 ± 26	749 – 687 cal BC 666 – 641 cal BC 568 – 479 cal BC	754 – 681 cal BC 669 – 608 cal BC 594 – 451 cal BC 447 – 416 cal BC	PG12

Table 1 (continued): Radiocarbon dates for Guardbridge.

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UB No	Sample	Context	Material	Radiocarbon Age BP	Calibrated 1-sigma (68.3% probability)	Calibrated 2-sigma (95.4% probability)	Structure
UBA 53323	1795	2962 fill of pit 2961	Alnus cf glutinosa	2843 ± 26	1047 – 1028 cal BC 1020 – 973 cal BC 955 – 933 cal BC	1109 – 1092 cal BC 1086 – 1066 cal BC 1058 – 920 cal BC	ST20
UBA 53324	1888	3053 fill of curvilinear feature 3052	Alnus cf glutinosa	4641 ± 31	3497 – 3436 cal BC 3378 – 3367 cal BC	3516 – 3421 cal BC 3415 – 3392 cal BC 3386 – 3361 cal BC	ST19
UBA 53325	1945	3283 fill of pit 3282	Corylus cf avellana	2944 ± 27	1214 – 1117 cal BC	1257 – 1245 cal BC 1229 – 1049 cal BC	
UBA 53326	2075	3512 fill of pit 3511	Alnus cf glutinosa	4694 ± 33	3519 – 3495 cal BC 3453 – 3378 cal BC	3619 – 3584 cal BC 3530 – 3371 cal BC	ST36
UBA 53327	2138	3743 fill of posthole 3742	Corylus cf avellana nutshell	2897 ± 33	1123 – 1040 cal BC 1038 – 1015 cal BC	1211 – 998 cal BC 996 – 988 cal BC	ST22
UBA 53328		Skeleton 1	H tibia	2608 ± 28	806 – 787 cal BC	813 – 772 cal BC	
UBA-54715	041	068 fill of pit 067	Alnus cf glutinosa	2958 ± 28	1218 – 1124 cal BC	1262 – 1103 cal BC 1101 – 1076 cal BC 1072 – 1054 cal BC	ST18
UBA-54716	129	162 fill of pit 161	Alnus cf glutinosa	3701 ± 28	2138 – 2113 cal BC 2101 – 2036 cal BC	2198 – 2167 cal BC 2148 – 2021 cal BC 1995 – 1981 cal BC	ST2
UBA-54717	176	240 lower fill of pit 242	Corylus cf avellana	2445 ± 25	738 – 693 cal BC 663 – 648 cal BC 547 – 465 cal BC 436 – 421 cal BC	750 – 684 cal BC 667 – 635 cal BC 620 – 614 cal BC 590 – 411 cal BC	PG1
UBA-54718	417	407 deposit	Alnus cf glutinosa	2823 ± 28	1008 – 964 cal BC 960 – 930 cal BC	1054 – 901 cal BC	ST41/PG1
UBA-54719	323	469 fill of gully 468	Salix sp	4136 ± 29	2861 – 2805 cal BC 2754 – 2720 cal BC 2703 – 2662cal BC 2652 – 2631 cal BC	2873 – 2797 cal BC 2783 – 2621 cal BC 2603 – 2582 cal BC	ST17
UBA-54720	344	512 fill of pit 510	Alnus cf glutinosa	4643 ± 31	3497 – 3436 cal BC 3378 – 3368 cal BC	3516 – 3421 cal BC 3415 – 3392 cal BC 3386 – 3362 cal BC	ST41/PG1
UBA-54721	474	764 fill of pit 765	Alnus cf glutinosa	3866 ± 32	2454 – 2418 cal BC 2407 – 2373 cal BC 2354 – 2288 cal BC	2461 – 2279 cal BC 2253 – 2208 cal BC	ST34
UBA-54722	SF 431	953 fill of ditch 952	Burnt residue from pottery sherd	2812 ± 24	1000 – 992 cal BC 990 – 928 cal BC	1045 – 1033 cal BC 1017 – 902 cal BC	ST12
UBA-54723	649	1140 fill of pit 1139	Corylus cf avellana	2407 ± 26	515 – 497 cal BC 489 – 408 cal BC	724 – 706 cal BC 701 – 699 cal BC 663 – 651 cal BC 545 – 401 cal BC	PG5
UBA-54724	676	1182 fill of curvilinear feature 1181	Alnus cf glutinosa	2710 ± 27	897 – 868 cal BC 846 – 816 cal BC	906 – 809 cal BC	ST31
UBA-54725	670	1184 fill of posthole 1183	Alnus cf glutinosa	4117 ± 30	2851 – 2809cal BC 2747 – 2726 cal BC 2698 – 2623 cal BC 2593 – 2585 cal BC	2868 – 2802 cal BC 2775 – 2714 cal BC 2709 – 2576 cal BC	ST36
UBA-54726	761	1374 fill of pit 1373	Salix sp	3017 ± 27	1370 – 1356 cal BC 1295 – 1218 cal BC	1387 – 1338 cal BC 1319 – 1194 cal BC 1175 – 1161cal BC 1143 – 1130 cal BC	PG7
UBA-54727	888	1592 lower fill of pit 1590	Betula sp	7852 ± 37	6766 – 6765 cal BC 6749 – 6722 cal BC 6701 – 6639 cal BC 6617 – 6605 cal BC	6904 – 6889 cal BC 6826 – 6594 cal BC	ST11

Table 1 (continued): Radiocarbon dates for Guardbridge.

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UB No	Sample	Context	Material	Radiocarbon Age BP	Calibrated 1-sigma (68.3% probability)	Calibrated 2-sigma (95.4% probability)	Structure
UBA-54728	909	1629 fill of pit 1628	Betula sp	2416 ± 27	537 – 531 cal BC 517 – 412 cal BC	740 – 693cal BC 664 – 647 cal BC 548 – 402 cal BC	ST43/PG9
UBA-54729	1177	1991 fill of pit 1990	Salix sp	4547 ± 33	3365 – 3328 cal BC 3220 – 3184 cal BC 3154 – 3114 cal BC	3369 – 3282 cal BC 3276 – 3266 cal BC 3243 – 3102 cal BC	Pit alignment
UBA-54730	1437	2015 deposit	Alnus cf glutinosa	2659 ± 33	887 – 886 cal BC 832 – 795 cal BC	899 – 857 cal BC 848 – 789 cal BC	ST40
UBA-54731	1236	2111 fill of pit 2112	Alnus cf glutinosa	2420 ± 25	538 – 530 cal BC 518 – 414 cal BC	739 – 693 cal BC 664 – 648 cal BC 547 – 404 cal BC	PG10
UBA-54732	1319	2276 lower fill of pit 2273	Betula sp	1802 ± 26	cal AD 221 – 222 cal AD 225 – 252 cal AD 291 – 318	cal AD 204 – 261 cal AD 276 – 339	?
UBA-54733	1627	2531 middle fill of Ditch 3 (2529)	Corylus cf avellana	3904 ± 30	2462 – 2399 cal BC 2385 – 2345 cal BC	2468 – 2295 cal BC	Fort ditch
UBA-54734	1517	2553 deposit	Salix sp	1086 ± 28	cal AD 897 – 921 cal AD 954 – 994	cal AD 892 – 934 cal AD 938 – 996 cal AD 1002 – 1020	ST 44
UBA-54735	1637	2564 upper fill of ditch 2 (2561)	Corylus cf avellana	3324 ± 28	1618 – 1598 cal BC 1593 – 1541 cal BC	1684 – 1652 cal BC 1643 – 1515 cal BC	Fort ditch
UBA-54736	SF 1217	2661 lower fill of ditch (2655)	Animal bone - indet. Mammal	2007 ± 23	41 cal BC – cal AD 9 1 cal BC – cal AD 25 cal AD 50 – 55	cal BC 49 – cal AD 71	Fort ditch
UBA-54737	1615	2707 fill of pit 2706	Corylus cf avellana	2947 ± 27	1214 – 1119 cal BC	1258 – 1244 cal BC 1231 – 1051 cal BC	E of ST23
UBA-54738	1675	2772 fill of pit 2773	Alnus cf glutinosa	2902 ± 27	1125 – 1044 cal BC 1033 – 1017 cal BC	1204 – 1141 cal BC 1133 – 1008 cal BC	ST26
UBA-54739	1783	2945 deposit	Alnus cf glutinosa	5310 ± 33	4231 – 4212 cal BC 4209 – 4193 cal BC 4170 – 4160 cal BC 4137 – 4054 cal BC	4248 – 4045 cal BC 4008 – 4001 cal BC	ST13
UBA-54740	1823	3045 fill of pit 3044	Corylus cf avellana	3362 ± 30	1732 – 1720 cal BC 1690 – 1613 cal BC 1571 – 1569 cal BC	1740 – 1712 cal BC 1696 – 1597 cal BC 1594 – 1540 cal BC	ST20
UBA-54741	1928	3271 fill of posthole 3270	Corylus cf avellana	2817 ± 326	1003 – 962 cal BC 959 – 930 cal BC	1047 – 1027 cal BC 1022 – 903 cal BC	ST22

Table 1 (continued): Radiocarbon dates for Guardbridge.

Lab ID	Sample	Context description	Material dated	Radiocarbon age (BP)	Calibrated date (95% probability)
UBA-51741	22	011 secondary fill of ditch 010	charcoal: Corylus cf. avellana	2023 ± 25	90 cal BC – cal AD 70
UBA-51742	112	035 fill of large pit 169	charcoal: Alnus cf. glutinosa	2732 ± 25	930 – 810 cal BC
UBA-51743	240	316 fill of enclosure 315	charcoal: Alnus cf. glutinosa	4419 ± 30	3310 – 2930 cal BC
UBA-51744	284	409 fill of ditch 408	charcoal: Corylus cf. avellana	2441 ± 32	750 – 410 cal BC
UBA-51745	299	447 spit C 7NW, fill of enclosure gully 446	charcoal: Corylus cf. avellana	3352 ± 26	1730 – 1540 cal BC
UBA-51746	326	465 fill of post-pit 464	charcoal: Alnus cf. glutinosa	2447 ± 26	750 – 420 cal BC
UBA-51747	707	790 fill of curvilinear feature 789	charcoal: Salix sp.	4715 ± 30	3620 – 3380 cal BC
UBA-51748	690	1280 fill of pit 1279	charcoal: Salix sp.	2421 ± 30	740 – 410 cal BC

Table 2: Radiocarbon dates with simplified calibration.

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Lab ID	Sample	Context description	Material dated	Radiocarbon age (BP)	Calibrated date (95% probability)
UBA-51749	806	1449 fill of enclosure ditch 1448	charcoal: Alnus cf. glutinosa	4299 ± 31	3010 – 2880 cal BC
UBA-51750	1041	1666 fill of enclosure 1665	charcoal: Salix sp.	4469 ± 38	3340 – 2980 cal BC
UBA-51751	1238	2115 fill of kiln 2113	charred grain: Triticum dicoccum	783 ± 23	cal AD 1220 – 1280
UBA-51752	1496	2438 fill of posthole 2506	charcoal: Corylus cf. avellana	2769 ± 27	1000 – 830 cal BC
UBA-51753	1647	2599 deposit at base of ditch 2057	charred nutshell: Corylus avellana	8657 ± 43	7810 – 7590 cal BC
UBA-51754	1549	2610 fill of lower kiln 2611	charcoal: Corylus cf. avellana	1067 ± 25	cal AD 890 – 1030
UBA-51755	1562	2636 fill of ditch 2635	charcoal: Betula sp.	2079 ± 26	170 – 1 cal BC
UBA-51756	1571	2656 upper fill of ditch 0 (2655)	charcoal: Corylus cf. avellana	2744 ± 29	980 – 820 cal BC
UBA-51757	1607	2686 fill of recut 2685	charcoal: Alnus cf. glutinosa	2481 ± 24	760 – 470 cal BC
UBA-51758	1690	2753 fill of posthole 2752	charcoal: Corylus cf. avellana	1851 ± 31	cal AD 110 – 300
UBA-51759	1685	2793 fill of posthole 2792	charcoal: Alnus cf. glutinosa	1986 ± 26	40 cal BC – cal AD 120
UBA-51760	1738	2945 deposit	charcoal: Betula sp.	5339 ± 34	4320 – 4050 cal BC
UBA-51761	1901	3197 fill of posthole 3196	charcoal: Prunoideae	2910 ± 28	1210 – 1010 cal BC
UBA-51762	2004	3405 fill of posthole 3404	charcoal: Betula sp.	2792 ± 27	1020 – 840 cal BC
UBA-53315	1038	1830 fill of pit 1829 within the ring ditch 1665	charcoal: Corylus cf. avellana	4704 ± 31	3620 – 3370 cal BC
UBA-53316	1129	1909 fill of ?cist 1908	charcoal: Corylus cf. avellana	3060 ± 26	1410 – 1230 cal BC
UBA-53317	1086	1916 fill of posthole 1915	charcoal: Alnus cf. glutinosa	2893 ± 26	1200 – 990 cal BC
UBA-53318	1092	1934 fill of curvilinear feature 1933	charred grain: Hordeum vulgare sl.	2429 ± 30	740 – 410 cal BC
UBA-53319	1114	1954 fill of curvilinear feature 1953	charcoal: Cytisis/Ulex	411 ± 22	cal AD 1440 – 1610
UBA-53320	1531	2569 fill of flue 2606	charcoal: Betula sp.	880 ± 23	cal AD 1050 – 1220
UBA-53321	1754	2909 fill of curvilinear 2908	charcoal: Corylus cf. avellana	2844 ± 25	1110 – 920 cal BC
UBA-53322	1772	2954 upper fill of pit 2953	charcoal: Corylus cf. avellana	2456 ± 26	750 – 420 cal BC
UBA-53323	1795	2962 fill of pit 2961	charcoal: Alnus cf. glutinosa	2843 ± 26	1110 – 920 cal BC
UBA-53324	1888	3053 fill of curvilinear feature 3052	charcoal: Alnus cf. glutinosa	4641 ± 31	3520 – 3360 cal BC
UBA-53325	1945	3283 fill of pit 3282	charcoal: Corylus cf. avellana	2944 ± 27	1250 – 1040 cal BC
UBA-53326	2075	3512 fill of pit 3511	charcoal: Alnus cf. glutinosa	4694 ± 33	3620 – 3370 cal BC
UBA-53327	2138	3743 fill of posthole 3742	charred nutshell: Corylus avellana	2897 ± 33	1210 – 970 cal BC
UBA-53328		Skeleton 1	Human bone: tibia	2608 ± 28	820 – 770 cal BC
UBA-54715	41	068 fill of pit 067	charcoal: Alnus cf. glutinosa	2958 ± 28	1270 – 1050 cal BC
UBA-54716	129	162 fill of pit 161	charcoal: Alnus cf. glutinosa	3701 ± 28	2200 – 1980 cal BC
UBA-54717	176	240 lower fill of pit 242	charcoal: Corylus cf. avellana	2445 ± 25	750 – 410 cal BC
UBA-54718	417	407 deposit	charcoal: Alnus cf. glutinosa	2823 ± 28	1080 – 900 cal BC
UBA-54719	323	469 fill of gully 468	charcoal: Salix sp.	4136 ± 29	2870 – 2590 cal BC

Table 2 (continued): Radiocarbon dates with simplified calibration.

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Lab ID	Sample	Context description	Material dated	Radiocarbon age (BP)	Calibrated date (95% probability)
UBA-54720	344	512 fill of pit 510	charcoal: Alnus cf. glutinosa	4643 ± 31	3520 – 3360 cal BC
UBA-54721	474	764 fill of pit 765	charcoal: Alnus cf. glutinosa	3866 ± 32	2460 – 2210 cal BC
UBA-54722	SF 431	953 fill of ditch 952	Burnt residue from pottery sherd	2812 ± 24	1040 – 900 cal BC
UBA-54723	649	1140 fill of pit 1139	charcoal: Corylus cf. avellana	2407 ± 26	730 – 400 cal BC
UBA-54724	676	1182 fill of curvilinear feature 1181	charcoal: Alnus cf. glutinosa	2710 ± 27	920 – 810 cal BC
UBA-54725	670	1184 fill of posthole 1183	charcoal: Alnus cf. glutinosa	4117 ± 30	2860 – 2580 cal BC
UBA-54726	761	1374 fill of pit 1373	charcoal: Salix sp.	3017 ± 27	1380 – 1140 cal BC
UBA-54727	888	1592 lower fill of pit 1590	charcoal: Betula sp.	7852 ± 37	6950 – 6600 cal BC
UBA-54728	909	1629 fill of pit 1628	charcoal: Betula sp.	2416 ± 27	730 – 400 cal BC
UBA-54729	1177	1991 fill of pit 1990	charcoal: Salix sp.	4547 ± 33	3370 – 3100 cal BC
UBA-54730	1437	2015 deposit	charcoal: Alnus cf. glutinosa	2659 ± 33	900 – 790 cal BC
UBA-54731	1236	2111 fill of pit 2112	charcoal: Alnus cf. glutinosa	2420 ± 25	730 – 410 cal BC
UBA-54732	1319	2276 lower fill of pit 2273	charcoal: Betula sp.	1802 ± 26	cal AD 170 – 330
UBA-54733	1627	2531 middle fill of Ditch 3 (2529)	charcoal: Corylus cf. avellana	3904 ± 30	2470 – 2280 cal BC
UBA-54734	1517	2553 deposit	charcoal: Salix sp.	1086 ± 28	cal AD 890 – 1020
UBA-54735	1637	2564 upper fill of ditch 2 (2561)	charcoal: Corylus cf. avellana	3324 ± 28	1690 – 1520 cal BC
UBA-54736	SF 1217	2661 lower fill of ditch (2655)	animal bone: indet. Mammal	2007 ± 23	50 cal BC – cal AD 80
UBA-54737	1615	2707 fill of pit 2706	charcoal: Corylus cf. avellana	2947 ± 27	1260 – 1050 cal BC
UBA-54738	1675	2772 fill of pit 2773	charcoal: Alnus cf. glutinosa	2902 ± 27	1200 – 1000 cal BC
UBA-54739	1783	2945 deposit	charcoal: Alnus cf. glutinosa	5310 ± 33	4260 – 4010 cal BC
UBA-54740	1823	3045 fill of pit 3044	charcoal: Corylus cf. avellana	3362 ± 30	1740 – 1540 cal BC
UBA-54741	1928	3271 fill of posthole 3270	charcoal: Corylus cf. avellana	2817 ± 26	1050 – 900 cal BC

Table 2 (continued): Radiocarbon dates with simplified calibration.

Samples and model

The radiocarbon-dated samples cover practically all periods from the Mesolithic through to the post-medieval. While this provides good indications of when, in the past, humans were active in the area, the longevity of activity increases the risks of residual material being dated in the excavated contexts. Therefore, a critical mind must be kept when considering the date of a sample and the sample's relationship to the formation of the context from which it was derived. Below, the dated samples are discussed in roughly their chronological order, but also specific reference to the feature groups where there is more than one dated sample and to the overall spatial relationship between the feature groups with dates from each period.

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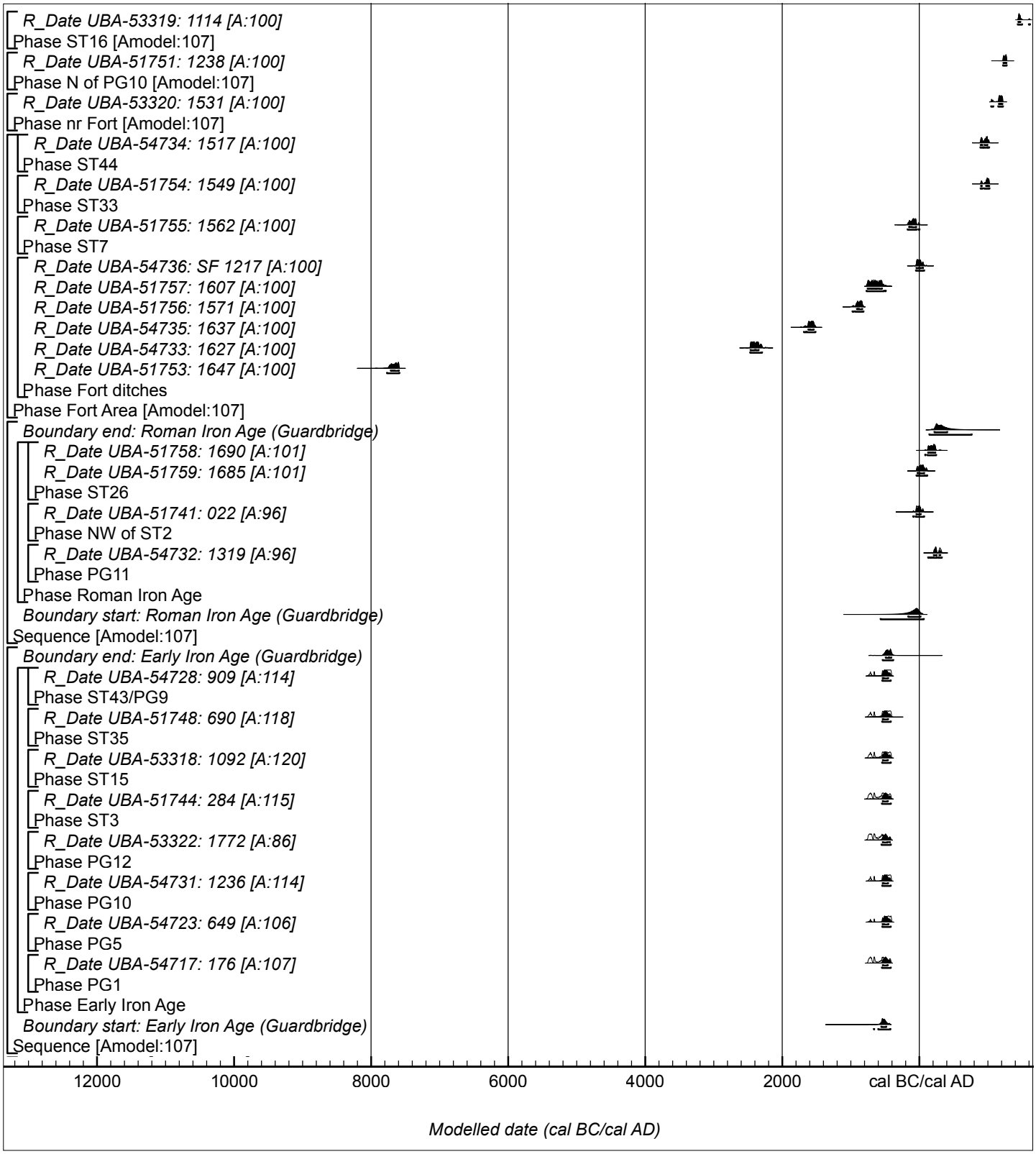


Figure 80: Overall chronological model from Guardbridge. Each distribution represents the relative probability that an event occurred at some particular time. For each of the radiocarbon measurements two distributions have been plotted, one in outline, which is the result of simple radiocarbon calibration, and a solid one, which is based on the chronological model use. The other distributions correspond to aspects if the model. For example, 'start: Neolithic Age (Guardbridge)' is the estimated date that Neolithic activity began at the site, based on the radiocarbon dating results. The large square 'brackets' along with the OxCal keywords define the overall model exactly.

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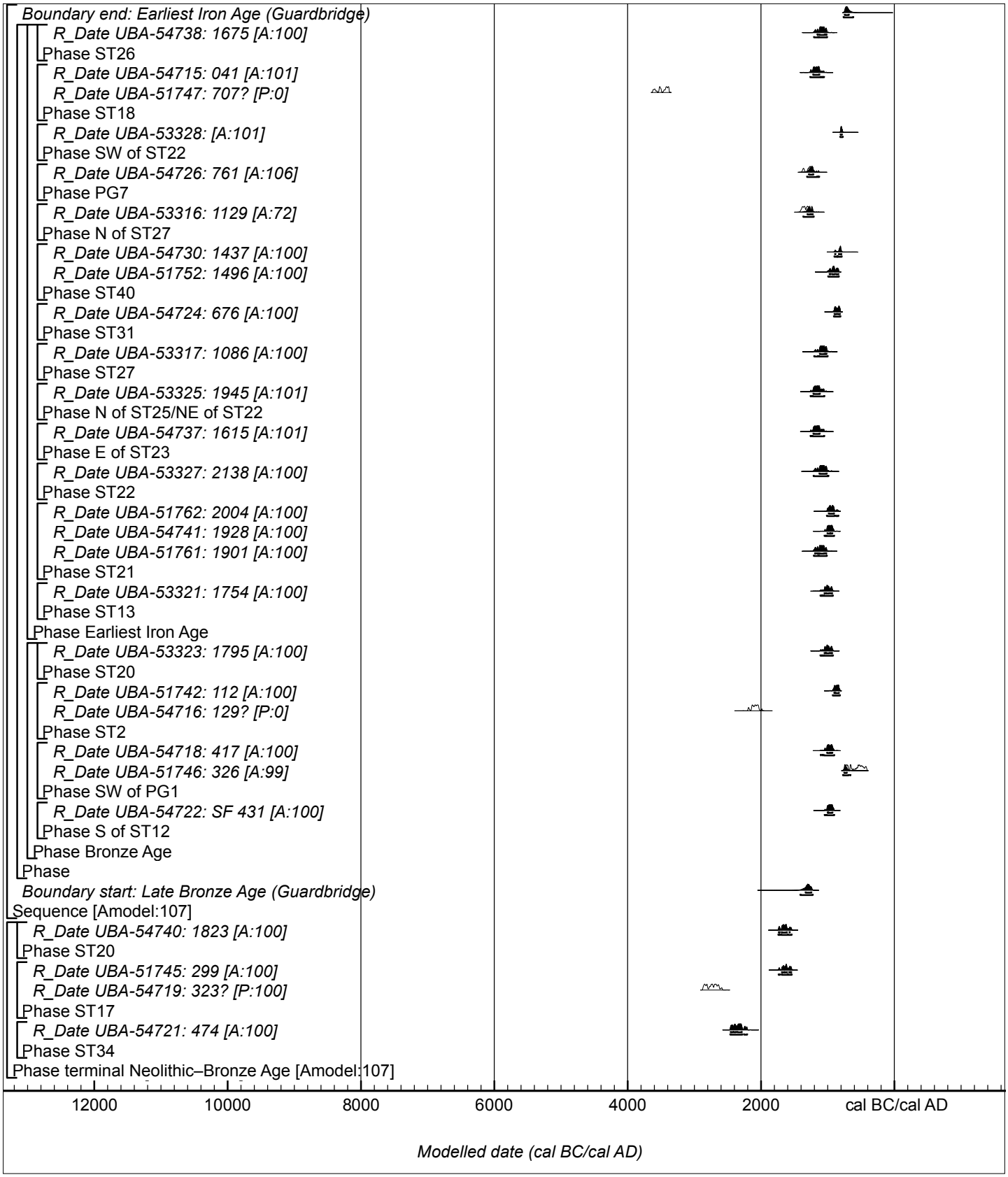


Figure 80 (continued): Overall chronological model from Guardbridge.

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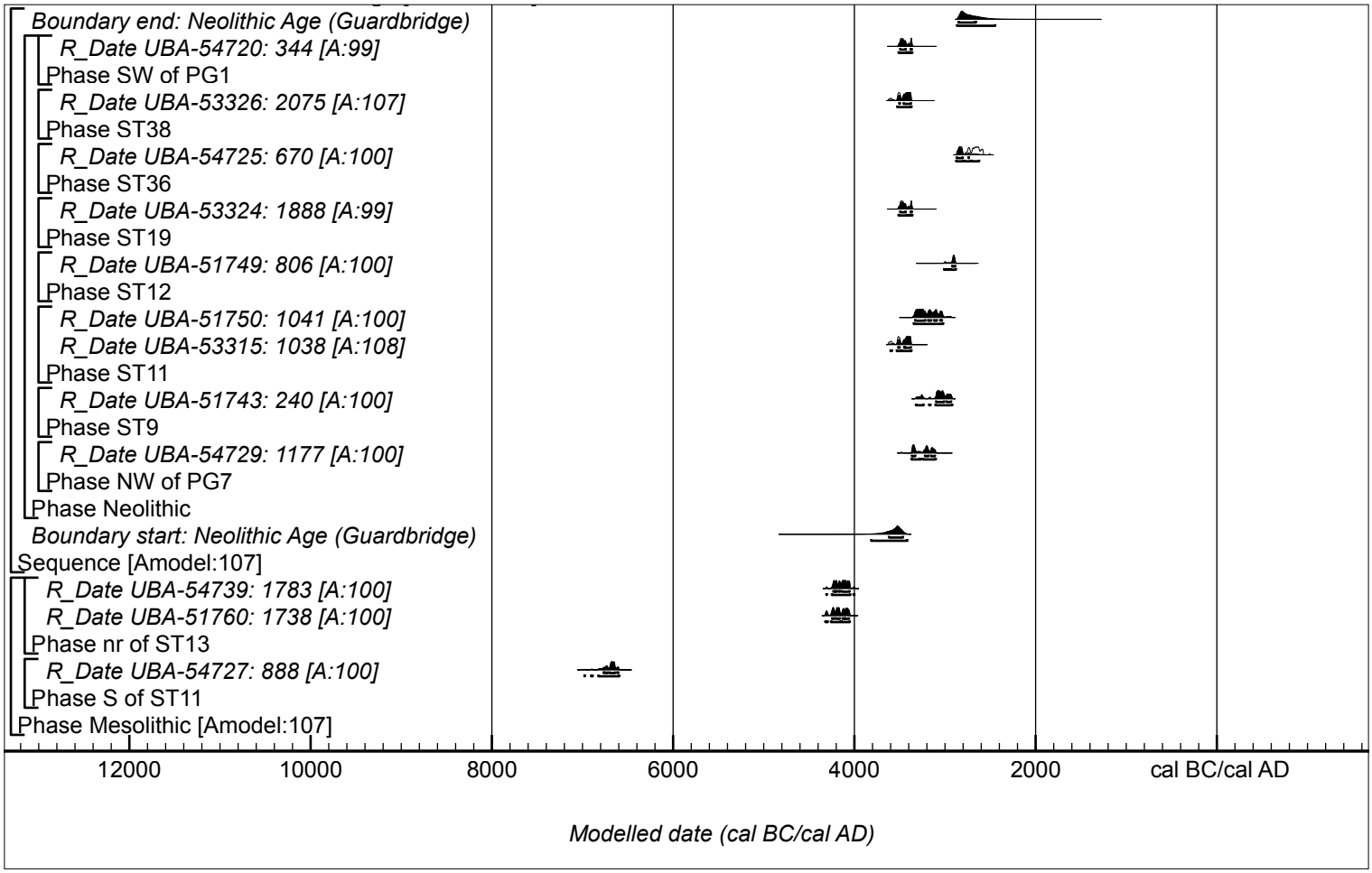


Figure 80 (continued): Overall chronological model from Guardbridge.

Mesolithic period

There are Mesolithic dates from three samples, associated with three features. A fragment of birch charcoal from the lower fill (1592) of pit (1590), which was located south of ST11, was dated (UB-54727) to the 7th millennium cal BC. Over 100 m south of pit (1590) and underlying ST13, there are two radiocarbon dates (UBA-51760 and UBA-54739) on fragments of birch and alder charcoal from different contexts in deposit (2945), which contained lithic debris. The two results are statistically consistent (T'=0.4; df=1; T'(5%)=3.8), and the later date (UB-54739) provides the best estimate for the date of the deposit and associated material culture.

Neolithic period

There are nine samples with Neolithic radiocarbon dates that come from features spread across the entire site, from near ST38 in the south-west corner to ST36 in the east and the post-alignment north-west of PG7. While it is possible that some of the dated samples were residual in the contexts from which they were recovered, they likely accurately reflect the spatial extent of the Neolithic activity across the site.

Moving from south to north, the samples include:

- A fragment of alder charcoal was dated (UBA-53326) from the fill (3512) of pit (3511) that was located 'internal' to the small enclosure ditch east of ST38.
- A fragment of alder charcoal was dated (UBA-53324) from the fill (3053) of curvilinear ditch (3052) that formed part of ST19.
- A fragment of alder charcoal was dated (UBA-54720) from the fill (512) of pit (510), which lay south-west of PG1 and near ST3.
- A fragment of alder charcoal was dated (UBA-51743) from the fill (316) of the horse-shoe shaped enclosure ditch (315) that formed ST9.

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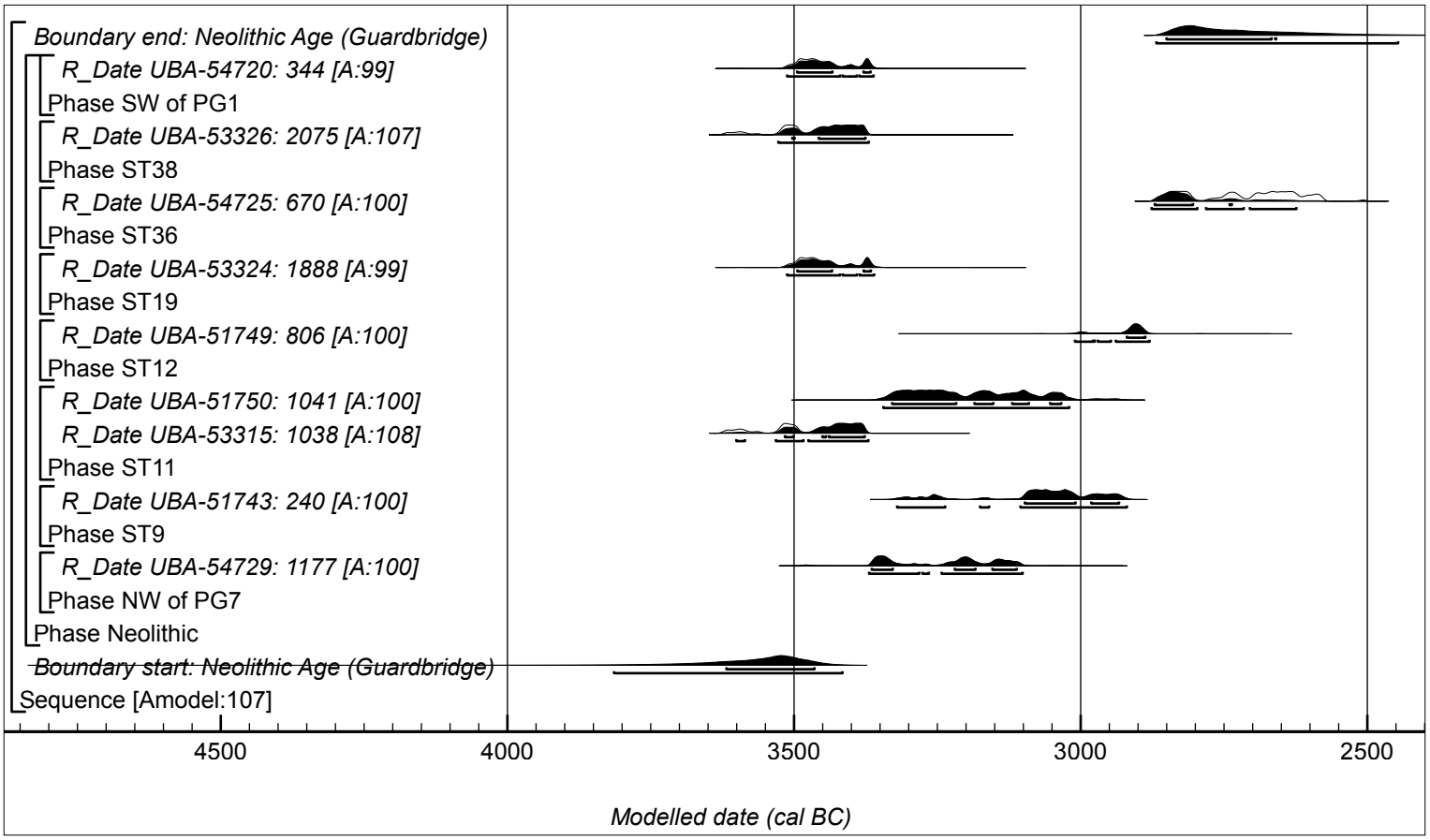


Figure 81: Chronological model for the Neolithic activity at Guardbridge. The model is excerpted from the overall model shown in Figure 80.

- A fragment of alder charcoal was dated (UBA-54725) from the fill (1184) of a posthole (1183) in ST36.
- A fragment of alder charcoal was dated (UBA-51749) from the fill (1449) of enclosure ditch (1448) that formed ST12.
- There are two dated samples in ST11. UBA-53315 is from a fragment of hazel charcoal that was recovered from a fill (1830) in pit (1829) that was surrounded by enclosure ditch (1665) which produced UBA-51750 from a fragment of willow charcoal from its fill (1666).
- A fragment of willow charcoal was dated (UBA-54729) from the fill (1991) of a pit (1990) that formed part of a pit alignment to the north-west of PG7.

Bronze Age

While the Neolithic period is represented across the site, the terminal Neolithic and earlier Bronze Ages are confined to two areas.

There is a single radiocarbon date (UBA-54740) on a fragment of hazel charcoal from the fill (3045) of pit (3044) in ST20, which lies south of the waterlogged area in the centre of the site. The remaining dates come from the centre of the site, north of the waterlogged area. There are three radiocarbon-dated samples from the area around ST17 and ST34. These include UBA-54721 on a fragment of alder charcoal from the fill (764) of pit (765), which lay at the edge of ST34 or just outside ST17. From ST17 there is a terminal Neolithic date (UBA-54719) on willow charcoal from the fill (469) of the ring gully (468) of the structure and a second Bronze Age date (UBA-51745) on a fragment of hazel charcoal from the fill (447) of the enclosure gully (446) to ST17. To the south-east of ST17, there is an earlier Bronze Age radiocarbon date (UBA-54716) from a fragment of alder charcoal from fill (160) of pit (161) that lay within the area enclosed by the ring gully to ST2. This small pit is adjacent to the large central pit and deposit in this structure that produced a late Bronze Age date (UBA-51742), discussed below.

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Late Bronze Age–earliest Iron Age

Like the Neolithic Period at Guardbridge, the late Bronze Age and earliest Iron Age archaeology is also not confined to any specific area(s) and can be found from the south-west area to the far north and all areas between. A total of 18 defined areas have material dated to this period and they are discussed from the south to the north.

- A charred hazel nutshell was dated (UBA-53327) from the fill (3743) of posthole (3742) that formed part of the small rectangular enclosure (ST22) in the south-west area of the site.
- Hazel charcoal was dated (UBA-53325) from the fill (3283) of pit (3282) that formed part of a southern double pit alignment near ST22 and ST25.
- A fragment of hazel charcoal was dated (UBA-54737) from fill (27007) of large pit (2706) that lay top the east of ST23.
- There are dates from three postholes in the large post enclosure ST21. They are on *Prunoideae* charcoal (UBA-51761) from fill (3197) in posthole (3196), hazel charcoal (UBA-54741) from fill (3271) of posthole (3270), and birch charcoal (UBA-51762) from fill (3405) of posthole (3404).
- A fragment of alder charcoal was dated (UBA-53323) from the fill (2962) of pit (2961) associated with ST20. The pit contained Bronze Age pottery.
- A fragment of alder charcoal was dated (UBA-54738) from the fill (2772) of large pit (2773) that lies in a break in the wall of the sub-rectangular post-built ST26.
- Hazel charcoal was dated (UBA-53321) from the fill (2909) of curvilinear enclosure ditch (2908) associated with ST13.
- From the fill (465) of a post-pit (464) associated with ST41 there is a date (UBA-51746) on a fragment of alder charcoal. The pit also contained a shale bracelet. Another date (UBA-54718) was made on alder charcoal from a deposit (407) in the same area as ST41 and PG1.
- Skeleton 1 was excavated to the immediate south-west of the internal area of ST2 and the tibia was dated (UBA-53328) to the early Iron Age.
- There are two radiocarbon dates (UBA-54716 and -51742) on alder charcoal from the fill (162) of pit (161) and fill (035) of pit (169), respectively, associated with ST2.
- A fragment of alder charcoal was dated (UBA-54724) from the fill (1182) of the curvilinear ditch (1181) associated with ST31.
- There are two radiocarbon dates (UBA-51752 and -54730) on hazel and alder charcoal, respectively, from features associated with ST40. UBA-51752 is from the fill (2438) of posthole (2506), while UBA-54730 is from deposit (2015).
- The charred food residue on a sherd of pottery was dated (UBA-54722) from the fill (953) of ditch (952) that lay south of ST12.
- There are two radiocarbon dates (UBA-51747 and -54715) on willow and alder charcoal from features associated with ST18. UBA-51747 is from the fill (790) of the curvilinear gully (789) to the north side of the structure, while UBA-54715 is from the fill (068) of pit (067).
- UBA-53317 is from a fragment of alder charcoal from the fill (1916) of an internal posthole (1915) in ST27.
- North of ST27 there is a radiocarbon result (UBA-53316) on a fragment of hazel charcoal recovered from the fill (1909) of a stone-lined pit (1908) that is a possible cist.
- Willow charcoal was dated (UBA-54726) from the fill (1374) of a pit (1373) in PG7.
- Within the area of ST43/PG9 there is a date (UBA-54728) on birch charcoal from the fill (1629) of pit (1628).

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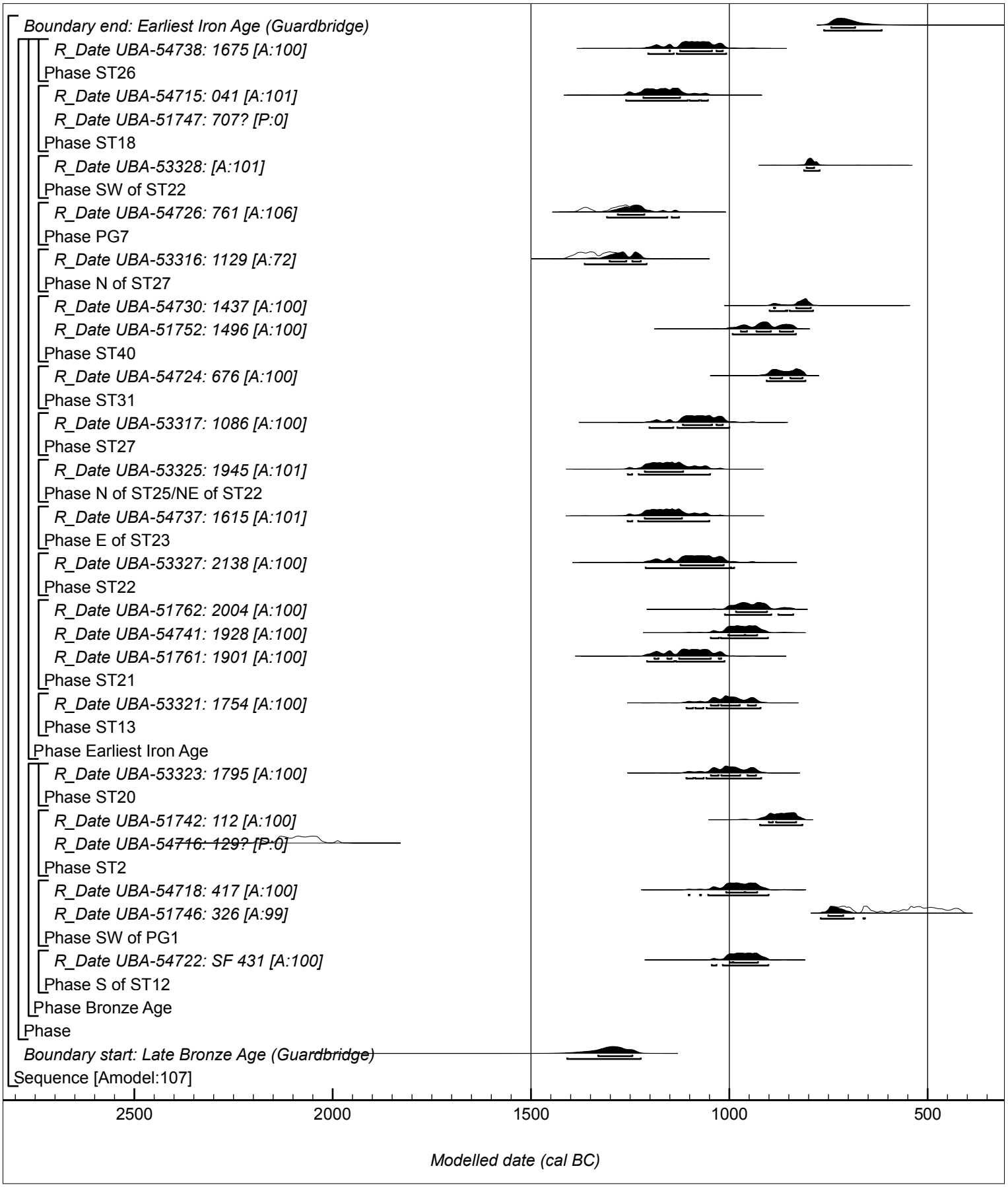


Figure 82: Chronological model for the Late Bronze Age to Early Iron Age activity at Guardbridge. The model is excerpted from the overall model shown in Figure 80.

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Early Iron Age

Early Iron Age activity appears to be represented by dated samples from across much of the site. From the south to north the dated samples include:

- A fragment of hazel charcoal was dated (UBA-53322) from the upper fill (2954) of pit (2953) in PG12. The lower fill of the pit contained Bronze Age pottery and a spindle whorl, so while it is possible the pottery is residual it is equally likely the fill from which the dated material was recovered was incorporated into the top of the pit at a later date.
- Hazel charcoal was dated (UBA-51744) from the fill (409) of the primary cut of the enclosure ditch (408) for ST3.
- Another fragment of hazel charcoal was dated (UBA-54717) from the lower fill (240) of pit (242) in PG1.
- A grain of charred barley recovered from the fill (1934) of curvilinear ditch (1933) of ST15 produced UBA-53318.
- A piece of alder charcoal was dated (UBA-54731) from the fill (2111) of pit (2112) in PG10.
- A fragment of hazel charcoal was dated (UBA-54723) from the fill (1140) of pit (1139) in PG5.
- A piece of willow charcoal was dated (UBA-51748) from the fill (1280) of pit (1279) that laid next to the small enclosure ST35. The pit also contained a loom weight.
- A fragment of birch charcoal was dated (UBA-54728) from the fill (1629) of pit (1628) that was located in the area of ST43/PG9.

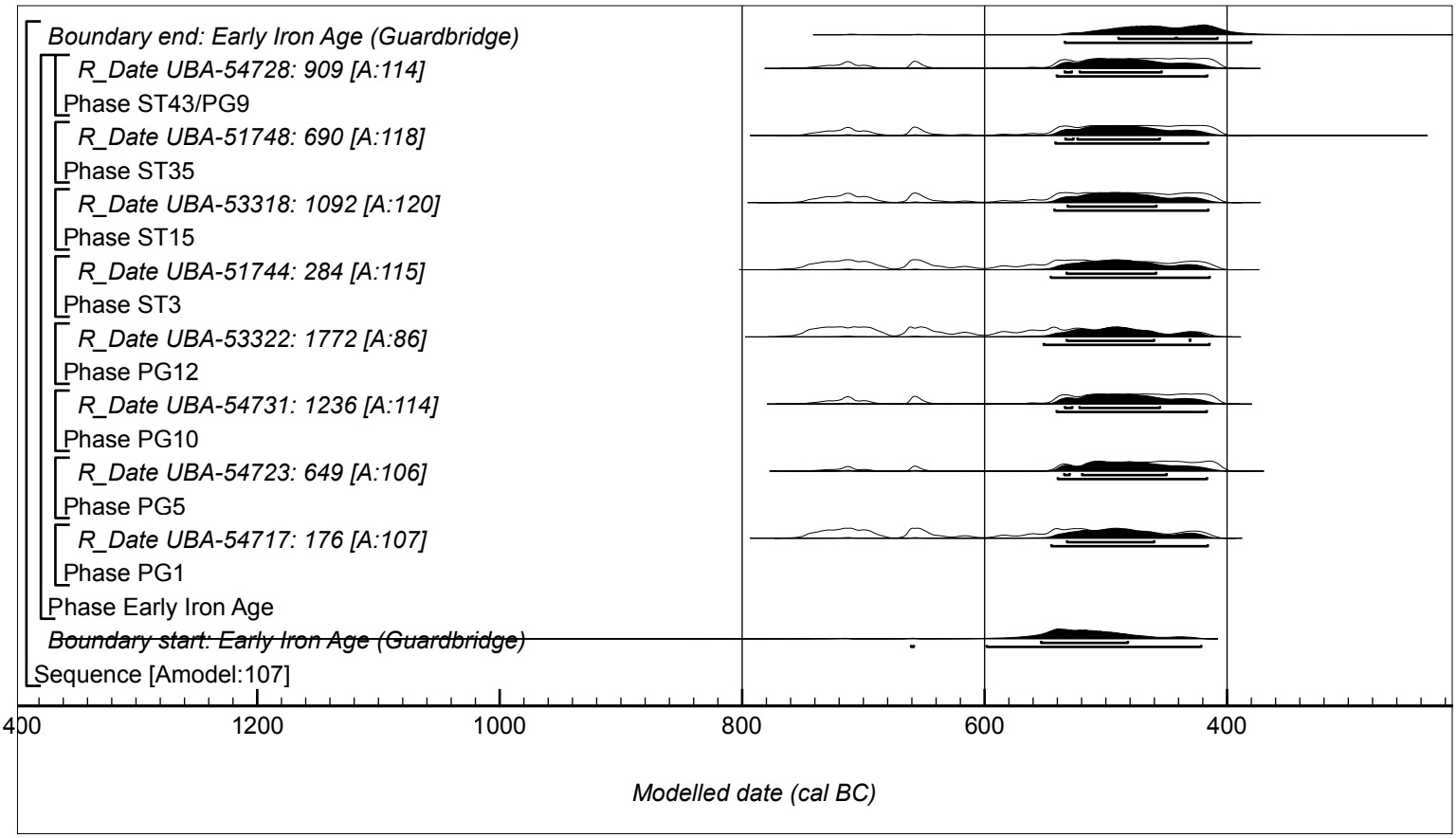


Figure 83: Chronological model for the Middle Iron Age activity at Guardbridge. The model is excerpted from the overall model shown in Figure 80.

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Roman Iron Age

The Roman Iron Age activity appears at both ends of the site. Firstly, there are two dated samples (UBA-51758 and UBA-51759 two postholes associated with sub-rectangular ST26. The samples include a fragment of hazel charcoal from the fill (2753) of posthole (2752) (UBA-51758) and a fragment of alder charcoal from fill (2793) of posthole (2792) (UBA-51759). There is a large pit (2773) that was excavated in an open break in the southern wall that has a Bronze Age result (UBA-54738, discussed above). Either this dated sample was residual in the context or the feature is fortuitously positioned in relation to ST26 and has no chronological relationship to it. At the north end of the site there is a radiocarbon date (UBA-54732) of a fragment of birch charcoal from the lower fill (2276) of pit (2273) in PG11. Finally, in the middle of the site, there is a date (UBA-51741) from the secondary fill (011) of ditch (010) that lies to the north-west of ST2. While it is possible the ditch dates from the Roman Iron Age, it is also possible given the location of the sample further up the stratigraphy that it is related to later activity which filled in a depression.

Fort ditches and overlying deposits

There are nine radiocarbon-dated samples associated with the fills of the fort ditches or overlying features. The radiocarbon dates span the Mesolithic through to the medieval period. The lack of chronological coherence makes it very likely that at least in the ditch fills there are a considerable number of dated samples that are residual material in their contexts.

A charred hazel nutshell in the basal fill (2599) of the outer ditch (2057) (Ditch 4) produced a Mesolithic date (UBA-51753), while the middle fill (2531) of Ditch 3 (2529) had a fragment of hazel charcoal produce a terminal Neolithic/early Bronze Age date (UBA-54733). A Bronze Age date (UBA-54735) was returned for a fragment of hazel charcoal recovered from the upper fill (2564) of Ditch 2 (2561). From the fill (2685) of recut (2685) for Ditch 1 there is an Iron Age date (UBA-51757). Finally, there are two dates from fills in Ditch 0 (2655). From the lower fill (2661) there is a Roman Iron Age date (UBA-54736) on a sample of mammal bone, while the upper fill (2656) produced a terminal Bronze Age date (UBA-51756) on a fragment of hazel charcoal. It seems more likely the charcoal in the upper fill is residual and that the infilling of this upper ditch began in (or after) the beginning of the Roman Iron Age period.

Lying above Ditches 2 and 3 is a small double ring ditch and a fragment of birch charcoal from the fill (2636) of the inner ring ditch (2635) (ST7) suggests it is late Iron Age in date (UBA-51755). A fragment of hazel charcoal dated (UBA-51754) the fill (2610) of the lower kiln (2611) that was above Ditches 1 and 2 and formed part of ST33 to the early medieval period. ST44 is a series of cut features and deposits that overlay Ditch 0 and UBA-54734, from a fragment of willow charcoal recovered from deposit 2553, suggests this activity dates to the early medieval period.

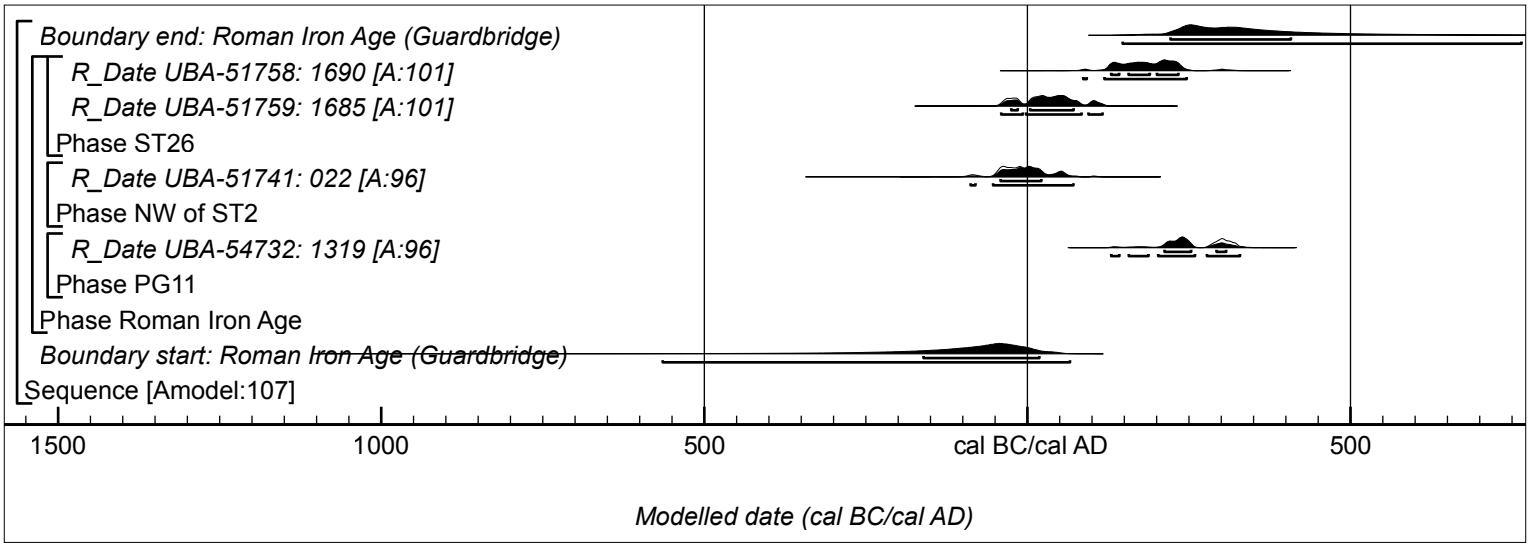


Figure 84: Chronological model for the Roman Iron Age activity at Guardbridge. The model is excerpted from the overall model shown in Figure 80.

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Medieval period

Medieval dates on site come from two spatial separated areas. At the west side of the site, a sample of gorse charcoal was dated (UBA-53319) from the fill (1954) of the curvilinear gully (1953) that formed ST16. To the north and east of the site, a grain of charred wheat was dated (UBA-51751) from the fill (2115) of kiln (2113), which lay to the north-east of PG10. Another medieval date (UBA-53320) was made on a fragment of birch charcoal recovered from the fill (2569) of flue (2606), part of a double-flue structure south-west of the Fort.

A chronological model was created that grouped the results by the time periods used above. Where there were four or more dates from a period, the OxCal program was used to apply the modelling algorithm to each phase or activity, independent of one another. The method follows the simple bounded phase model described in Hamilton and Kenney (2015). Radiocarbon dates on samples that appear to be residual in a feature group or from features not positively identified as part of a group have been excluded from the modelling and are shown with a '?' next to their label in Figures 80-84.

Results

The model had good agreement (Amodel=107) and estimates:

The Neolithic activity began in *3810 – 3415 cal BC* (*95% probability*; Figure 81; *start: Neolithic Age (Guardbridge)*) or *3625 – 3460 cal BC* (*68% probability*). It ended in *2870 – 2455 cal BC* (*95% probability*; Figure 81; *end: Neolithic Age (Guardbridge)*) or *2870–2670 cal BC* (*68% probability*).

The late Bronze Age activity began in *1405 – 1225 cal BC* (*95% probability*; Figure 82; *start: Late Bronze Age (Guardbridge)*) or *1335 – 1245 cal BC* (*68% probability*). The activity continued into the earliest Iron Age and ended in *765 – 615 cal BC* (*95% probability*; Figure 82; *end: earliest Iron Age (Guardbridge)*) or *745 – 680 cal BC* (*68% probability*).

The early Iron Age at Guardbridge began in *605 – 420 cal BC* (*95% probability*; Figure 83; *start: Early Iron Age (Guardbridge)*) or *560 – 480 cal BC* (*68% probability*). It ended in *535–380 cal BC* (*95% probability*; Figure 83;*end: Early Iron Age (Guardbridge)*) or *495 – 410 cal BC* (*68% probability*).

The Roman Iron Age began in *500 cal BC – cal AD 75* (*95% probability*; Figure 84; *start: Roman Iron Age (Guardbridge)*) or *155 cal BC – cal AD 25* (*68% probability*). It ended in *cal AD 140 – 730* (*95% probability*; Figure 84; *end: Roman Iron Age (Guardbridge)*) or *cal AD 220 – 400* (*68% probability*).

It can be debated whether a distinction should be made between the late Bronze Age running until the earliest Iron Age and keeping the early Iron Age separate or including the early Iron Age dates into the previous group. From a modelling point-of-view, the separation of the late Bronze Age/ earliest Iron Age dates from the early Iron Age dates provides more nuance to the chronological understanding, but only if there was a period of low or no activity between the earliest and early Iron Age periods. If this separation is not borne out in the archaeological record, then a model that combines the dates from the late Bronze Age and earliest Iron Age with those from the early Iron Age should be preferred. This alternate model has good agreement (Amodel=96) and estimates that the early Iron Age ends in *525 – 305 cal BC* (*95% probability*; *end: early Iron Age (Guardbridge) alt*) or *470 – 380 cal BC* (*68% probability*). A range not so very different from the primary model discussed above. What is clear from the radiocarbon dating is that there was little or no activity in the middle Iron Age at Guardbridge with the intensity only picking back up at the end of the 1st millennium cal BC.

Discussion

The combination of extensive human activity across much of the site stretching back at least to the Neolithic with the sandy nature of the soils that can lead to an increase in the post-depositional mobility of material has presented a challenge for producing robust date estimates for individual features and feature groups at Guardbridge. Considering the pottery and radiocarbon data together, there are areas where the typological dating of the pottery is in close agreement with the calibrated dates. For

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instance, early Bronze Age pottery was identified in association with ST18, ST34 and in the vicinity of ST20 and ST26. Furthermore, ST34 and ST20 produced radiocarbon results 25th–23rd century cal BC and 18th–16th century cal BC, respectively. While it is often difficult to further separate later prehistoric pottery based on typology, the radiocarbon-dated material is very clearly of different ages and related to different periods of activity, and so it is possible that the pottery is of different periods as well. However, when looking at the core of the site activity extending out from PG1, the pottery is dated from the early Neolithic through to the middle Iron Age. The features in this area all have radiocarbon dates that span this period as well.

The intensity of activity in the core areas and the strong possibility for reworking must be taken into consideration when interpreting the artefactual and environmental records from the site, as they may be composed of material from multiple periods in individual features or contexts associated with feature groups. Furthermore, caution should be exercised in using the radiocarbon results to attribute dates to any artefacts, since even where there is a radiocarbon date that is from broadly the period expected for an artefact, the nature of the activity and the sandy soils means a dated sample could be residual or intrusive in the specific context.

What is certain is that the area of the Guardbridge site was occupied intensively off and on since at least the Neolithic and that the spatial spread of the radiocarbon dated samples should provide a robust chronology for those periods. However, in the periods where there appear to be no dating evidence, it is also important to remember that the absence of dates can simply be the result of relatively low levels of activity or activity that was not sustained for a long enough period to result in either many negative features or much debris suitable for dating.

Environmental evidence and human remains

Archaeobotany

By Susan Ramsay

Introduction

This archaeobotanical report details the processing, analysis and interpretation of botanical remains recovered from samples taken during an excavation at Guardbridge near St. Andrews, Fife. The work was carried out by GUARD Archaeology Ltd between July 2019 and July 2021. The botanical finds from the site suggest that there has been human occupation on the site from the Mesolithic to the medieval period.

Methodology

Bulk sample processing

A programme of bulk sampling was undertaken in order to examine the carbonised archaeobotanical remains from Guardbridge. In total, 293 samples were analysed for the presence of botanical remains. The bulk samples were processed by flotation for the recovery of carbonised remains, using standard methods and sieves of mesh diameter 1 mm and 500 µm for flots and 2 mm and 4 mm for retents from flotation. There was no indication that any of the samples had the potential for the preservation of uncarbonised plant remains through waterlogging.

Macrofossil analysis

Dried flots and sorted retents were examined using a binocular microscope at variable magnifications of x4 - x45. For each sample, an estimation of the total volume of carbonised material >4 mm was made. For each sample, all the charcoal >4 mm was identified unless this proved to be too large an amount, in which case a known percentage of the total charcoal >4 mm was identified. All carbonised seeds were also identified and any other plant macrofossil remains were noted.

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The testa characteristics of small seeds and the internal anatomical features of all charcoal fragments were further identified at x200 magnification using the reflected light of a metallurgical microscope. Reference was made to Schweingruber (1990), Gale and Cutler (2000) and Cappers *et al.* (2006) to aid identifications and vascular plant nomenclature follows Stace (1997).

Pollen analysis

Pollen analysis was undertaken on six monolith tins A, B, C, D, E, and F taken during excavation from Ditch 2 (2561) of the fort. The monolith tins had been sampled to cover the entire depth of the ditch section, with Monolith A at the top of the section and Monolith F at the bottom of the section. However, the sediment within the tins proved to be very sandy in nature and so not ideal for pollen analysis. No plant macrofossil remains were recovered from the monolith tins that could be used for AMS dating.

Monolith tins A, B, E and F measured 30 cm in length and were sampled at depths of 0-1 cm, 7-8 cm, 14-15 cm, 21-22 cm, 28-29 cm. Monolith tins C and D measured 25 cm in length and were samples at 0-1 cm, 6-12 cm, 12-13 cm, 18-19 cm and 24-25 cm. Pollen samples were prepared by the University of Reading, using standard methodologies with sodium polytungstate heavy liquid separation to remove the mineral component and final mounting of the samples in glycerine jelly stained with safranin.

Pollen identification and nomenclature follows Moore *et al.* (1991), whilst vascular plant nomenclature follows Stace (1997). The pollen concentration within these samples was extremely low and so it was not possible to count the usual minimum number of 500 land pollen grains for each level. As an alternative, 40 slide traverses were counted to give standard for each sample. The slides also contained varying amounts of very dark, apparently lignified material, which made it difficult to quantify genuine charcoal fragments on these slides. Therefore, it was decided to omit charcoal counts from the analysis.

Waterlogged samples

Four samples were taken from the waterlogged pond area in the middle of the site. These were taken from various depths from a section within the sediment. The samples were all labelled SF 172 and then with depths 0-10 cm, 30-40 cm, 70-80 cm and 110-120 cm and all appeared to be grey sandy clay, with occasional larger pieces of gravel. A 200ml sub-sample was taken from each of these samples, mixed with water and then sieved using mesh sizes of 500 µm and 1 mm. No botanical remains were recovered from these samples and so they will not be discussed further in the results section of this report.

Results

Results are discussed by feature group, following the order and groupings contained within the Data Structure Report (Kilpatrick 2021). The full results are given in Archaeobotany Tables 1-37 in Appendix 1.

Structure ST1: palisade enclosure (Table 1)

A large palisaded enclosure (1082) was located in the central area of the site and was defined by a perimeter ditch (796). The fill (797) of the palisade ditch produced only small amounts of heather-type charcoal and a few carbonised grains of barley and indeterminate cereals.

Within the enclosure were a number of pits, including two large pits (1016 and 933). The fill (1015) of pit (1016), produced small amounts of birch, heather-type and oak charcoal, whilst the fill (934) of pit 933) contained small amounts of heather and oak charcoal, with traces of barley and oat.

Towards the southern end of the enclosure, pit (985), fill (986), produced only traces of heather-type charcoal, as did pit (855), fill (856), towards the western side of the enclosure. A number of other pits and postholes were located in this western part of the enclosure. Pit (1222), fill (1224), produced traces of hazel and heather-type charcoal with a few barley grains, whilst pit (1235), fill (1236), produced traces of alder and oak charcoal. A posthole (881), fill (882), produced charcoal of alder, heather-type, oak, willow, traces of possible barley grains and hazel nutshell fragments. This assemblage would be indicative of hearth waste that has trickled down into the posthole, with no evidence for the original post having been burnt in situ.

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Overall, the carbonised remains from this structure suggest scattered hearth waste rather than structural material.

Structure ST2: ring-ditch enclosure (Table 2)

A large ring ditch enclosure (054), with an entrance at the southern end, was also found within the central area of the site, to the south of the large palisaded enclosure ST1 discussed above. The fill ((055) of ditch (054) produced only traces of heather and oak charcoal, with a few cereal grains. A stone-lined pit (197) cut this enclosure ditch. The fills (198 and 202) produced only small amounts of heather-type, oak and willow, with traces of cereal grain.

Two curvilinear grooves (049), fill (037), and (063), fill (064), were located on its eastern side but the fills produced only small traces of mixed charcoal, probably from the background scatter of hearth waste. These curvilinear features were covered by an occupation deposit (035) that contained prehistoric pottery, bone, fired clay and a lithic fragment. The charcoal assemblage contained small amounts of alder, heather-type and oak charcoal, with traces of carbonised barley grain. This suggests general domestic hearth waste scattered in the middle of the enclosure.

Towards the entrance was the remains of a crouched inhumation associated with two pits (153 and 159). The fill (152) produced a mixed assemblage of alder, hazel, heather-type, oak and a few carbonised cereal grains. This seems like an unlikely assemblage to have been deliberately deposited within the grave and so is more likely to be background domestic hearth waste that has been accidentally incorporated into the grave fill.

A series of postholes (160, 161 and 175) were also located in the north-east of the enclosure but the fills produced only traces of mixed charcoal, with no evidence for posts burnt in situ.

Structures ST3-ST6: enclosed ring-ditches (Table 3)

Four circular ring ditch structures (Structures 3, 4, 5, 6) were located away from the main band of settlement in the centre of the site.

Structure ST3

Ring ditch (408) enclosed three large pits and was located on the low-lying ground to the south of the central area. The fill (409) of the original cut (408) produced traces of heather-type and hazel charcoal. The fill (411) of the re-cut (412) of this ditch also produced traces of heather charcoal and a single carbonised barley grain. The fills (424 and 425) of pit (423) produced more significant amounts of heather-type charcoal, with traces of cereal grain. It isn't clear whether the heather was used for fuel or is the remains of burnt roofing or flooring material.

Structure ST4

The fill (1284) of ring-ditch (1283) produced small amounts of alder, heather-type and willow charcoal, with a single carbonised cereal grain and single seeds of fathen and heath grass. This suggests hearth waste, with the seeds potentially from the ground beneath the hearth.

Structure ST5

The fill (1688) of ring-ditch (1689) produced only tiny traces of heather-type and oak charcoal, possibly from background scatter on the site.

Structure ST6

The fill (1717) of ring ditch (1716) produced traces of burnt heather-type stems and indeterminate rhizomes, together with single seeds of cleavers, redshank and a heather seed capsule. This might suggest evidence for burnt heathy turf.

Structure ST7: double ring-ditch enclosure (Table 4)

A double ring-ditch enclose was located in the north-east corner of the site. The fills (2615), (2628) and (2629) of the outer ditch (2619) produced only traces of heather-type charcoal and a single seed of cultivated flax. Although flax is generally associated with sites that are Medieval or later in date, a single seed is not enough to suggest a date for this feature.

The fill (2636) of the inner ditch (2635) produced small amounts of birch, heather-type and oak charcoal, together with traces of cereal grain. This suggests the remains of scattered domestic hearth waste.

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Structures ST8-ST16: ring-ditch roundhouses (Tables 5-8)

Nine possible ring-ditch roundhouses were located during the excavations and designated ST8-ST16.

Structure ST8

Ring-ditch (552) was circular, with an entranceway on the west side. The fill (553) produced only traces of heather-type charcoal and a possible wheat grain. Within the roundhouse were pits (560 and 570), with the fills (561 and 571) both producing heather-type charcoal, but (561) also contained traces of hazel and oak charcoal and a few carbonised grains of oats, barley and possibly wheat. These fills suggests domestic hearth waste.

Structure ST9

Ring-ditch (315) was horseshoe shaped, with a narrow entranceway towards the south. The fill (316) of the ring-ditch (215) produced only a trace of alder charcoal and a single carbonised barley grain. The ring-ditch was truncated by pit (352) and linear feature (285). The pit fill (353) produced small amounts of heather-type and willow charcoal with traces of barley and emmer wheat. The fill (353) of pit (352) produced small amounts of hazel, heather-type and oak charcoal, with traces of barley. This suggests the remains of domestic hearth waste were scattered across the inside of the structure.

Structure ST10

Ring-ditch (336) was circular in shape, with a narrow entrance in the southwest. Only a single pit (323) was located within this structure but the fill (324) produced only a single carbonised grain of barley.

Structure ST11

Ring-ditch (1665) was circular, with an entrance in its western side, and was located in the north-west of the site. The fill (1666) of ditch (1665) produced small amounts of heather-type, birch, hazel and willow charcoal, with a couple of carbonised barley grain and a single seed belonging to the pea family (but not cultivated pea).

A number of pits were located within the interior of this structure. Fill (1828) of pit (1827) and fill (1830) of pit (1829) both produced small amounts of heather-type charcoal and hazel nutshell. A further two pits (1659 and 1824) were located near to the terminal ends of the perimeter ditch. The fill (1660) of pit (1659) produced only traces of heather-type charcoal and a single indeterminate cereal grain. However, the lower fill (1826) of pit (1824) contained a very different carbonised assemblage. Although the charcoal assemblage comprised heather-type, alder and oak charcoal, there were also significant amounts of carbonised cereal grain in this fill, with both oats and barley represented. In addition, a number of carbonised weed seeds were also recorded, with sedges, goosefoot, heath grass, black bindweed, wild radish and docks all present. These could be weeds of the arable crop. The cereals in this pit may be from cereal processing activity, although no chaff was identified. The presence of both oats and barley in the assemblage might suggest a medieval or later date for this feature.

Just to the south of the entrance to the ring-ditch was a further large pit (1590) that contained several different fills. The fills (1593 and 1613) both contained significant quantities of oak charcoal but no other carbonised remains. However, fills (1591, 1592 and 1605), contained only small amounts of mixed charcoal, with traces of hazel nutshell. These assemblages suggest that an oak post may have been burnt in situ but that scattered domestic hearth waste had also trickled down into the fill of the posthole.

Structure ST12

Ring-ditch (1448) was circular, with an entrance to the north-west, and was located to the south-east of Structure 11. The fill (1449) of the ring-ditch (1448) produced heather-type charcoal, alder and hazel nutshell, suggesting scattered hearth waste. Pit (1486) was located within the ring-ditch, in the south-west area. The fill (1487) contained small amounts of alder, heather-type and oak charcoal, with traces of cereal grain. A posthole (1464), fill (1465) was located at the entrance to the ring-ditch and also produced traces of heather-type and oak charcoal, along with burnt rhizomes and grassland weeds, suggesting burnt turf was also present.

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Structure ST13

Ring-ditch (2908) was similar in shape to ST11, but with the entrance on the eastern side. The fill (2909) of the ring-ditch produced only traces of alder, hazel and heather-type charcoal, with a single cereal grain, suggesting background hearth waste or occupation debris. A gully (2912) that abutted the ring ditch at the entrance had a similar fill (2913) with hazel and heather-type charcoal, along with traces of oak.

Within the ring-ditch were a number of pits, including (2916, 2918 and 2921). The fill (2917) of (2916) produced only traces of heather-type charcoal but the fill (2929) of pit (2918) produced more substantial amounts of charcoal, with oak, alder, heather-type and willow all represented together with a few carbonised cereal grains and arable weed seeds. This may be waste from cereal processing activities. The fill (2922) of pit (2921) was very different in producing large amounts of alder charcoal, with birch, hazel and oak also present. The amount of charcoal present is too large for background scatter and indicated deliberate dumping of hearth waste into the pit.

In the southern part of ST13 were two deposits (2907 and 2945) which were part of a lithic scatter that produced over 300 lithic fragments and suggest much earlier activity on the site prior to the construction of the ring-ditch enclosure. Deposit (2907) produced only trace amounts of oak charcoal, whereas (2945) contained small amounts of alder and birch charcoal.

Structure ST14

Ring-ditch (4057) was located in the north-west of the area, with an entrance facing north-east. The fill (4058) of the ring-ditch produced only traces of heather-type charcoal.

Structure ST15

Ring-ditch (1933) was located in the western part of the site, with an entrance to the south-east. The fill (1934) of the ring-ditch was very different to that seen elsewhere. The fill produced no charcoal remains but significant quantities of carbonised cereal grain, with emmer wheat and barley present. Some of the barely grains were further identifiable as naked barley. This combination of cereal types tends to suggest a Neolithic or early Bronze Age date for this deposit. These cereal grains may be the result of accidental combustion during the drying process and so the remains may have just been dumped into the ditch fill.

Structure ST16

Ring-ditch (1953) was also located in the western part of the site but with the entrance to the east. The fill (1954) produced small amounts of gorse/broom and heather-type charcoal, with a few cereal grains, including some that were identifiable as oats. This might suggest a medieval or later date for this fill.

Structures ST17, ST18 and ST35: Segmented roundhouses (Tables 9-12)

To the east of ST1 (palisaded enclosure) were two segmented enclosures, ST17 (714) and ST18 (788), that overlapped each other. However, it is not clear which enclosure is the earliest. A further segmented enclosure, ST35, was also located towards the northern boundary of the site.

Structure ST17

ST17 comprised segmented ditches (461 fills 462 463), (446 fill 447), (466 fill 467), (468 fill 469) and (726 fill 725). These fills generally contained mixed charcoal assemblages with hazel, heather-type and oak commonly present, with alder and willow also present in some samples. In addition, traces of oats, barley and possible wheat were also present. This combination of cereal types suggests a medieval or later date for these fills.

There were a number of pits and postholes located within the roundhouse. A possible post ring comprising seven postholes produced small amounts of mixed charcoal, including alder, hazel, heather-type and oak, from fills (681/680, 713/712 and 724/723). These assemblages are probably from scattered hearth waste and not the remains of posts burnt in situ. Pit (517) was located amongst the postholes and the fill also produced a mixed charcoal assemblage with alder, birch, heather-type and blackthorn type present.

Several pits or postholes were located at the various entrances to the ring-ditch. Pits (762 and 814) were located at the east entrance but the fills (763 and 815) produced only traces of alder and ash charcoal respectively and so do

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not provide evidence for posts burnt *in situ*. Pits (774 and 863) were located at the southern entrance to the ring-ditch. The fill (781) of pit (774) produced traces of heather-type and oak charcoal and a few cereals. The fill (864) of pit (863) produced only traces of heather charcoal and birch and so again, no evidence for posts if these were originally entrance postholes. The western entrance had a single pit (484) but the fill (485) produced only traces of heather-type charcoal.

A small group of six postholes were located to the exterior of the western entrance and may be the remains of a porch structure. Only the fills (109 and 119) of posthole (108) were examined and these produced significant amounts of heather-type charcoal, with a few grains of wheat and barley and occasional weed seeds. This assemblage suggests the remains of crop processing waste perhaps indicating that this area is where crop processing took place. There is no evidence for a post burnt in situ.

Structure ST18

The second segmented roundhouse (788) was located immediately to the east of ST17, with one ditch overlapping between each structure, although it was not possible to determine which structure was the earliest. As with ST17, ST18 also had four sections of enclosure ditch (717, 755, 775 and 789). The fills (718, 756, 776, and 790) contained small amounts of mixed charcoal, with traces of barley and wheat grains. These assemblages are similar to those from the fills of the ring-ditch sections from ST17.

There were sixteen postholes/pits in the interior of Structure 18. Of these, fills (068/067, 070/069, 828/827, 1228/1227 and 1231/1232) produced only traces of mixed charcoal, with heather-type present in most fills. Pit (865) was located in the centre of the structure and the fill (866) produced charcoal of alder, hazel, heather-type and oak, together with carbonised rhizomes, traces of barley grain and a tuber of tuber oat grass. This assemblage suggests domestic hearth waste. The tuber oat grass is a weed of arable fields but can also be eaten as a food in its own right.

There were also several pits outside the entrance to the structure. The fills (730 and 750) of pits (749 and 757/749) produced small amounts of mixed charcoal with traces of cereals, including wheat. These assemblages are consistent with those found within the structure and are probably the result of scattered domestic hearth waste.

Structure ST35

Segmented enclosure (1335) was located in the north of the site and comprised two curvilinear ditches (1281 and 1312), with entrances in the south-west and north-east. The fills (1282 and 1315) of these ditches produced only traces of oak charcoal with a few fragments of hazel nutshell in (1315). The quantities of oak recovered are not sufficient to suggest the remains of structural material.

A large pit (1279) lay just outside the south-east section of the enclosure ditch of ST35. Fire-cracked stones were recovered during excavation and the charcoal assemblage comprised small quantities of hazel, heather-type and willow with some carbonised rhizomes. This is consistent with dumped domestic hearth waste.

Structure ST19: rectangular enclosure (Table 13)

A rectangular shaped enclosure was located in the south-west of the site and was formed from two L-shaped ditches (3052 and 3306). The fills (3053 and 3307) produced only small amounts of mixed charcoal and a few weed seeds.

Structures ST20-ST28: pothole structures (Tables 14-18)

Several posthole structures were found in the south-west of the site.

Structure ST20

ST20 was a post-built timber circle roundhouse that was defined by a series of 11 postholes. Postholes (3042, 3044, 3032, 3005, 3003 and 3012) were examined and the fills (3043, 3045, 3033, 3006, 3004 and 3013) produced small amounts of carbonised remains with heather-type and oak charcoal present in most fills. In addition, traces of carbonised barley were recovered from pit (3032). It is possible that the oak and heather is related to structural remains but the quantities involved do not suggest the structure was destroyed by fire. These charcoal types seem to have been common across the site and are more likely to be evidence of scattered hearth waste.

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Two large pits (2961 and 3007) that were located within the structure had fills (2962 and 3008) that produced very similar charcoal assemblages of alder, heather-type and oak, with traces of carbonised barley and wheat. In addition, small fragments of cramp, which is often associated with burnt bone, were recorded from (3008). These deposits may be from midden or hearth waste.

Structure ST21

A second circular post-built structure was formed by 11 postholes, with a central posthole that may have been part of the roof support. Only fill (3821) of pit (3820) and fill 3845) of pit (3844) were examined. They produced only traces of mixed charcoal and a single indeterminate cereal grain and so provide little information about this structure.

Structure ST22

ST22 (3332) was a large oval, post-built enclosure that was located in the south-west of the site and was defined by a series of 76 postholes, with an entrance in the south-west. Posthole fills (3271/3270, 3285/3284, 3313/3318, 3405/3404, 3649/3648, 3690/3689, 3197/3196 and 3696/3695) were examined but these only produced small amounts of mixed charcoal. However, posthole fill (3127/3126) produced significant amounts of hazel charcoal, together with a single fragment of hazel nutshell. It is not likely that a structural post was made from hazel wood but this could suggest the presence of hazel wattle.

There were only a few features within the structure, including pits (2728 and 3284). The fills (2727 and 3285) produced only small amounts of mixed charcoal.

Structure ST23

ST23 was a trapezoidal post-built structure (3658) in the south of the excavated area, which truncated the large oval post-built ST22. The structure was formed by 31 postholes but only postholes (3398, 3663 and 3667) were examined. The fills (3664/3663 and 3668/3667) produced only traces of mixed charcoal, but fill (3399) of posthole (3398) produced significant amounts of oak charcoal, with a single wheat grain, which may be intrusive. The oak charcoal may represent the remains of an oak post burnt in situ.

Structure ST24

ST24 was a second trapezoidal post-built structure (3945), which was located to the south of ST23, and was formed from nine postholes. Of these, only postholes (3907, 3899 and 3887) were examined. The fills (3878, 3900 and 3908) produced only traces of mixed charcoal and a fragment of hazel nutshell.

Structure ST25

Towards the east of both trapezoidal post-built ST23 and ST24 was a further post-built ST25 that was rectangular in shape and was defined by 13 postholes. The fills (3327 and 3743) of postholes (3326 and 3742) both produced traces of oak charcoal, but not enough to suggest posts burnt in situ. The fill (3743) also contained a fragment of hazel nutshell.

Structure ST26

In the south of the site were a foundation gully and postholes from a large rectangular post-built structure with rounded ends. The structure was defined by a gully (2750) and 31 postholes, of which six were examined for the presence of botanical remains: (2847, 2752, 2756, 2792, 2823 and 2839). The fills (2848, 2753, 2757, 2793, 2824 and 2840) generally contained small amounts of mixed charcoal, with heather-type charcoal present in all fills. There were also traces of oats and barley grain in some of the fills. These assemblages are consistent with domestic hearth waste. The fill (2751) of gully (2750) also produced small amounts of heather-type charcoal, with traces of hazel and hazel nutshell. Another posthole (2780) was located just outside the gully. The fill (2781) produced only traces of heather-type charcoal.

There were also five postholes at the entrance to the structure, which may be the remains of an entrance structure. The fills (2691/2690 and 2693/2692) contained only traces of heather-type charcoal and barley grains.

A pit (2779), fill (2778), and a deposit (2846) in the interior of the structure also produced small amounts of mixed charcoal.

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Structure ST27

ST27 was located in the north-west of the site. The fill (1894) of curvilinear (1895) contained traces of heather-type charcoal, indeterminate cereals and hazel nutshell, indicating scattered domestic hearth waste. Two posthole fills (1885/1884 and 1916/1915) also produced small amounts of mixed charcoal, with traces of oats and barley grain in (1916).

Structure ST28

ST28 was located to the south of ST27. Only the fill (1853) of pit (1852) was examined but it produced only traces of oak charcoal and hazel nutshell. The oak charcoal is not in sufficient quantities to suggest the burnt remains of a structural element.

Structures ST31, ST34, ST37, ST38: curvilinear features (Table 19)

A number of curvilinear ditch features were identified across the site, which may be the remains of small structures.

Structure ST31

ST31 was located in the east of the site and was defined by ditches (1181 and 1145). The fill (1182) comprised small amounts of mixed charcoal, including heather and a few carbonised cereal grains. The fill (2386) of a pit (2355) on the north-east side of the boundary ditch (1181) produced only traces of oak charcoal and a single oat grain. Within the structure was a stone lined pit or cist (1996) that contained bone, pottery and lithics. The fills (1997) and (2141) were both unusual in producing large quantities of oak charcoal and nothing else. This oak charcoal could be the remains of an oak built structure or fuel associated with a cremation if the bone from this feature is from cremated human remains.

Structure ST34

ST34 was located immediately to the north of ST17 and to the west of ST1 and ST18. It was defined by ditch (942), fill (943), which contained only traces of hazel and heather-type charcoal and a single grain of barley. Within this structure were a number of pits, including (1011, 1032 and 1252). The fill (1012) of pit (1011) contained small amounts of a range of charcoal types, with alder, heather-type, cherry type and oak all represented together with a few grains of barley. The fill (1033) of pit (1032) produced alder, hazel and willow charcoal together with a few grains of barley and a fragment of hazel nutshell. Pit (1252) contained two fills, with the upper fill (1253) producing a mixed charcoal assemblage of alder, heather-type and oak, together with a few barley grains, one of which was further identifiable as naked barley. Naked barley tends to date to the Neolithic or Bronze Age in Scotland, although could persist as a weed of other crops into later periods. The lower fill (1254) also produced heather charcoal and barley grains but also two larger pieces of birch charcoal.

Structure ST37

Structure 37 was immediately to the south-east of ST31 and was defined by two curvilinear ditch fragments. Ditch (1131) was the inner ditch with ditch (1133) being the outer ditch. The ditch fills (1132 and 1134) produced small amounts of heather-type charcoal and traces of barley, together with oak charcoal in (1132) and willow in (1134). In addition, small fragments of carbonised Fucoid seaweed were identified from fill (1134). Burnt seaweed may be added to arable land as fertiliser or may be used in industrial processes but it is not clear why seaweed is present in this structure but nowhere else on site.

Structure ST38

ST38 was located immediately to the south-west of ST22 and was defined by a short curvilinear section of ditch (3505), fill (3506), which produced only traces of oak and heather-type charcoal. Pit (3511) was located inside the curvilinear ditch but the fill (3512) produced only traces of alder, heather-type and oak charcoal.

Pit Groups (PGs), pit alignments and isolated pits (Tables 20-26)

At least 12 pit groups were located across the site, together with pit alignments and other isolated pits.

Pit Group PG1

Pit Group 1 comprised 17 pits that were located to the south of Structure 2. The pits examined were (234, 242, 247 and 426). The fills (235, 240, 241 and 427) all contained heather-type

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charcoal, with either alder or hazel also present together with a few grains of barley. The fill (248) of pit (247) was very different with only small amounts of cinder and barley but very large quantities of hazel nutshell, together with three whole hazelnuts. This abundance of hazel nutshell is often associated with Mesolithic or Neolithic occupation.

Pit Group PG2

PG2 comprised three clusters of pits, immediately to the north of Structure 9. Pits (203 and 211) were part of the westernmost cluster. Fills (204 and 231) of pit (203) produced oak and heather-type charcoal, with a few grains of barley and a possible wheat. The fill (212) of pit (211) also contained heather-type charcoal, but with traces of alder and bone also present.

The central cluster of pits included pits (257, 263 and 291). The fills (258 and 284) of (257 and 263) produced traces of mixed charcoal with a few cereal grains. However, the fills (292 and 345) of pit (291) produced more significant numbers of cereal grains, with barley being the dominant type present, with only traces of emmer wheat also recorded.

The easternmost cluster of pits included pit (2442), with fill (2443), but this only produced traces of heather-type and oak charcoal.

Pit Group PG3

PG3 comprised 11 pits, and was located immediately south-west of Structure 9. Only pits (348 and 388) were examined and the fills (349 and 389) produced heather-type charcoal and oak, with traces of barley also present. In addition, small amounts of willow charcoal were also recorded from (389).

Pit Group PG4

PG4 was located partially beneath stone wall (1531) and comprised none pits. Pit (1596) produced burnt bone and worked stone and the fill (1597) also contained small amounts of hazel and heather-type charcoal with single grains of naked barley and wheat. Although the cereals are only present at trace levels, this combination of types might suggest a Neolithic or early Bronze Age date.

A flint scraper and lithic fragment were recovered from pit (1574), and the fill (1575) also produced a mixed charcoal assemblage of alder, hazel, heather-type and oak charcoal, with traces of barley. Pit (1551), fill (1552), produced only traces of oak and heather-type charcoal.

Pit Group PG5

PG5 was located in the northern part of the site and comprised 11 pits but only pits (1139 and 1317) were examined. The fills (1140 and 1318) both produced small amounts of heather-type charcoal and oak, with a single trace of hazel in (1140) and a single barley grain in (1318).

Pit Group PG6

PG6 lay to the west of Structure 10 and comprised 11 pits but only pits (1338, 1348 and 1361) were examined further. The fill (1339) of pit (1339) produced significant amounts of heather-type charcoal, with traces of hazel and willow also present. In addition, there were several carbonised barley, some of which were further identified as the naked variety, and some carbonised grassland weed seeds. The presence of naked barley suggests a Neolithic or early Bronze Age date for this pit.

The fills (1349 and 1363) of pit (1348) produced significant amounts of heather-type charcoal, with traces of hazel and oak, and a few grains of possible barley.

Pit (1361) contained three fills (1362, 1405 and 1406), with heather-type charcoal being present in all fills, but fill (1362) also producing traces of alder, birch, hazel and willow, and a fragment of hazel nutshell.

Pit Group PG7

PG7 was located to the south-west of Pit Group 5 and comprised 13 pits and four outlying pits. Of these, (1302, 1308, 1368 and 1373) were examined for the presence of botanical remains. The fill (1357) of pit (1302) produced only traces of heather-type and hazel charcoal, whilst the fill (1374) of pit (1373) produced heather-type and willow. The fills (1366 and 1367) of pit (1308) also produced traces of hazel and heather-type charcoal, but with a trace of hazel nutshell. Pit (1368) contained multiple fills (1369, 1370 and

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1380) which produced birch, hazel, heather-type, oak and willow charcoal, with traces of barley and emmer wheat, together with some seeds of grassland weeds.

Pit Group PG8

PG8 was located in the western area of the site and included seven pits, of which only (1576 and 1588) were analysed. The fill (1577) of pit (1576) produced birch and heather-type charcoal, burnt rhizomes, and traces of cereal and grassland weeds.

The fill (1587) of pit (1588) contained more heather-type charcoal, again with burnt rhizomes and a few seeds of grassland weeds.

Pit Group PG9

PG9 was in the north-east of the site and comprised 13 pits, of which (1614 and 1628) were examined. Pit (1614) contained three fills (1615, 1626 and 1617), which produced small amounts of heather-type charcoal and a few cereal grains. The fill (1693) of pit (1628) contained only traces of heather-type charcoal, birch and indeterminate rhizomes.

Pit Group PG10

PG10 was located in the north-west of the site and comprised 15 pits, but only pits (2112 and 2059) were examined. The fill (2060) of pit (2059) produced only traces of heather-type charcoal and a barley grain. The fill (2111) of pit (2112) also produced more significant amounts of heather-type charcoal, with traces of alder and hazel also present, along with a grain of oats and several grains of barley.

Pit Group PG11

PG11 was located in the north-east of the site, close to the fort, and comprised 10 pits and three outlying pits. Of these only pits (2273 and 2103) were examined. Pit (2273) contained three fills (2104, 2125 and 2126), which produced mainly heather charcoal with traces of hazel and oak, with traces of oats and barley.

Pit (2273) also contained three fills (2274, 2275 and 2276) and produced heather-type charcoal with only a single fragment of hazel, with traces of oats, barley and wheat. This combination of cereal types suggests a medieval or later date for this pit feature.

Pit Group PG12

PG12 was located in the southern area of the site, close to ST20. It comprised seven pits and a further eight outlying pits but only pits (2953, 2993 and 2965) were examined. In addition, a small section of curvilinear ditch (2955) was located around the north-east of the pit group. The upper and lower fills (2952 and 2954) of pit (2953) produced charcoal of heather-type, hazel and oak with traces of barley. The upper and lower fills (2994 and 2995) of pit (2993) produced a very similar carbonised assemblage as did the fill (2966) of the curvilinear ditch section but with alder in place of hazel. The upper fill (2966) fill of pit (2965) produced only traces of heather-type charcoal with a few grains of barley.

Pit alignments

Several pit alignments were located on the site. The largest pit alignment was located in the north-west of the site and it lay on an east / west alignment. Ten pits were excavated but only the two larger pits (1903 and 1908) and one smaller pit (1906) were examined. The fills (1905 and 1909) of the larger pits produced only a trace of hazel nutshell and hazel charcoal respectively. The fill (1907) of pit (1906) produced slightly larger amounts of charcoal with hazel, heather-type and oak all represented. In addition, a few grains of barley, an oat grass tuber, hazel nutshell and a few weed seeds were also identified. This material may be midden waste that has been dumped into the pit.

To the north of the above pit alignment was a second alignment that comprised four pits, with only pit (1990) analysed for botanical remains. The fill (1991) produced significant amounts of alder and willow charcoal suggesting the remains of hearth waste.

A small posthole/pit alignment was located within the internal area of ST10. It comprised two parallel lines of shallow pits but only pit (024) was examined for botanical remains, as it also contained prehistoric pottery and a lithic fragment. However, the fill (025) did not produce any identifiable botanical remains.

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A double pit alignment was found to the south of ST22, with two parallel rows of three pits each. Prehistoric pottery was recovered from some of these pits. The fills (3273 and 3283) of pits (3272 and 3282) produced only traces of mixed charcoal, with heather-type present in both.

Isolated pits

A number of isolated pits were located across the site.

A large pit (1548) contained a lump of Iron Age slag, which might have suggested metalworking debris. However, the fills (1549 and 1550) produced a mixed charcoal assemblage of heather-type, birch and oak, together with significant amounts of carbonised cereal grain, with both barley and emmer wheat present. This suggests the remains of cereal processing waste and so this pit may be a general rubbish pit.

Large pit (2083) produced a complete early Neolithic polished stone axe. However the fills (2084) and (2089) produced only traces of heather charcoal.

Pit (1817) produced a large number of pottery sherds, possibly dating to the Neolithic. The fills (1818 and 1819) produced only traces of heather-type charcoal and hazel, but also significant numbers of hazel nutshell fragments. Hazel nutshell is more commonly found in features that are Mesolithic or Neolithic in date.

Linear structures (Table 27)

A number of isolated linear and curvilinear features were located across the site.

Linear feature (952) produced a significant amount of possible Iron Age pottery in its fill (953) along with small amounts of heather-type and oak charcoal, a few cereal grains and a fragment of hazel nutshell, suggesting domestic midden waste.

A large ditch (2034) was also found to the west of the fort. The fill (2035) produced prehistoric pottery and a lithic fragment but only traces of heather-type charcoal and single grains of possible oat and possible barley. It is not clear whether these cereal grains may be from later scatter on the site.

A further linear feature (1621), fill (1621), also produced traces of mixed charcoal and cereals, with a fragment of carbonised wild radish pod.

A rectangular ditch feature (010) contained an 'ankle breaker' at its base, which might suggest an Iron Age/Roman date for this feature. The fill (011) produced only traces of hazel and heather-type charcoal with a fragment of hazel nutshell. A second rectangular ditch (590), fill (591), only produced traces of heather-type charcoal.

Two curvilinear features (018 and 2584), fills (019 and 2585), produced similar carbonised assemblages of heather-type charcoal and oak.

Fort ditches (Tables 28-30)

A series of five curvilinear ditches defined the area of the fort in the north-east of the site and they will be discussed from the outside inwards.

Ditch 4

Ditch 4 (2507) was curvilinear in shape and contained two fills (2508 and 2599) that produced only traces of heather-type and oak charcoal, cereal and nutshell.

Ditch 3

Ditch 3 (2529) contained three fills (2530, 2531 and 2532) that produced only traces of heather-type, hazel and oak charcoal, with small amounts of bone.

Ditch 2

Ditch 2 (2561) also contained three fills (2562, 2563 and 2564), all of which were silty sand. The bulk samples from the fills produced traces of alder, hazel, heather-type and oak charcoal, with a few cereal grains.

Ditch 2 was also sampled during excavation using monolith tins to provide samples for pollen analysis. Unfortunately, the sediments within the ditch were not ideal for the preservation of pollen since they are very sandy and so probably have not stayed waterlogged since deposition. Sandy sediments also have the possibility of percolation of pollen grains down through the section with the passage of water and so the stratigraphical relationships between different pollen levels may not be secure.

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The pollen counts from the 30 samples analysed were extremely low or produced no pollen at all. The few pollen grains that were recorded tended to be indicative of open grassland, with grass (Poaceae), sedges (Cyperaceae), pink family (Caryophyllaceae), dandelion type (Lactuceae), ribwort plantain (*Plantago lanceolata*), buttercup (Ranunculaceae) and devils-bit scabious (*Succisa pratensis*). The only tree pollen identified was alder (*Alnus* spp). A few grains of heather pollen (*Calluna vulgaris*) were also recorded but, considering that carbonised heather-type stems were common over the entire site, this does suggest extremely poor preservation of pollen in this sequence. In addition, fern spores were slightly more common than pollen, but these types are very resistant to decay and so provide further evidence for poor preservation of pollen in the sediments. The only other microfossils found were pre-Quaternary spores, which indicate redeposited sediments from earlier geological periods.

Ditch 1

Ditch 1 (2682) contained two fills (2683 and 2684) that produced only traces of heather-type and oak charcoal. This ditch was re-cut at some point (2685) and the fill (2686) produced only traces of alder and heather-type charcoal, with a fragment of hazel nutshell and a few burnt grassland weed seeds.

Ditch 0

The innermost ditch (2655), designated Ditch 0, contained five fills (2656, 2657, 2659, 2660 and 2661). The fills all produced small amounts of heather-type charcoal, with traces of hazel and oak present in some. A single fragment of hazel nutshell was recorded from fill (2660).

Kilns (Tables 31-32)

A number of different kilns, with different functions, were located across the site.

Double-flue kilns

Structure 32 was a large double flue kiln (2568) that was located close to the fort ditches. Both flues were lined with stones as was the central bowl and fragments of medieval pottery were found in the fill (2569). Fill (2569) produced a charcoal assemblage of alder, birch, heather-type, ash and oak, small amounts of carbonised oats and barley together with a few grassland weeds. It is not clear whether this kiln was ever used for cereal drying or whether the cereals are just part of organic material that was used for fuel.

A further double flue kiln, with two phases of use, was located overlying the fort ditches. The lower kiln (2611) had a primary fill (2610) that produced small amounts of hazel and heather-type charcoal, traces of cereal, hazel nutshell and grassland weeds. The upper kiln (2479) had fill (2612) within one of the flues. This fill produced small amounts of rowan type and heather-type charcoal with traces of oats and barley.

Corn-drying kiln

A keyhole-shaped corn-drying kiln (2113) was cut into the subsoil and lined with clay (2283). Above the clay was a silty sand fill (2144) that was thought to be the remains of a fire-pit left when the kiln was last cleared out. The fill (2144) produced significant amounts of alder, hazel and oak charcoal, which was presumably used to fire the kiln. In addition, large quantities of cereal grain were also recorded, with emmer wheat being the most abundant type present, although traces of oats and barley were also recorded. There were also numerous carbonised weed seeds that are characteristic of arable agriculture, in particular corn marigold, corn cockle and corn spurrey. Numerous carbonised seeds from the pea family were also recorded but these were too poorly preserved to be further identifiable, however they are not likely to represent cultivated peas.

Above (2283) was another charcoal rich layer (2115) that included patches of burnt wood that were thought during excavation to represent the remains of a wooden roofed construction that had burnt down. The carbonised assemblage from (2115) was extremely similar to that recovered from (2144), with the addition of a few fragments of ash wood in the charcoal assemblage. The similarities between the two assemblages does not really provide any evidence for a roofed structure that had burnt down, unless this roof material is also present in fill (2144).

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Lime kiln

Lime kiln (2017) was located in the eastern part of the site. It was oval in shape and its vertical sides were lines with two layers of burnt sand (2018 and 2019). However, no carbonised botanical remains were recovered from these fills.

Stone structures (Tables 33-36)

Several stone features were located across the site.

Structure ST40 - stone roundhouse

In the upper eastern part of the site were the degraded remains of a large stone structure that was covered by dark silty sand (2001), which produced charcoal of alder, hazel, heather-type, oak and fragments of cramp. Other finds included industrial waste, pottery, lithics and bone, suggesting occupation or midden waste across the site.

The northern section of the structure comprised two parallel walls (2010 and 2439), with associated deposits (2450, 2441 and 2455), which only contained traces of mixed charcoal. The outer line of facing stones had been set into a shallow ditch (2453) of an earlier enclosure. The fill (2454) of the ditch produced only traces of heather-type, oak and willow charcoal.

The southern wall (2466) was mainly rubble and the deposit (2467) around the stones produced only small amounts of alder, heather-type and oak charcoal, with a single fragment of hazel nutshell. A large pit or posthole (2477) was adjacent to this wall. The fill (2476) again produced a mixed charcoal assemblage of alder, heather-type and oak, with no evidence for a post burnt in situ.

The internal area was covered by on occupation deposit (2015) that contained large amounts of pottery, lithics and animal bone, but only traces of alder and hazel charcoal with a single fragment of hazel nutshell.

Within the internal area of the structure were two postholes (2492 and 2506). The fills (2493 and 2438) both produced small amounts of oak charcoal, but with other types and barley grains also present. These fills are probably from scattered hearth waste rather than evidence for posts burnt in situ.

Beneath the stone structure were the remains of a curvilinear enclosure (2453). Associated with this enclosure were pit (2451), fill (2452) that produced traces of heather-type and oak charcoal, with a possible barley grain, and a deposit (2495) that only contained traces of heather-type charcoal.

Structure ST41

ST41 was a sunken structure (368) located to the south-west of ST10. It was a large semi-circular feature which was covered by two deposits (406 and 407). Both fills contained heather-type charcoal with other types present in trace amounts. Deposit (407) also contained traces of oat and barley. A number of pit features were also located within this structure, of which (510, 670 and 464) were further examined. The fills (512, 513, 541, 564, 565 and 566) of pit (510) produced only traces of heather-type, alder, ash and oak charcoal with a few carbonised barley grains. The fill (669) of pit (670) also produced only traces of hazel and heather-type charcoal.

The fill (465) of post pit (464) produced a mixed charcoal assemblage of alder, hazel, heather-type, oak and willow, together with a few grains of barley. This assemblage is consistent with domestic hearth waste and there is no evidence for a post burnt in situ.

Structure ST42

ST42 was located near to the entrance of Structure 11, and was formed from flat stones and several uprights. Associated deposits (1625 and 1842) produced only tiny traces of oak and heather-type charcoal.

Structure ST43

A degraded curvilinear drystone structure ST43 was found in the north-east of the site. The fill (1691) of stone wall (1692) produced only traces of heather-type charcoal and a couple of oat grains. A pit (1690), fill (1693) did not produce any charcoal and only a single indeterminate cereal grain.

Structure ST44 - stone structure above internal fort ditch

The remains of drystone ST44, were located above the internal fort ditch (2655). A possible

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wall foundation (2644) lay above deposit (2653), which contained traces of hazel, heather-type and oak charcoal and a single grain of oats. To the south of these features was a curvilinear feature (2638) that lay below drystone wall (26470. The fill (2639) produced small amounts of alder, hazel, heather-type and oak charcoal, with a barley grain and a few indeterminate cereals.

Stone platform

A stone platform (2046) was one of five found on site. The deposit (2046) produced only traces of heather-type charcoal and a single grain of oat.

Stone wall footings

A degraded section of wall (1515) was located in the west of the site. The soil (1511) around the stones produced birch, heather-type and oak charcoal, with a grain of oats, oat grass tuber and fragments of hazel nutshell. This suggests scattered domestic occupation debris, but could date to any period.

A further stone footing (2412) was found to the east of the site and the overburden deposit (2460) produced only traces of heather-type and oak charcoal.

Miscellaneous (Table 37)

Shell midden

There were several concentrations of shells in the overburden deposit (147). These deposits were linear and it is thought they may be the remains of drainage material within field drains. Deposit (1559) produced only traces of heather-type charcoal, which seems to be ubiquitous across the site.

Structure ST36

ST36 was located to the east of Structure 31. Only one pit/posthole (1183) was examined and the fill (1184) produced only traces of alder charcoal and a barley grain, with no evidence for a post burnt in situ.

Miscellaneous

Two other pits were examined that did not appear in the DSR text and so have been included here for completeness. Pit (2894), fill (2895) produced hazel, heather-type and oak charcoal, while pit (3276), fill (3277) produced traces of alder and heather-type charcoal, with a fragment of hazel nutshell.

Discussion

Woodland & heathland resources

The contexts examined from Guardbridge produced a diverse range of charcoal type, all of which were native trees or shrubs that could have been sourced locally. Oak was one of the commonest tree charcoal types present on the site. Oak charcoal is often linked with the destruction of structures by fire but there seems little evidence for this from most of the structures at Guardbridge, since only small quantities of oak charcoal were generally recorded in any one context. The only structures with more substantial quantities of oak charcoal were from pit (1590) in ST11, the cist fill from ST31 and the fill of a posthole (3398) from ST23. These contexts may contain the remains of oak structures burnt in situ. Other situations where oak charcoal can be abundant is when metalworking or other industrial activities are taking place since oak wood and charcoal has a higher calorific than most other European woods (Gale and Cutler 2000) and so can maintain the even, high temperatures required for smelting or other metalworking processes. Although some metalworking waste was recovered from the site, the contexts containing high quantities of oak do not correspond with those producing the metalworking waste.

Heather-type charcoal was recorded in almost all contexts that produced any charcoal remains. However, only three features produced significant amounts of heather-type charcoal, namely pit (108) from ST17, pit (423) from ST3 and pit (2993) from PG2 and so these may represent deliberate collection and burning of heather-type stems or may be the remains of burnt roofing or flooring material that has been dumped into the pits. The presence of heather-type charcoal over most of the site may represent the burning of heathland vegetation whilst clearing various parts of the site prior to occupation. This would explain why there may be a general scatter of heather-type charcoal across the whole site and in almost all fills or deposits.

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Cereal grain

A wide range of cereal types were identified from this site and combinations of these types suggest different periods of occupation. Naked barley (*Hordeum vulgare var nudum*) is particularly prevalent in the Neolithic in Scotland and often occurs with wheat (Bishop *et al.* 2010). Naked barley was found at trace levels in ST34 and pit (1338) from PG6 but in larger quantities from isolated pit (1550) and from the fill of curvilinear (1933) in ST15. The contexts with significant numbers of naked barley also produced grains of emmer wheat. This combination of grain types suggests that these features may be Neolithic in date. There is little evidence for crop processing waste, other than a few crop weed seeds.

The greatest concentrations of cereal grains were recovered from the corn drying kiln (2113). Thousands of grains of emmer wheat were identified, with only traces of barley and oats, which may have been weeds within the wheat crop rather than evidence for the cultivation of these crops in their own right. Emmer wheat is recorded in Scotland from the Neolithic period, is most commonly found during the Iron Age, but is then relatively rare by the 5th century AD (Gibson and Stevens 2007). The corn-drying kiln fill produced medieval pottery, which might suggest a later than usual date for this emmer wheat, but AMS dating of this feature will clarify whether the pottery may be later than the feature or whether this is a particularly late concentration of emmer wheat. The corn-drying kiln also produced large numbers of carbonised weed seeds that would be consistent with arable agriculture.

There were also numerous carbonised weed seeds that are characteristic of arable agriculture, in particular corn marigold, corn cockle and corn spurrey. Numerous carbonised seeds from the pea family were also recorded but these were too poorly preserved to be further identifiable, however a species such as *Vicia cracca* (tufted vetch) would be a potential source of these seeds as it is commonly found in arable fields with the other species mentioned above. No chaff, other than a few culm fragments, was recovered and so this appears to be cleaned grain, with weed seeds that were incorporated during harvesting.

Significant numbers of barley and oat grains were recorded from the flue of one of the double flue kilns and from pit (1824) in Structure 11. This combination of grains suggests a medieval or later date for these features. Although barley is grown throughout both the prehistoric and historic periods in Scotland, oats are really only common in mainland Scotland from the medieval period onwards.

Other food plants

Other than cereal grains, very few types of possible food plant remains were recorded from this site. Hazel nutshell was found at trace levels in many contexts, suggesting that hazel nuts were being eaten, probably throughout the occupation of the site. However, large quantities of hazel nutshell fragments were found in pit (247) from Pit Group 1, along with three whole hazelnuts. Large quantities of hazel nutshell are often associated with Mesolithic or Neolithic features and prehistoric pottery was recorded from this feature. AMS dating of the nutshell will clarify the exact date for this feature and, by association, for the pottery.

Unusual possible food plant finds were occasional carbonised tubers of tuber oat grass (*Arrhenatherum elatius* ssp *bulbosum*). Oat grass occurs as two different subspecies, *Arrhenatherum elatius* ssp *elatius and Arrhenatherum elatius* ssp *bulbosum,* but only the latter subspecies produces a swollen basal stem which contains starch and can be used as a foodstuff (Effenberger *et al.* 2021). The tuberous form of oat grass tends to grow in as a weed in arable fields and so could have been collected as an additional food source or there is also a suggestion that the whole plant can be used as tinder material (Robinson 1988).

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Micromorphology analysis summary

By Dr Carol Lang[2]

Introduction

This report provides a summary of the findings from micromorphological analysis of undisturbed sediment samples collected from a site adjacent to Seggie Farm, Guardbridge, near St Andrews, Fife during archaeological investigation. The full report forms part of the site archive.

The landscape under archaeological investigation had revealed intensive human activity at the site of the multi-vallate fort over centuries. Micromorphological investigation took place of the soil thin sections (K1 (4655), K2 (1635), K4 (1643) and K5 (1655) from the deposits in the fort ditches to determie their formation. The developmental relationship between ditch (2592) and ring ditch (2619) was undertaken with Sample K3 (1636) (Figure 85).

Results

Micromorphological investigation of the soil thin sections from Guardbridge, Fife has characterised the deposits and has identified evidence to indicate that there has been a high level of mixing occurring in the soils. The undisturbed soil samples collected from the archaeological investigation were derived from similar parent material and had undergone similar pedological development in the lower part of the ditches, compared to the soil collected at the interface between the ditch and the ring ditch.

There is clear delineation between depositional processes, indicating a hiatus in sediment deposition, the abrupt boundary between Regions in samples K1 and K2 indicative of this. The variability in the colour of the soils within the samples signifies amorphous organic matter and the incorporation/mixing of soil. This is evident most notably in samples K3 and K5, where evidence of 'sods' of soil, containing increased organic matter have been mixed into the soil as there is clear definition between the different soils and their organic content (Figures 86 and 87).

The development of the soil indicates that there has been surface disturbance in K1 particularly, with the formation of textural pedofeatures, while localised waterlogging has provided the mechanism for the formation of redoximorphic features in all samples.

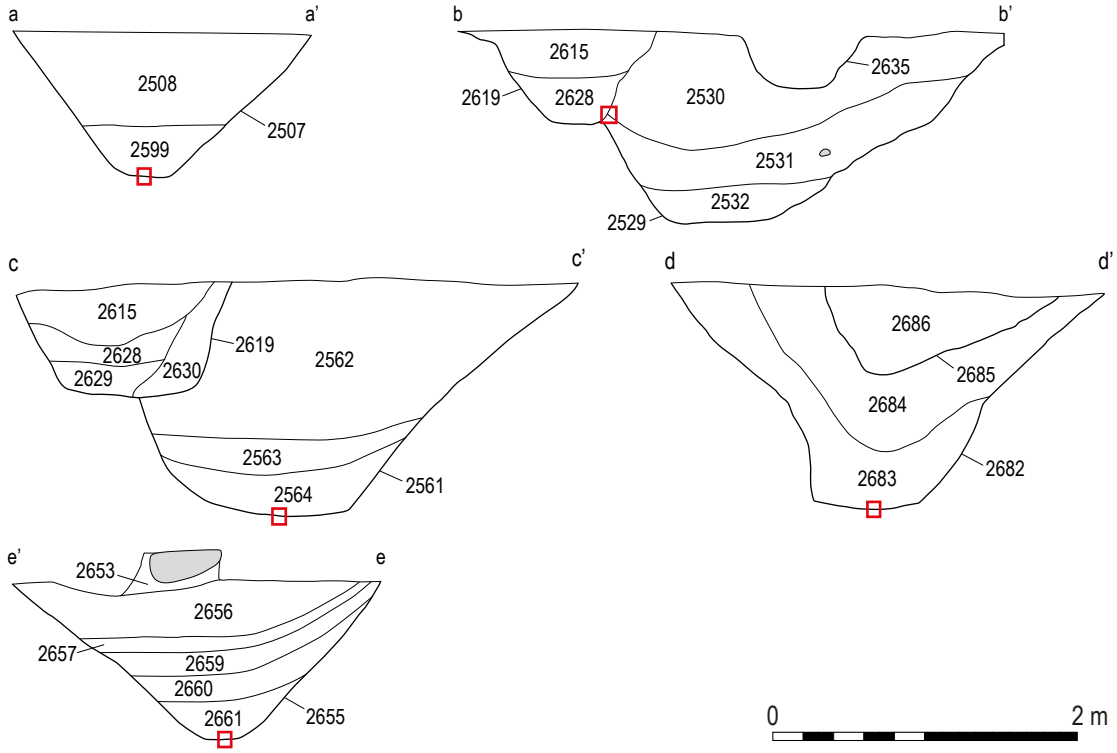


Figure 85: Ditch sections with kubiena samples located.

2 Lang Geoarchaeology, Hamilton.

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Micromorphological investigation has determined that there was variability in the pedogenic processes occurring in the samples. There is little evidence in sample K4 of disturbance and anthropogenic activity. However, the presence of a higher frequency of amorphous organic matter being mixed into samples K3 and K5 confirms that digging in of upper, more organic soils during construction of the ditch. Additionally, there is evidence to indicate that during construction that in sample location K1 and K2 there was a hiatus prior to the deposition of material with higher organic content. It can tentatively be hypothesised that topsoil had been dug into the ditches during construction. There is little evidence to indicate a difference in the interface sample K3 and the other sample locations in the ditches (K1, K2, K4 and K5).



Figure 87: Thin section of sample K3, the interface between ditch 2592 and ring ditch 261.

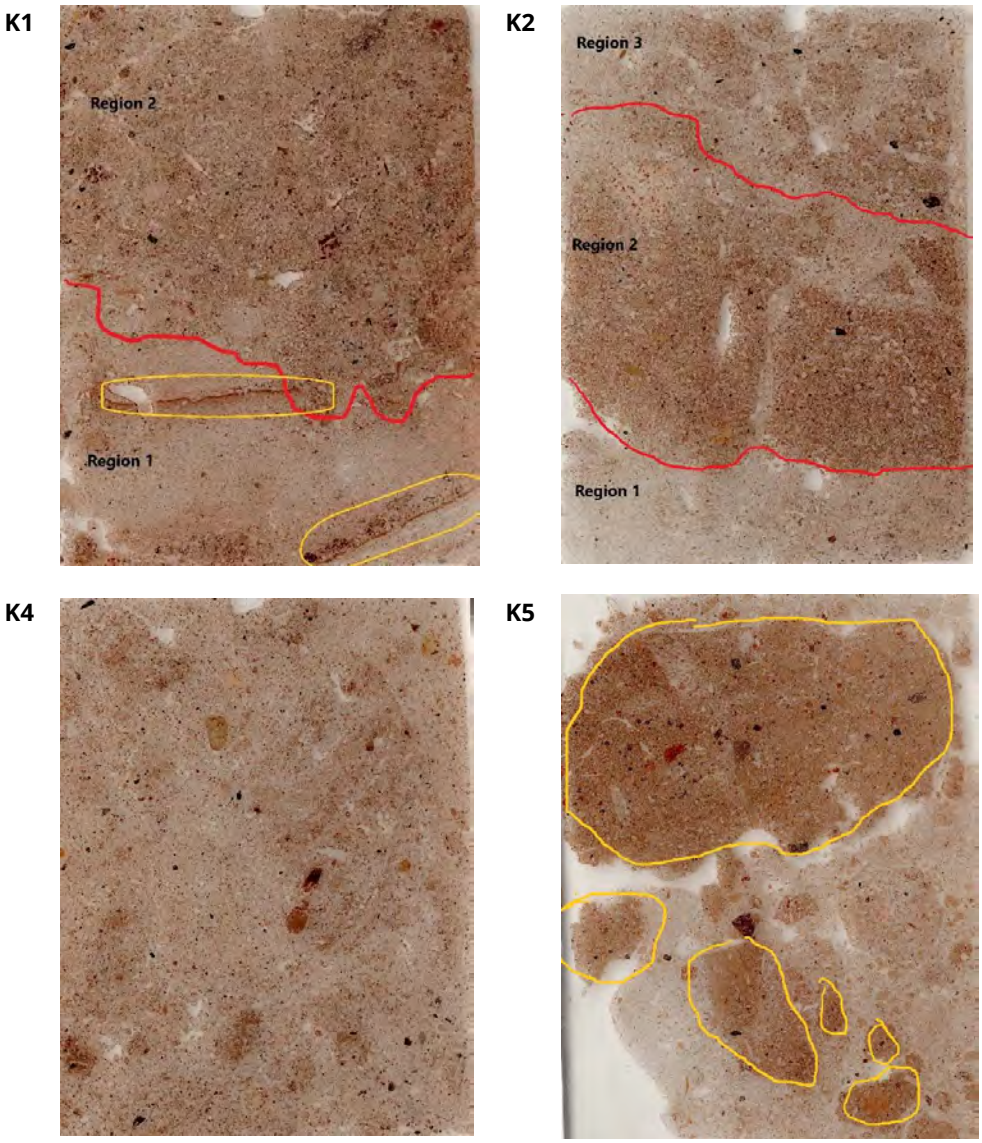


Figure 86: Annotated thin sections of the samples from Guardbridge: K1 displays two significantly different microstratigraphic regions and 2 areas of ferruginisation; K2 contains three different microstratigraphic regions; K4 has a homogenous appearance and K5 exhibits a moderately developed microstratigraphy with variation in the composition of the c/f ratio, highlighted in yellow

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Biomarker interpretations from pit sediments

By Dr Helen Mackay[3]

Background and context for lipid biomarker interpretations

Lipid biomarkers were extracted from two sediment samples (S4760 and S4761) from pits excavated at Guardbridge, Fife. The sediment samples were described as greasy sand deposits. Lipids were extracted from these samples and integrated by the BECS laboratory group. Four fractions were analysed (Table 3) to characterise the content of the sediment samples. This is a shortened report of the initial assessment of the lipid composition of these archaeological sediment samples. The full report can be found in the Guardbridge Archive.

Fats and oils summary

In summary, both samples have fatty acid and fatty alcohol distributions that could originate from mammalian and/or plant sources such as seeds/nuts/berries. Ratios of reported compounds do not provide evidence to support a ruminant source; however, δ13C analysis of C16:0 and C18:0 fatty acids would be required to confirm this and advance overall characterisation of the source material. The samples have significantly different fatty acid distributions, which could indicate differences in the sources of fatty acids, but again isotope analysis is required to confirm this as it is not apparent from diagnostic ratios. Higher concentrations of fatty acids and fatty alcohols are detected in S4760. This could represent differences in amounts of initial deposition and/or preservation rates.

Summary of the biomarker interpretation

Key findings from lipid biomarkers

- Terrestrial plants are a key source of lipids in these deposits (based on n-alkanes, fatty alcohols and fatty acids)
- Burning events contemporary with both sedimentary deposits, possibly from gymnosperm fuel, and more burning activity associated with S4761 (based on PAHs)
- Oils/fats present and originated from plants and/or mammalian sources (based on fatty alcohols and fatty acids)
- S4760 likely had more concentrated initial input of oils and leaf waxes and/or higher rates of preservation than S4761 based on the higher S4760 concentrations of n-alkanes, fatty alcohols and fatty acids lipids.
- Generally, the lipid sources of both samples are similar; however, the fatty acid distributions are statistically different and may therefore represent different and/or mixed sources of fat input.

Fraction	Main target lipids compounds	Origin of lipids
N1	n-alkanes	Leaf waxes indicative of vegetation inputs
N3	Polycyclic aromatic hydrocarbons	Burning/incomplete combustion of organic matter
N2 & A2	Fatty alcohols and fatty acids	Oils and fats (from plants, animals and microbes)

Table 3: Lipid biomarkers analysed in this study and their source in archaeological sediments.

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Animal bone

By Catherine Smith

Introduction

Animal bones recovered from hand-excavated archaeological features at Seggie Farm totalled some 2477 fragments, from all time periods of the site. Over a third (38.8%) of the bone fragments were burnt or calcined. Tooth fragments were also almost all probably subjected to heat, although it was not possible to determine by appearance. Fragment size of both bones and teeth was generally small, and limited to a small number of fragments per context, with the exception of a few contexts in the fort area. Unusually for this site the assemblage from context (2621) comprised larger fragments of unburnt bone. Bone fragments were also retrieved from sieved soil samples but did not consist of identifiable material.

Methods and measurement

Bone fragments were allocated to particular bone and species where possible. However bone condition was in many cases poor and fragments were small, with only a few exceptions, noted above. In order to avoid over-confidence in identification of small fragments, some are described as 'cf' particular species. The terms large ungulate, small ungulate and indeterminate mammal were used for lower levels of identification, the first two mainly used for tooth enamel fragments which were likely cattle and sheep/goat respectively. Tooth fragments which had probably originated from the same individual tooth are recorded in the Catalogue as minimum numbers of teeth, in order to avoid overinflating the true number. Tooth count was based on the numbers of dentine pillars in each SF numbered bag, on the basis that the first and second molars (M1 and M2) break down into two dentine pillars and the lower third molar (M3) and third deciduous premolar (dm3) into three.

Large ungulate bones were most likely to have come from cattle or horse but could also have come red deer, although as deer were not definitely observed at the site their presence can probably be discounted. Similarly, small ungulate bones were most likely to have come from sheep, but could possibly have originated from goat, pig or roe deer. All other mammalian fragments for which neither species nor bone could be ascertained were described as indeterminate mammal.

Measurements were made in accordance with the scheme of von den Driesch (1976) and are expressed in millimetres. Mandibular tooth wear and eruption patterns were assessed using Grant's (1982) scheme. Diagnostic zones present in individual bone elements were recorded using the system of Dobney and Rielly (1988).

Condition scoring: The following attributes were scored and recorded in the Catalogue:

General: provides a general short-hand description of the overall condition of the bone. May be one of the following (numerical score in brackets): very poor (1), poor (2), fair (3), good (4). 'Good' would be applicable to fresh bone.

Surface abrasion: describes the degree of erosion of the surface caused by taphonomic factors such as weathering, soil conditions, etc. Scored as heavy (1), moderate (2) or slight (3).

Density: describes the 'heaviness' of the bone. In general, the more well-preserved a bone is, the heavier and denser it appears to be, whether through retention of organic material or re-mineralisation from the soil. Scored from 1 to 5, where 1 is the least dense.

Friability: describes the degree of crumbliness. Scored from 1 to 5, where 1 is the most crumbly and 5 is the least crumbly.

Total score for poorly preserved bone is therefore lower than that for well-preserved bone. The most poorly preserved would score only 4 points while the best could potentially score 17 points.

Results

Species present and relative abundance

Species identified across the whole site and all time periods were cattle (162), cf cattle (9), sheep/goat (16), cf sheep/goat (1), pig (35), horse (6), cf horse (1), large ungulate (67), small ungulate/?small ungulate (7), ungulate (28), indeterminate mammal (2145) (numbers of fragments in brackets). Total number of fragments recorded was 2477.

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The numbers of bone and tooth fragments from each taxon grouping is shown in Table 4. The high number of indeterminate mammal fragments is an indicator of the poor condition and small size of the majority of bone fragments outwith the fort area.

Type	Bone	Tooth/ fragments	Total
cattle	76	86	162
cf cattle	4	5	9
sheep/goat	6	10	16
cf sheep/goat		1	1
pig	11	24	35
horse	1	5	6
cf horse		1	1
large ungulate	65	2	67
small ungulate	4	1	5
?small ungulate	2		2
ungulate		28	28
indeterminate mammal	2132	13	2145
total	2301	176	2477

Note: fragmentary teeth are recorded as minimum numbers based on dentine pillars

Table 4: Total numbers of fragments by species.

Percentages are based on fragment count of cattle, sheep/goat, pig and horse only. Cattle appear to be the most abundant species (74.0%). While pigs are present they are not common (16.0%) and sheep/goats are even less abundant (7.3%) than pigs. Horses are present but are a minor contributor to fragment count (2.3%).

Minimum numbers of animals (MNI) based on the most commonly occurring elements across the whole site are: four cattle, one sheep/goat, two pigs and one horse although clearly the large date range over which the bones are spread means that MNI is a poor indicator of abundance through time. It is clear that domesticated animals were exploited rather than wild species such as deer and small game, neither of which were identified in the assemblage. Bird and fish bones were also absent, but this is not unexpected for reasons of preservation and recovery.

Distribution of bones across the site

In Table 5, cattle bones from across the whole site are grouped by particular bone (anatomical element). It can be seen that the most numerous elements are teeth and that all parts of the skeleton are represented. This probably means that animals were butchered, processed and consumed on site.

Bone	L	R	L/R	Total
skull fragment			3	3
horn core	1		1	2
maxilla	2	1		3
premaxilla	1			1
mandible	1	5	9	15
tooth			86	86
scapula	1	2	2	5
humerus, entire	1			1
humerus, distal	2	2		4
humerus, shaft			1	1
radius	1	1		2
ulna		2		2
carpal			2	2
metacarpal, proximal	1		1	2
metacarpal, distal			1	1
innominate	1		2	3
femur, proximal			2	2
femur, shaft			1	1
tibia, proximal		2		2
tibia, distal	1	1		2
tibia, shaft			1	1
astragalus	1	1		2
naviculo-cuboid		1		1
calcaneum/os calcis			1	1
metatarsal, proximal		4	2	6
metatarsal, distal		1	2	3
metatarsal, shaft			3	3
phalanx 1			2	2
phalanx 2			2	2
phalanx 3			1	1
total	14	23	125	162

Table 5: Cattle bone by anatomical element.

Table 6 compares fragments by species and site feature, grouping them into pits and pit groups, context (2621) alone, and all other features both including and excluding (2621), which was a stone structure ST33 above the internal fort ditch. Context (2621) contained the highest number of cattle fragments found in a single deposit SF 1203 and SF 1205, consisting of 59 bones from a minimum number of three animals. Bones in (2621) may be of later date than the highly fragmented and burned material more typical of the early periods of the site.

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Species	No. of bones in pits and pit groups	No. of bones from non-pit features including (2621)	No. of bones from (2621)	No. of bones from non-pit features excluding (2621)	No. of bones across whole site
cattle	15	147	59	88	162
cf cattle	2	7		7	9
sheep/goat	2	14	5	9	16
cf sheep/goat	1				1
pig		35	25	10	35
horse	1	5		5	6
cf horse	1				1
large ungulate	2	65	10	55	67
small ungulate	1	4	1	3	5
?small ungulate	2				2
ungulate	14	14		14	28
indeterminate mammal	542	1603	1016	587	2145
Total	583	1894	1116	778	2477
%	23.5%	76.5%	45%	31.4%	100%

Table 6: Animal bone from pits and pit groups and other features.

Fragments from pits and pit groups were too infrequently preserved to identify any pattern of deposition, other than that species found in pits comprised cattle, sheep/goat and horse, while pig was absent, unsurprising given the small sample size. On fragment count, 23% of the bones from the site were recovered from pits. Of these, bone associated with a pit in ST2 (035) was dated to 923 – 817 cal BC (UBA-51742).

The single largest assemblage of bone from any one context, (2621) comprised 1116 fragments or 45.0% of the total for the site. In (2621) cattle, sheep/goat and pig remains (as well as fragments identified less specifically) were identified. The remaining features contained 31.4% of the fragments and comprised cattle, sheep/goat, pig and horse as the main species.

Ages of animals at death

Cattle

Only three mandibles survived with the cheek tooth row still in place. All three came from animals which had reached adulthood at the time of death. Two came from ST44 (2553)/SF 1216 and ST33 (2621)/SF 1205 and had reached Grant's mandible wear stages 39 and 45–47 respectively, meaning they were fully mature. Similarly (902)/SF 421 had a mandible wear stage of 39. Of the many loose tooth fragments retrieved, however, three were lower deciduous third molars (dm3) and three were upper deciduous molars (dm) indicating that juveniles had indeed been present.

For long bones, epiphyseal fusion evidence was also sparse. Over the whole site only 19 examples preserved evidence of fusion of epiphyses: ten bones came from immature/adult animals and nine from adults. No long bones from juvenile animals or neonatal calves were retrieved, but this was almost certainly due to the poor conditions of preservation.

Sheep/goat

No sheep/goat mandibles were present and all ovicaprine tooth fragments, where large enough to be determined, came from adults. Epiphyseal fusion evidence was equally sparse, but a femur with an unfused trochanter was from a juvenile/ immature animal (147)/SF 1137.

Pig

No pig mandibles were recovered but a maxilla with an upper third molar in wear was an indicator of maturity (2621)/SF 1205. One loose lower deciduous third molar (dm3) from a juvenile was found in the same context.

Horse

The only evidence of age came from a row of loose cheek teeth which all came from the same

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mandible, thought to be from an animal which had reached at least 5 years of age (48003)/SF10.

Size of animals

A small number of cattle bones were well enough preserved to warrant taking anatomical measurements, which are summarised in Table 7. No measurements were possible for the other species. Few published comparanda are available for bones of any period in mainland north-east Scotland prior to the medieval. There are a few measurements however for Clatchard Craig, a hillfort near Newburgh, Fife. Bones of cattle recovered from the ramparts there, dating to the sixth to seventh centuries AD, were all smaller than any measured at Seggie Farm (distal humerus, distal metacarpal, astragalus and proximal metatarsal) (Barnetson 1986, fiche 1:B1–C4).

Bone	Measurement	Context 57013	Context 902
humerus	Bd	73	77
	BT	66.2	70.3
	HT		37.2
	HTC		40.1
	SD		34.3
		Context 2621	
metacarpal	Bd	48.2	
	Dd	27.4	
		Context 866	
tibia	Dd	40.5	
		Context 2621	
astragalus	GLl	59.4	
	Bd	38.2	
		Context 2621	Context 2480
metatarsal	Bp	39.8-46.2	
	Dp	42.0-44.4	
	Bd		66

Measurements follow the scheme of von den Driesch (1976) and are expressed in millimetres

Table 7: Cattle anatomical measurements.

Bone abnormalities

A slight dental abnormality was observed in a cattle lower third molar in which the 5th cusp (or third pillar) was reduced in size (902)/SF421. This variation has also been observed in Scottish Iron Age cattle at two sites in East Lothian, at Fishers Road, Port Seton (Hambleton and Stallybrass 2000, 150) and Broxmouth Hillfort (Cussans *et al.* 2013, 460) as well as a number of Roman sites in the north of England and is considered a congenital non-metric trait, possibly indicating inbreeding (Hambleton and Stallybrass 2000, 150).

From an articulating set of thoracic vertebrae from a large ungulate (probably cattle) found with associated ribs there is some evidence of arthritic changes. Small, rough but dense, sclerotic patches of extra bone were present on three vertebral centra, indicative of changes within the joints, probably affecting the cartilaginous intervertebral discs (2621)/SF 1205. It is not possible on this evidence alone to diagnose osteoarthritis, but the animal's joints certainly show signs of 'wear and tear'.

Butchery

There was some evidence that bones had been butchered, mainly in the form of hacking cuts or chopped surfaces caused by a sharp implement such as an axe. Seventeen examples of chopping or hacking were observed in cattle mandibles, skull and long bone fragments. In one cattle skull and horn core fragment, a hack was placed parallel to the sagittal suture, in order to split the skull in half (2621)/SF 1205.

Of the abnormal large ungulate vertebrae noted above, one was chopped in half in the sagittal plane, one was chopped both sagittally and dorso-ventrally and another chopped both sagittally and in a cranio-caudal direction. Several rib shafts found with these articulating vertebrae indicate that one joint of meat, from a carcass divided into sides, had been present and the bones disposed of together. Possibly the vertebrae were discarded with some soft tissue still holding them together (2621)/SF 1205.

A pig mandible was chopped in half at the symphysis (2065)/SF 921. Only one bone displayed a knife cut: this was a small ungulate rib shaft (147)/SF 1137.

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Discussion

With the exception of a few contexts including (2621), a stone structure above the internal fort ditch, most of the bone fragments from across the site at Seggie Farm were highly fragmented due to having been subjected to high temperatures. Many fragments consisted of disintegrated cattle or sheep/goat tooth teeth, probably also burnt. The most likely source of heat would have been brightly burning domestic fires. Bones could have been thrown into fires in order to dispose of them after a meal but it is also possible they could have been deliberately used as fuel since their organic component and associated fats burn well and produce heat.

Evidence that domestic animals were utilised for their meat comes from butchered bones. Butchered fragments were mainly found in (2621), which may have been of later date than many of the early burnt fragments which were too small to preserve evidence of butchery.

Domestic species such as cattle survived into adulthood but on the evidence of loose deciduous teeth, juvenile cattle, sheep/goats and pigs must also have been present. It is likely that the adult cattle and sheep represent breeding stock which could also provide dairy products, inferring a good level of stockmanship and availability of both winter fodder and shelter needed to see the animals safely through to the next spring.

A small number of anatomical measurements of cattle bones were larger than examples recorded at the Iron Age hillfort of Clatchard Craig. This may indicate a later date for the material from Seggie Farm but as the sample sizes are very small in both cases this may be a chance finding. An abnormality of cattle teeth reported from sites of Iron Age date in Scotland was also noted in material from Seggie Farm - thus there are both similarities to and differences from other prehistoric sites.

Faunal assemblages of Neolithic and Iron Age date do not survive well in central and north-east Scotland due to the acidic nature of soils in this region (Smith n d). Observations from Seggie Farm have thus added a little more data to what we know about animal husbandry and exploitation in this part of Scotland in the prehistoric period.

Human remains

By Maureen C. Kilpatrick

Introduction

The remains of an incomplete articulated inhumation burial (skeleton 1) were recovered from a shallow scoop (152) within the internal area of enclosure 054 of ST2. The scoop (152) was located between two pits (153 and 159), which contained prehistoric pottery fragments (SF 95, 97-101). The pits and inhumation were located close to the south-west of the wide south-facing entranceway of the enclosure. The structure is part of a multiphase prehistoric settlement located adjacent to the remains of a multi-ditched fort overlooking the Eden Estuary and was excavated prior to development of the site. The remains were orientated NW/SE with the head facing north-east and the body within a crouched position with both the legs and arms tightly flexed.

Methodology

The macroscopic analysis was conducted using standards outlined by Buikstra and Ubelaker (1994) and Brickley and McKinlay (2004) and recorded on GUARD proforma skeletal recording sheets. Skeletal completeness was calculated on the percentage of the skeletal material present for analysis and on the surface erosion of the cortical bone in accordance with McKinley (in Brickley and McKinley 2004). The minimum number of individuals (MNI) present was calculated using the most repeatable skeletal elements and those of differing skeletal age. The biological age and sex could not be calculated due to the very degraded and partial nature of the skeletal remains. Metric and non-metric data could also not be gathered due to the poor state of the remains. Each bone of the skeleton was observed for evidence of pathology and it was recorded according to possible cause. Unfortunately, due to the fragmentary nature of most of the bones present, predominantly due to post mortem damage and disturbance, it was difficult to diagnose disease with overall certainty as most diagnosis usually requires a complete skeleton, which can be examined for overall distribution patterns of observable lesions.

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SK No	Preservation	MNI	Age	Sex	Pathology
1	<10 (%)	1	Adult	No	No

Table 8: Human Remains.

Results of the analysis

A summary of the results of analysis of Skeleton 1 is displayed in Table 8.

Completeness and preservation

Preservation of this skeleton was very poor with only approx. <10% available for study (Figure 88). All of the right side of the individual was absent probably due to later disturbance in the area, with only the left side of the skeleton surviving albeit very degraded and with missing fragments. Unfortunately, the bone was in a very poor state prior to lifting and had further disintegrated during storage. The fragments of the left humeral shaft, radius and ulna that were visible during excavation were no longer observable due to further fragmentation as the bone dried out. A small fragment of the innominate bone acetabulum was present as was a fragment of left temporal bone. The best preserved was a fragmentary section of mid to lower shaft of the left femur and tibia. Two small rib shaft fragments were also observed. All bones had cortical surface erosion estimated at grade 2-3 (McKinley in Brickley and McKinley 2004).

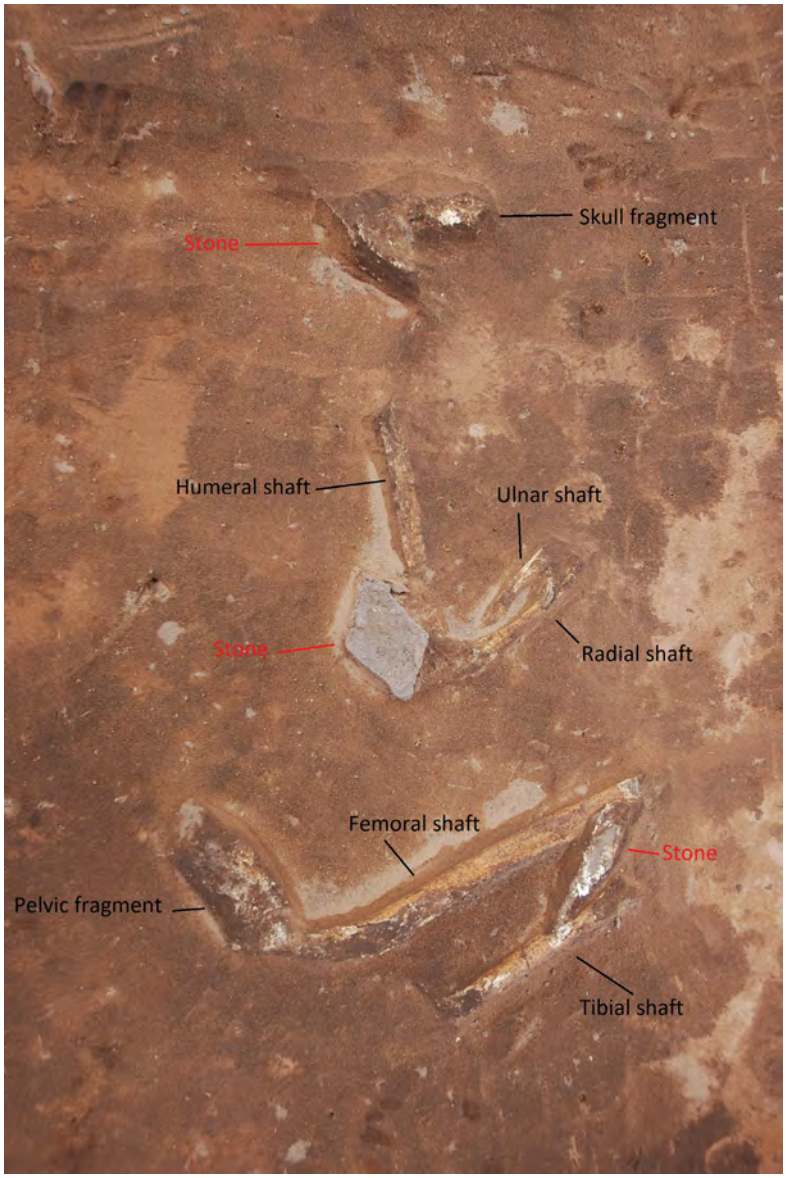


Figure 88: The skeleton during excavation.

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MNI and biological sex

A minimum number of one individual was present with no repeatable elements observable although as mentioned above the skeleton was in a very poor state. Biological sex could not be observed in any of the surviving bone fragments.

Age at death

Age at death could also not be observed due to the absence of skeletal elements used during this observation. This includes skull, pelvis, dentition, bone fusion and age-related changes. However, the relative size of both the femoral and tibial shafts would suggest that the individual had reached a minimum age of late teens/early adulthood prior to death.

Radiocarbon Dating

A fragment of left tibial shaft (4.3 g) was radiocarbon dated to 813 – 772 cal BC (UBA-53328) at 2 sigma, a date within the very early Iron Age.

Conclusion

A single crouched inhumation burial comprising of one individual was recovered from a shallow scoop within the south-west internal area of ST2. Due to the fragmentary and poor remains of the bones it was impossible to decipher sex, age and cause of death.

Initially, it was thought that the burial, due to its crouched position, would be Bronze Age in date, but without the formal setting of a cist or other burial structure. However, radiocarbon dating has provided a date from the very early Iron Age.

Research suggests that there appears to be a large variety of mortuary practice during the Iron Age which includes crouched inhumation burials. Cook (2018) referred to this in his work on the Atlantic seaboard of Scotland where several sites containing human remains dating to the Iron Age were excavated following their accidental exposure due to eroding sand dunes. These included evidence of re-use such as at Drimsdale in South Uist (Cook 2018) where an adult crouched inhumation was placed within a much smaller cist leading to the legs being placed within a crouched upright position against the cist sides. It was suggested by the author that it was evidence of the re-use of an earlier cist to accommodate a later burial. Another burial at Valley, North Uist comprised an individual in an extended position which was placed directly into the ground. Two stones were noted at the feet of the skeleton which might represent a stone setting. Human remains have also been found at caves sites during the Scottish Iron Age and include High Pasture Cave on Skye which contained the remains of multiple individuals and at MacArthur Cave, Oban which contained the remains of four individuals although there is debate whether they were articulated or disarticulated when found (Hume and Armit 2024).

Burials with artefacts also vary, some like those outlined above in North and South Uist were devoid of artefacts, while others have a rich array of artefacts including those ‘warrior’ burials such as High Street, Dunbar where within a stone cist the remains of two individuals, with the partial remains of two other individuals, were discovered. Both articulated earlier burials had metal clothes fasteners (Fraser in Roy 2015), while one of them which was in a flexed position was found with a spear, sword and pin. Radiocarbon dating of the bone provided a date within the latter centuries of the 1st millennium BC and early 1st millennium AD, albeit later than the present site.

Another burial within Dunbar contained the remains of at least 21 individuals within a large stone cist with evidence of multiple re-internments over an extended period of time. A penannular brooch found within the cist suggested an Iron Age date (Longworth 1964-66).

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Material cultural evidence

The lithic assemblage

By Torben Bjarke Ballin

Introduction

Background

A large number of archaeologically significant features and artefacts were uncovered at Guardbridge. These included enclosures/ring ditch structures, pits and pit groups and the remnants of stone-built structures along with the ditches of a fort. Artefacts recovered from the site included an assemblage of lithic objects amounting to 1,120 artefacts of flint, chert chalcedony *sensu lato*, quartz and other raw materials (Table 9). The lithic artefacts have been characterized in detail, with special reference to raw-materials, typological composition and technology. From this it was sought to date and interpret the finds to the degree this was possible. The evaluation of the lithic material is based upon a detailed catalogue of all the lithic finds from Guardbridge (an Access database), and in this report the artefacts are referred to by their catalogue (CAT) number.

	Flint	Chert	Chalc family	Quartz	Others	Total
Debitage						
Chips	159	1	113	111	2	386
Flakes	236	3	98	34	6	377
Blades	95	2	6	1		104
Microblades	27		3		1	31
Indeterminate pieces	20		83	4	4	111
Crested pieces	25		2			27
Platfform rejuvenation flakes	4					4
Total debitage	566	6	305	150	13	1,040
Cores						
Split pebbles			1			1
Single-platform cores			1			1
Opposed-platform cores	3		1			4
Discoidal cores			1	1		2
Irregular cores	1		13			14
Bipolar cores	4	1	4	2		11
Core fragments			2			2
Total cores	8	1	23	3		35
Tools						
Points	2					2
Microburins	1					1
Short end-scrapers	4		1			5
Side-scrapers	3					3
End/side-scraper	1					1
Backed knives	1					1
Scale-flaked knives	5					5
Plano convex knives	1					1
Flakes with flattened bulb			1			1
Truncations	4		1			5
Serrated pieces			1			1
Piercers	1					1
Combined scraper/scale-flaked knives	1					1
Notches	1					1
Pieces w edge-retouch	15		1			16
Total tools	40		5			45
Total	614	7	333	153	13	1,120

Table 9: General artefact list of the entire lithic assemblage from Guardbridge.

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Chronological framework

The basic chronological framework applied in connection with this analysis corresponds to that defined in Ballin (2021a, 3), and it is presented in Table 10.

The evidence suggests that the Scottish late Upper Palaeolithic period is aligned with contemporary industries on the north-west European mainland (the Hamburgian, *Federmesser-gruppen*, and the Ahrensburgian techno-complexes), rather than with industries towards the south (e.g. the Creswellian; Jacobi 2004), and it is suggested to use these material cultural terms (rather than for example those suggested in Barton and Roberts 1996) to allow comparison with the Continental complexes, with which people in late Upper Palaeolithic Scotland would have been in touch (directly or indirectly), across the then dry Doggerland (Ballin 2016; Ballin and Bjerck 2016; Brooks *et al.* 2011; Sturt *et al.* 2013).

Traditionally, the Scottish Mesolithic has been subdivided into an early and a late part (the early and late Mesolithic periods), defined by the dominance of either broad or narrow blades/microliths. It is recommended not to use the terms 'broad blade' and 'narrow blade' as period-defining terms, as blades on the Scottish west-coast and on the east-coast differ in terms of width, with blades from the former region being narrower than those from the latter region due to the availability of differently sized flint pebbles in those areas. Using the terms 'broad blade industries' and 'narrow blade industries' as periods would mean that the transition between these two periods (if broad and narrow blades are defined by blades broader and narrower than 8 mm; Ballin 2021a, 12) would differ, with the transition being earliest in the west.

Instead, it is suggested to define the early and late parts of the Mesolithic as periods defined primarily by broad and narrow microliths (based on broad and narrow blades), but with the two groups of microliths being characterized not only by different *sizes*, but first and foremost by different sets of microlith *forms*. Although idiosyncratic microlith forms occur at all times through the Mesolithic (cf. Ballin 2021a, 32), the Scottish early Mesolithic period is associated *mainly* with obliquely blunted points and isosceles triangles, and the late Mesolithic period *mainly* with scalene triangles, crescents and edge-blunted pieces. As a rule of thumb, the transition between the two Mesolithic periods could be defined as the time when isosceles triangles were replaced (probably gradually, say, over a few hundred years) by scalene triangles.

The transition between the Scottish early and late Mesolithic periods is defined as in Saville (2008). On the basis of an analysis of the microliths from Cramond, Edinburgh, and the radiocarbon-dates relating to these finds, he suggested that the switch from broad to narrow microliths (isosceles to scalene triangles) took place at approximately 8,400 cal BC.

The Scottish Neolithic and Bronze Age phases are defined on the basis of not only lithic material but also (and primarily) pottery styles and metalwork. The post-Mesolithic chronology followed in this report corresponds to that of the main Neolithic and Bronze Age ScARF panel reports (Brophy and Sheridan 2012; Downes 2012).

Bronze Age	Late Bronze Age	1,150-800
	Middle Bronze Age	1,550-1,150
	Early Bronze Age	2,200-1,550
	Neo/BA transition (Chalcolithic)	2,450-2,200
Neolithic	Late Neolithic	3,000-2,500
	Middle Neolithic	3,500-3,000
	Early Neolithic	4,000-3,500
Mesolithic	Late Mesolithic	8,400-4,000
	Early Mesolithic	9,800-8,400
Late Upper Palaeolithic (LUP)	Ahrensburgian	10,800-9,800
	Federmesser-gruppen	12,000-10,800
	Hamburgian	12,700-12,000

Table 10: Basic chronological schema for Scotland's early prehistory (cal BC). The dates for the industries of the LUP are based on European dates, and they are expected to change as continued research into the period makes more data available. The remainder of the dates are based largely on information from the various Scottish research framework (SCARF) panel reports (Saville and Wickham-Jones 2012; Brophy and Sheridan 2012; Downes 2012; information relating to the LUP Sonia Grimm pers. comm.).

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General lithic definitions

The lithic typology followed in the present report generally follows Ballin 2021a. This report is freely available on the Internet. The abbreviation 'GD' is used for 'greatest dimension'.

Report structure and overview

The lithic finds from Guardbridge form three logical groups:

- The unrolled LUP assemblage from Structure 13 (457 pieces)
- The probably pre-MHT rolled lithics, and (117 pieces)
- The post-MHT unrolled lithics (547 pieces)

The presentation and discussion of the finds are therefore divided into three sections, each dealing with one of these three sub-assemblages.

Assemblage 1 consists largely of flint (94%), and diagnostic typo-technological attributes suggest that this material may generally be datable to the LUP, most probably the Ahrensburgian (10.800 – 9.800 cal BC). All flints are unrolled.

Assemblage 2 is heavily dominated by raw materials of the chalcedony family (82%), supplemented by some flint and quartz. These finds include few diagnostic typo-technological elements, but the rolled status of the lithics shows beyond any doubt that they have been submerged, with the main 'culprit' being the Main Holocene Transgression (MHT). This transgression peaked towards the end of the Late Mesolithic period around 5630 – 5440 cal BC (Ballantyne and Dawson 1997, 39). In the Tay valley this event was associated with an exceptionally rapid rise in relative sea level which, according to Cullingford *et al.* (1980), led to a rise of c. 9 m, whereas Dawson and Cressey (2010) suggest a rise of *at least* 12 m. Based on the topographic location of the Late Mesolithic site Freeland Farm in the inner part of the Tay estuary, and the fact that this assemblage includes almost no rolled lithics, the latter is probably the more likely scenario (Nicol and Ballin 2019).

It is thought that the rolled lithics may have been abraded after having been submerged by the MHT and that they therefore represent early or early late Mesolithic flooded settlements. This material was then probably scooped up and scattered across the top of the Guardbridge promontory (height c. 20 – 29 m OD) by the Storegga tsunami (e.g. Dawson *et al.* 2011) which occurred around 6150 cal BC, or c. 600 – 700 years before the peak of the MHT. The runup height of the tsunami may have been in the order of 20 – 25 m (Bondevik *et al.* 2003).

Assemblage 3 is more mixed in terms of its raw materials, including c. 33% flint, c. 39% raw materials of the chalcedony family and *c.* 26% quartz (although much of the quartz is in the form of chips and could represent other activities, such as the crushing of quartz for pottery temper; e.g. Ballin 2011b), supplemented by small numbers of chert, pitchstone and other raw materials. The unrolled status of this assemblage, in conjunction with its diagnostic objects and associated structures, suggests a general date after the MHT (the later part of the late Mesolithic period, the Neolithic period and the Bronze Age period). Most of the lithics are from pits, postholes and ditches in and around roundhouses and enclosures, and the diagnostic material includes *inter alia* two discoidal cores, five scale-flaked knives, one plano-convex knife, one serrated piece with *gloss* and a combined end-scraper/scale-flaked knife. This suggests that Assemblage 3 may largely be post-Mesolithic.

The more well-executed tools from for example pits may represent deliberate depositions, whereas simpler, less well-executed pieces, as well as 491 pieces of debitage, probably generally represent material from knapping floors and activity areas which became included in the features' fills when the knapping floors were penetrated and the features then back-filled. Only 52 pieces (10%) of the debitage is from so-called 'deposits' which may be old ground surfaces or house floors, and which could represent small or truncated knapping floors or activity areas. It was therefore decided in this report to focus on the finer tools from features (mainly pits) and assess the nature of these features and their depositions.

Raw Material- types, sources and condition

The lithic assemblage is composed of almost one-half flint and one-third raw materials of the chalcedony family, supplemented by small numbers of non-flint/non-chalcedony raw

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materials (Table 11). The latter category includes seven pieces of chert, two pieces of pitchstone, 153 pieces of quartz, five pieces of sandstone, two pieces of dolerite, one piece of granite and three pieces of indeterminate raw materials. Most of the quartz is in the form of minuscule chips.

The flint includes a number of different types, with many pieces being fine-grained and mottled-grey or mottled-light brown with abraded pebble cortex. Most of these are thought to be of local origin, corresponding to flint types recovered from other prehistoric sites in eastern Scotland, but the Guardbridge assemblage also includes a number of other specific types of flint. Three fine-grained mottled grey pieces (e.g. scale-flaked knife CAT 261 from pit (1551), PG4) and one fine-grained piece of black flint (large scale-flaked knife CAT 164 from pit (1141), between ST20/ST21) were defined as Yorkshire flint due to similarities to the flint recovered from sites near the Overhowden Henge in the Scottish Borders (Ballin 2011c). In Ballin (2011c) it was showed that the black flint had a tendency to be associated with late Neolithic oblique arrowheads, and at Guardbridge 2 (a pit group approximately 1 km east of the present Guardbridge site) unusually large, well-executed tools of black flint were recovered from pits with Grooved Ware pottery (Ballin forthcoming).

Type	n	%
Flint	614	54.8
Chert	7	0.6
Pitchstone	2	0.2
Chalcedony family	333	29.7
Quartz	153	13.7
Others	11	1
Total	1120	100

Table 11: General raw material composition.

The flint from the LUP scatter within ST13 includes some of the assumed local flint types, but a proportion of this sub-assemblage is of a type of medium-grained, light-brown flint with small dark dots and dark streaks or elongated lenses (e.g. cylindrical core CAT 554 and crested blade CAT 629). Some of this flint has soft or soft-ish cortex, indicating that this raw material may have been procured from primary sources (for example on Doggerland; Ballin 2016). The dorsal ripples of CAT 629 suggest that this piece was detached from an opposed-platform core like CAT 554. The LUP scatter consists almost entirely of flint.

The large number (Table 12) of artefacts of various forms of chalcedony retrieved at Guardbridge (generally associated with features and contexts outside the LUP scatter) compares well with other early prehistoric sites in the region (Fife, the Tay estuary, Angus). The assemblage from the early Mesolithic site Morton A in north-eastern Fife (c. 8 km north of Guardbridge) includes 47% raw materials of the chalcedony family ('minerals from the Lower Old Red Sandstone lavas'; Coles 1971, Table 3), and the assemblage from the late Mesolithic site Freeland Farm in the inner part of the Tay estuary (just south of Perth) includes *c*. 60% of these raw materials. Many of the chalcedony-related materials from Guardbridge are rolled, and may date to the rarely or late Mesolithic period prior to the Main Holocene Transgression, and the 117 rolled pieces include 82% raw materials of the chalcedony family, suggesting that in the Guardbridge area Mesolithic people used these raw materials to the same high (or higher) degree as at other Mesolithic sites in the region (*c*. 50-80%), whereas earlier and later settlers at Guardbridge focused more on the exploitation of flint (the region's preference for flint after the Mesolithic period was confirmed by the analysis of the finds from Freeland Farm; Nicol and Ballin 2019, 35).

Type	n	%
Chalcedony proper	89	26.7
Chalcedony, indeterminate	156	46.9
Agate	64	19.2
Carnelian	15	4.5
Jasper	9	2.7
Total	333	100

Table 12: Composition of the chalcedony family (total as in Table 11).

The chalcedony family is defined by having a vitreous to waxy lustre, where for example flint and quartz both have a clearly vitreous lustre, and the different forms of chalcedony were generally formed in volcanic areas. This raw material family (Heddle 1901) may be subdivided into a number of different sub-categories on the basis of colour and patterning, such as chalcedony proper

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(cream, grey or bluish-grey), agate (characterized by concentric banding), jasper (red, opaque), carnelian (brown, translucent), and bloodstone (mainly green but also other colours; only found on the Isle of Rhum; Ballin 2018).

Although the subdivision of chalcedony suggests that we are dealing with clearly definable categories, these types grade into each other and form a continuum. In this part of Scotland much agate is pink, but there are also bluish-grey forms, which are almost indistinguishable from the common bluish-grey chalcedony, only defined as agate by its faint concentric banding.

Pebbles of the chalcedony family would probably have been available along the region's waterways and the North Sea coast, where it eroded out of the region's lavas (Pellant 1992, 88; Heddle 1901). Although many chalcedony nodules may have been procured by 'beach combing', the presence of large plates of chalcedonies at Guardbridge (e.g. CAT 251-253 with lengths of up to 140 mm) suggests that a proportion of this material may derive from primary outcrops, prised from the local lavas.

The site's chalcedonic materials are characterized by numerous parallel internal fault-planes, which hampered the controlled reduction of these raw materials, and a proportion of the tool blanks are therefore tabular indeterminate pieces. However, in some cases it was possible to procure large and thick tabular blocks, which allowed the production of large, regular broad blades (e.g., blades CAT 121, 528, 569, 613 from the LUP scatter, with widths between 10-15 mm).

The group 'indeterminate chalcedony' includes many weathered pieces with altered surfaces, but also some unusual fresh ones. The latter include pieces of spectacular, patterned greeny-brown colours (e.g. CAT 68 and CAT 78); some are yellow (CAT 121); and CAT 293 has a colour and texture which corresponds to the brown bloodstones from Rum (Ballin 2018).

The site's chert pieces (e.g., bipolar core CAT 440) are generally fine-grained, light or dark bluish-grey and black specimens, indistinguishable from so-called Southern Uplands radiolarian chert (Owen *et al.* 1999; Ballin and Ward 2013)[4].

This raw material probably originates from the region's Carboniferous limestone, and as it clearly did not represent an important resource to the site's settlers it is most likely that it was procured in the form of beach pebbles, rather than quarried from bedrock. Quartz (white milky quartz; Ballin 2008) was also used sparsely and may have been procured in the same manner.

One flake CAT 86 of black aphyric pitchstone was recovered from pit (661) in PG1 and this piece must have been procured through exchange either directly or indirectly, with groups on the Isle of Arran (Ballin 2009). Most aphyric pitchstone was probably collected or quarried from sources in eastern Arran (Ballin and Faithfull 2009). One tiny chip of burnt, discoloured pitchstone was also retrieved, but it is too small to be characterised safely on the basis of visual inspection.

A small number of pieces of dolerite, sandstone and granite probably represent *ad hoc* raw material procurement.

The 117 rolled pieces include five irregular cores, two bipolar cores, one short end-scraper and one piece with edge-retouch, all of either chalcedony, agate or jasper. These pieces were found across the site, and no pieces from the LUP scatter are rolled. In addition, 196 pieces (18% of the total assemblage) are burnt. Most of these pieces were probably burnt due to knapping and tool use taking place near hearths with bits occasionally falling into the fireplace.

The LUP scatter within ST13

A large scatter was discovered in the south-western part of ST13, a roundhouse most likely to date to post-Neolithic times (Figures 6-8). Approximately 95% of the finds were recovered from undisturbed deposit (2907) grey-brown silty sand and (2945) dark-brown silty sand, with c. 1% deriving from posthole (2905) at the northern edge of the deposit and c. 4% from Ditch 2908 at the southern edge of the scatter. The latter only just touched the scatter and therefore affected its layout and the artefact distribution minimally. Context (2945) may be darker than (2907) due to the inclusion of fine charcoal particles from the hearth.

4 For this reason, the term Southern Uplands chert should only be used to describe chert know to originate from that region and not as a name of a type of chert.

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Logically, it was first considered whether the scatter might be associated with ST13, but the identification of the industry responsible for this assemblage as a broad blade industry ruled this out. Scotland's post-Neolithic industries are flake industries (Ballin 2002). The recovery of a tanged point and a point fragment then indicated a possible LUP date, and the identification of many blades as deriving from cylindrical opposed-platform cores, four opposed-platform cores and numerous crested blades supported this date (see discussion below).

Characterisation

As shown in Table 13, the material recovered from the LUP scatter includes 457 pieces, 94% of which is of flint, supplemented by 5% chalcedony *sensu lato* and small numbers of quartz and 'other' materials. Several flints (e.g. flake CAT 652) have soft or soft-ish cortex, indicating that some flint may have been procured from primary sources, either from outcrops on Doggerland (cf. Ballin *et al.* 2018) or further down the east-coast. This sub-assemblage includes 441 pieces of debitage, five cores and ten tools.

A total of 108 pieces were classified as chips and 188 as flakes, with blades and microblades making up 109 pieces, or 25% of the debitage. Twenty-seven pieces were identified as preparation flakes, with 24 being crested pieces (mostly blades) and three being platform rejuvenation flakes. Figure 89 shows the width of the blades, and the curve has a peak at 11-12 mm. Fifty-two intact blades (including crested specimens) have average dimensions of 31.0 mm by 12.1 mm by 4.5 mm, with the largest blades being up to 65mm long. However, it should be noted that the curve fluctuates somewhat and has several minor peaks. As shown, the trendline is double-peaked, with a main peak at width 11-12 mm and a minor peak at 6-7 mm. This indicates that the location chosen by the LUP hunters for their camp may have been visited briefly in post-MHT times by a microblade-producing group in the late Mesolithic (see dating section below). Basically, broad blades are three times more numerous than microblades (Table 13).

	Flint	Chert	Chalc family	Quartz	Others	Total
Debitage						
Chips	103		3	1	1	108
Flakes	177		11			188
Blades	78	2	4			84
Microblades	23		2			25
Indeterminate pieces	9					9
Crested pieces	24					24
Platf rejuv flakes	3					3
Total debitage	417	2	20	1	1	441
Cores						
Opposed-platf cores	3		1			4
Irregular cores	1					1
Total cores	4		1			5
Tools						
Points	2					2
Side-scrapers	1					1
Flakes w flattened bulb			1			1
Truncations	1					1
Notches	1					1
Pieces w edge-retouch	4					4
Total tools	9		1			10
Total	430	2	22	1	2	457
Per cent	94	trace	5	trace	trace	99

Table 13: The lithic artefacts from the LUP scatter within ST13.

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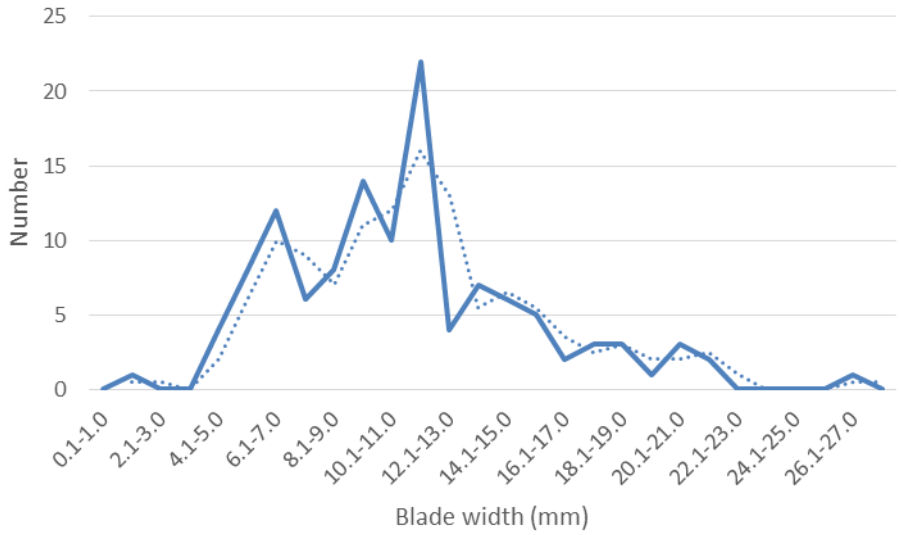


Figure 89: Width of all blades. The stippled line is the curve's trendline.

It was noticed that several blades had platform-edge trimming at either end, showing clearly that these pieces had been struck from cylindrical opposed-platform cores. It was therefore decided to scrutinise all blades and blade fragments a second time, focusing on the direction of the dorsal ripples. In 21 cases, or c. one-fifth of all blades (or one-quarter of all broad blades), these blanks displayed opposed dorsal ripples or opposed dorsal hinge terminations, suggesting that these pieces had been detached from opposed-platform cores.

It was also observed that 10 broad blades and two flakes had finely faceted platform remnants. This suggests that either these pieces had been struck from LUP cores (Ballin 2021b; 2019a; 2019b; Ballin *et al.* 2018a), or that they had been produced by the application of the later Neolithic Levallois-like technique (Ballin 2011a; 2011c). However, the main purpose of this approach was probably to produce broad flakes for later Neolithic chisel-shaped and oblique arrowheads, and the notable dominance of blades amongst the finely faceted blanks from scatter (2907/2945) makes a LUP date more likely. Compared to broad blades from other prehistoric periods, which tend to curve along the long axis (early Mesolithic ones very much so), the blades from the LUP scatter are relatively straight, which is an effect of producing blades from opposed-platform cores. Straight blades were desired for LUP tanged and other points.

This assemblage includes an unusually large number of preparation flakes, with 24 pieces being crested blanks (mostly blades) and three platform rejuvenation flakes. Mesolithic and later assemblages rarely contain high numbers of preparation flakes, whereas it has been shown that high numbers of such pieces, indicating meticulous core preparation, is an attribute of some Scottish LUP assemblages. It was demonstrated that the core preparation at the LUP site Milltimber Zone 4 in Aberdeenshire included extensive, and in some cases serial, cresting, and several crests and core tablets could be refitted in twos and threes (Ballin 2019a; 2019b).

The five cores are quite informative, including four opposed-platform cores and one irregular core. Two of the opposed-platform cores are of different types, one flint specimen being cylindrical (CAT 554), and one chalcedony specimen having had blades struck off at one end of elongated, sloping platforms (CAT 970). The platforms are generally well-trimmed and plain. CAT 554 has an unworked back-side covered by relatively soft cortex, and at one end it was attempted to detach a final blade, which was only loosened at the proximal end, but did not detach properly; this core measures 51 by mm 20 by mm 11 mm. CAT 970 is affected by the exposure to fire, and measures 22 by mm 14 by mm 24 mm. The other two opposed-platform cores (CAT 648,

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Figure 90 and 724) could not be characterised more precisely, as they are both completely exhausted (GD = 42-43 mm) and formally highly irregular. However, a number of opposed flake/blade scars across their surfaces define them as opposed-platform cores. CAT 724 is heavily burnt. CAT 636 is an irregular (multi-directional) core (GD = 48 mm), reduced from a number of different angles. At one end it has the remains of a faceted platform.

The assemblage only includes 10 tools, namely one tanged point, one fragment of a point, one side-scraper, one flake with a flattened bulb (thought to be a knife), one truncation, one notch and four pieces with edge-retouch (Figure 90).

The tanged point (CAT 591) is an exceptionally small specimen based on a microblade (17.6 mm by 5.7 mm by 1.5 mm). Its tang is at the distal end, and it was formed by propeller retouch (one lateral side retouched from the ventral face and the other from the dorsal face). At its tip, it has a slightly oblique, concave truncation which may be a repair. It has extremely fine retouch or use-wear (visible with the naked eye) along its right lateral side.

CAT 501 is the proximal tip of another point (25.7 mm by 8.5 mm by 2.6 mm). It is based on a slender blade, and it has an oblique truncation with a shallow angle at the proximal end, whereas the distal end is missing. Knives with an oblique truncation (as well as some Creswellian angle-backed points; Jacobi 2004) tend to have a truncation with a c. 45 degrees angle against the cutting-edge, whereas the oblique truncation of many LUP tanged points tend to have oblique truncations with a considerably more shallow angle against the cutting-edge (just below 30 degrees; Ballin *et al.* 2018a). The angle of truncation of CAT 501 is c. 28 degrees.

One piece (CAT 969) was defined as a side-scraper (25 mm by 20 mm by 10 mm). It is based on a bifacial bipolar core with one reduction axis, and it has a straight, steep scraper-edge along one lateral side. CAT 206 is a broad hard-hammer flake made of flint-like chalcedony, and its bulb of percussion was flattened by flat ventral retouch. Parts of its broad distal edge have broken off, but there is fine macroscopic use-wear along surviving parts of the edge, suggesting that this idiosyncratic piece was used as a knife.

One blade with an oblique truncation (CAT 536) was also recovered. It is missing its outermost distal tip and part of the truncation; like CAT 206, this is probably also a small (23.8 mm by 9.6 mm by 4.1 mm) knife. CAT 585 is the proximal end of a broad blade with a lateral retouched notch (26.5 mm by 21.5 mm by 5.2 mm). The notch may be a hafting device, and this implement may be yet another knife. Four pieces with varying edge-retouch may represent different functions. Three are based on blades and one on a flake blank. One blade is crested (CAT 718); two of the modified blades are from cylindrical opposed-platform cores (CAT 193, 718); and one has a finely faceted platform remnant (CAT 193). The two intact blades (CAT 193, 718) measure 49.0 mm by 17.4 by 6.4 mm and 56.6 mm by 21.4 mm by 5.4 mm, respectively

Distribution

To assess the nature of the scatter (was the site visited once or several times; may the scatter represent a dwelling; and which activities took place at the site?), a number of distribution maps were produced. The lithics were recovered mainly from two deposits (2907) grey-brown silty sand and (2945) dark-brown silty sand, with c. 1% deriving from posthole (2905) at the northern edge of the spread and c. 4% from ditch (2908, see plan Figure 88). Context (2945) may have been discoloured (darkened) by the presence of a hearth, producing minuscule charcoal particles. Context (2907) measured c. 5 m by 4 m and (2945) measured c. 2.5 m by 1m. The extent of (2907) and the lithic scatter, which did not fill (2907) completely – approximately 5 m across – corresponds to the size of the main scatter at Hamburgian Howburn in South Lanarkshire and Hamburgian Slotseng in southern Jutland, Denmark (Holm 1991), indicating the minimum size of a dwelling. The actual size of a dwelling would have been somewhat larger, allowing for probably debris-free sleeping quarters, storage space, etc.

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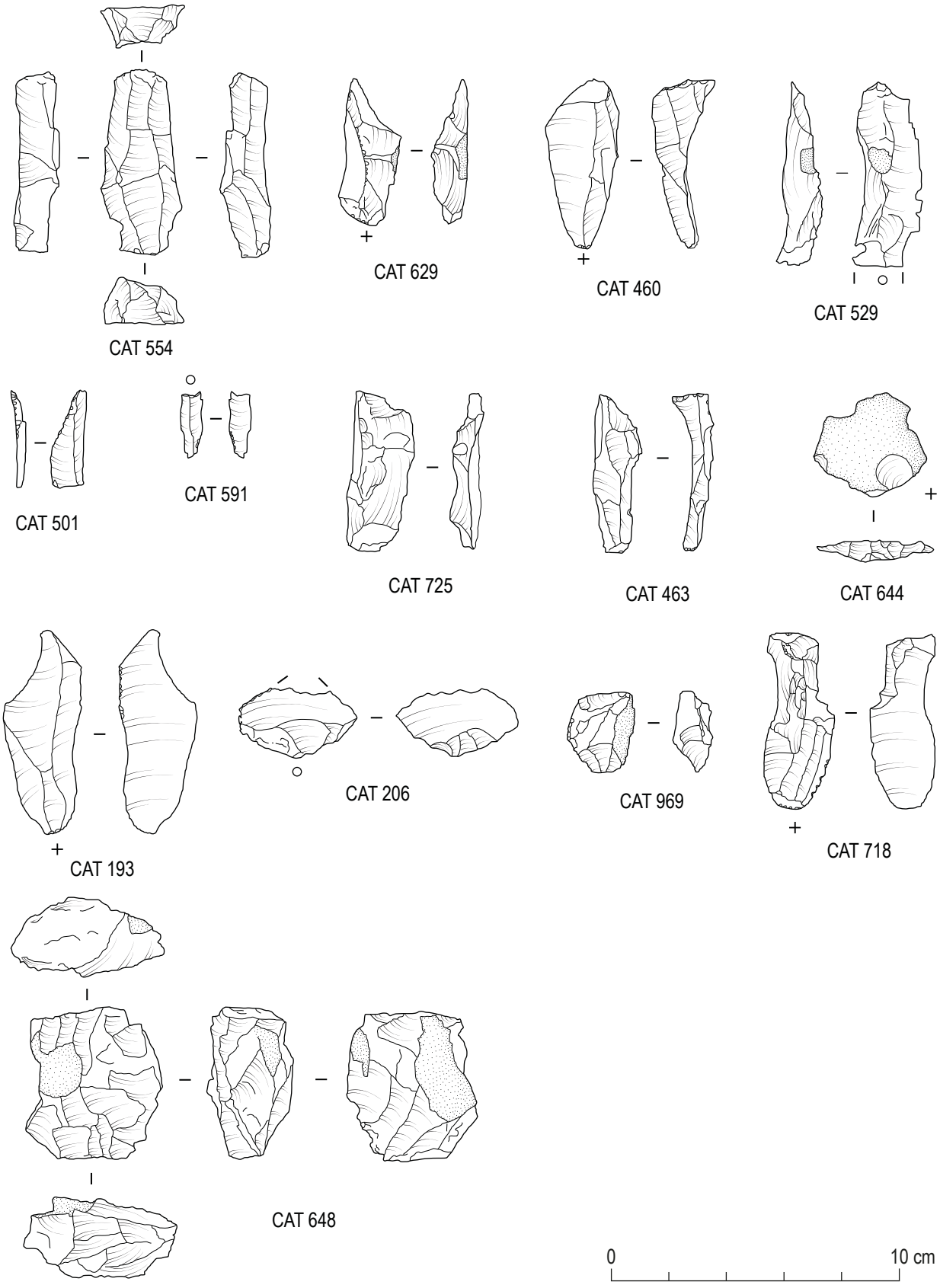


Figure 90: Late Upper Palaeolithic core and tools.

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Figure 91 shows the distribution of all lithic artefacts recovered from the LUP scatter. This map does not show any particular trends, and it mainly indicates the general extent of the scatter.

Figure 92 is probably the most essential of the distribution maps, as it shows that all burnt lithic artefacts form a single concentration at the centre of the scatter, indicating the location of a hearth, and that the scatter is therefore likely to represent a single visit to the site in the LUP period.

Figure 93 shows the distribution of all blades, and the fact that the blades form several small concentrations around the hearth probably indicates either that the (family?) group settling the site in the LUP included several knappers or that one knapper moved around in relation to the hearth. Considering the relatively small number of lithics, and that the visit was therefore probably quite brief, the former is probably the more likely of the two options. The two tongues towards the south-west and south-east may indicate activity areas, although it is also possible that the more substantial tongue towards the south-east represents the entrance area of a dwelling.

The distribution of the blades from this little LUP site forms a star-shaped figure, like that of the lithics from Slotseng in southern Jutland, Denmark (Figure 94; Holm 1991). This kind of distribution characterises many LUP sites and may indicate the presence of a tent-like structure, where the indentations represent the location of the stakes supporting the dwelling. It is uncertain why the distribution of all the lithics from this location does not show the same distributional trend, but it may be that where Figure 93 only shows a limited set of activities (the production and use of blades), Figure 91 shows a larger number of activities (fire-making, primary production and tool use) where each activity has a different centre (the tools, for example, seem to have been used in an area south of the centre of the primary production; see Figure 97, below), and with the different distributional trends cancelling each other out to some degree and producing a more blurred general distribution.

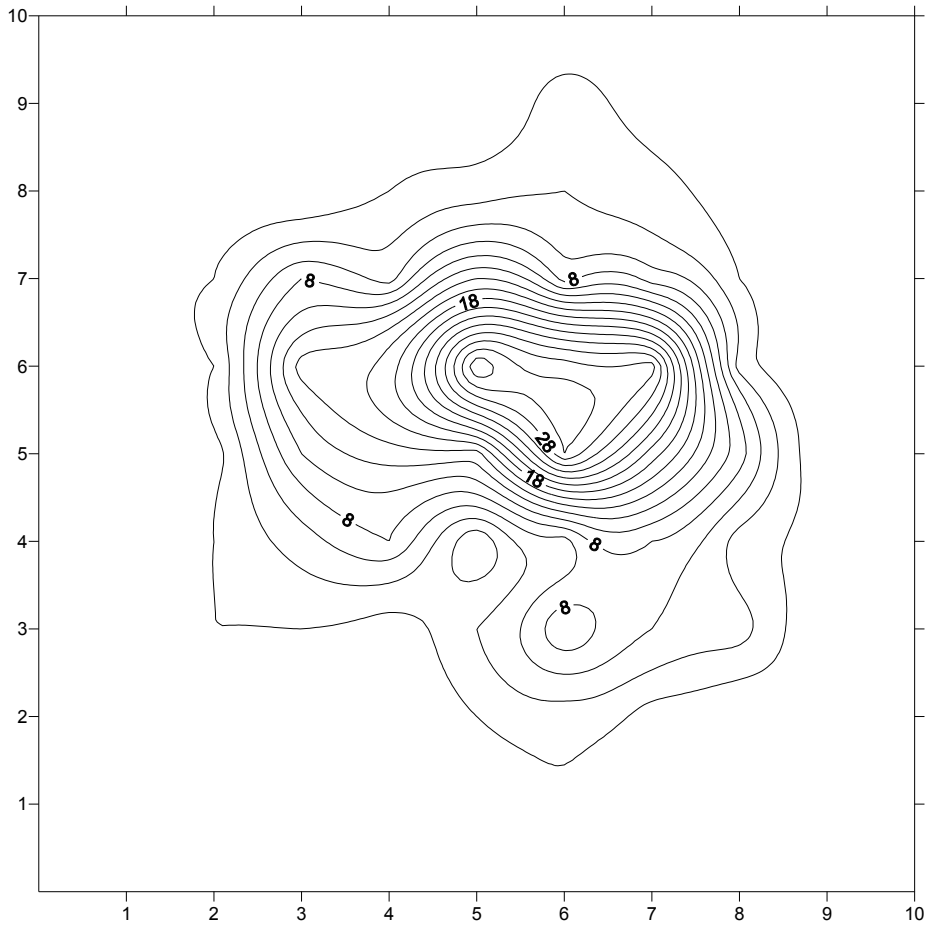


Figure 91: Contour distribution of all lithic artefacts.

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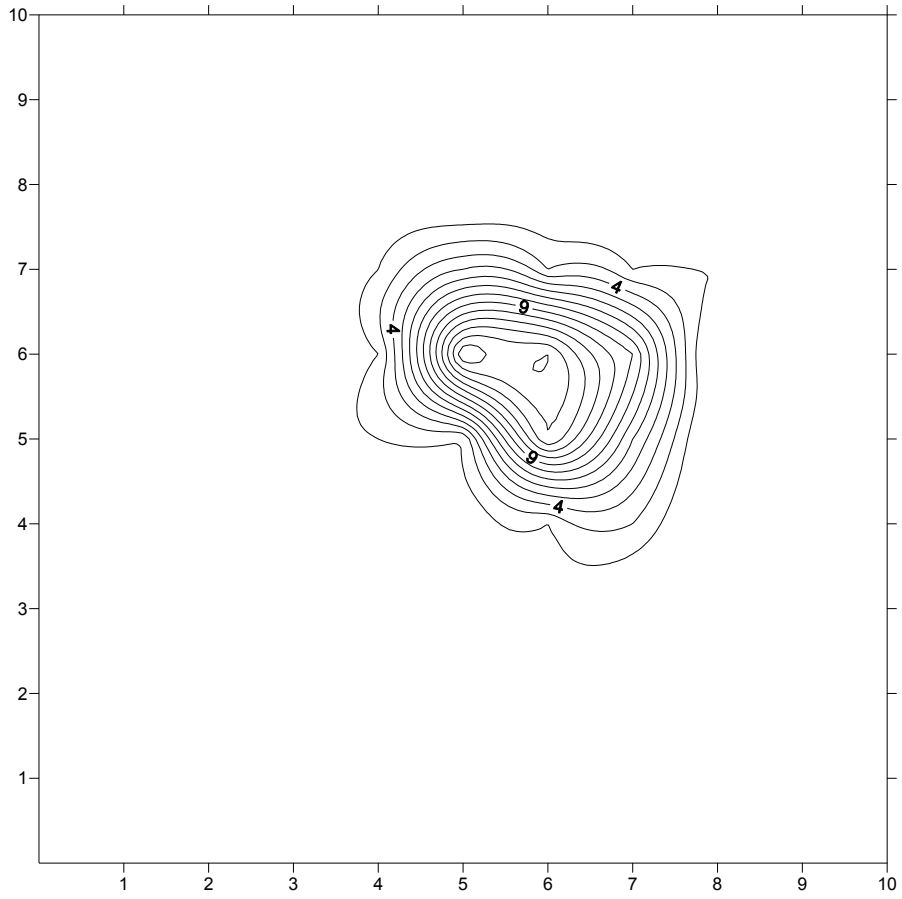


Figure 92: Contour distribution of all burnt pieces.

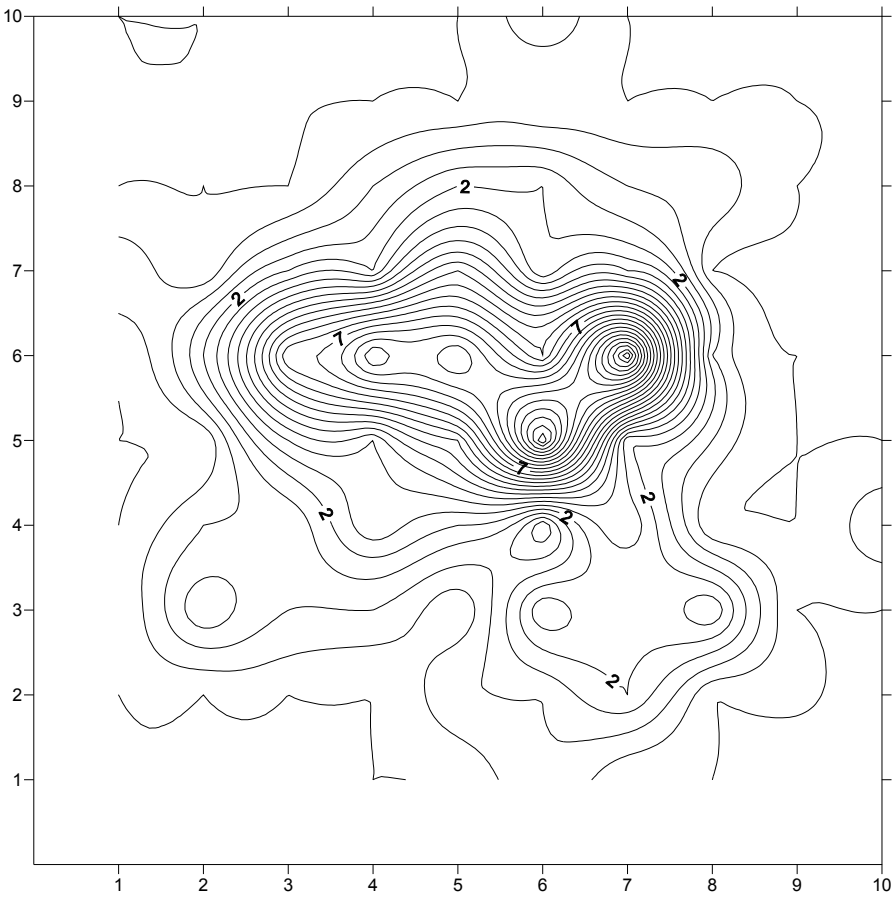


Figure 93: Contour distribution of all blades.

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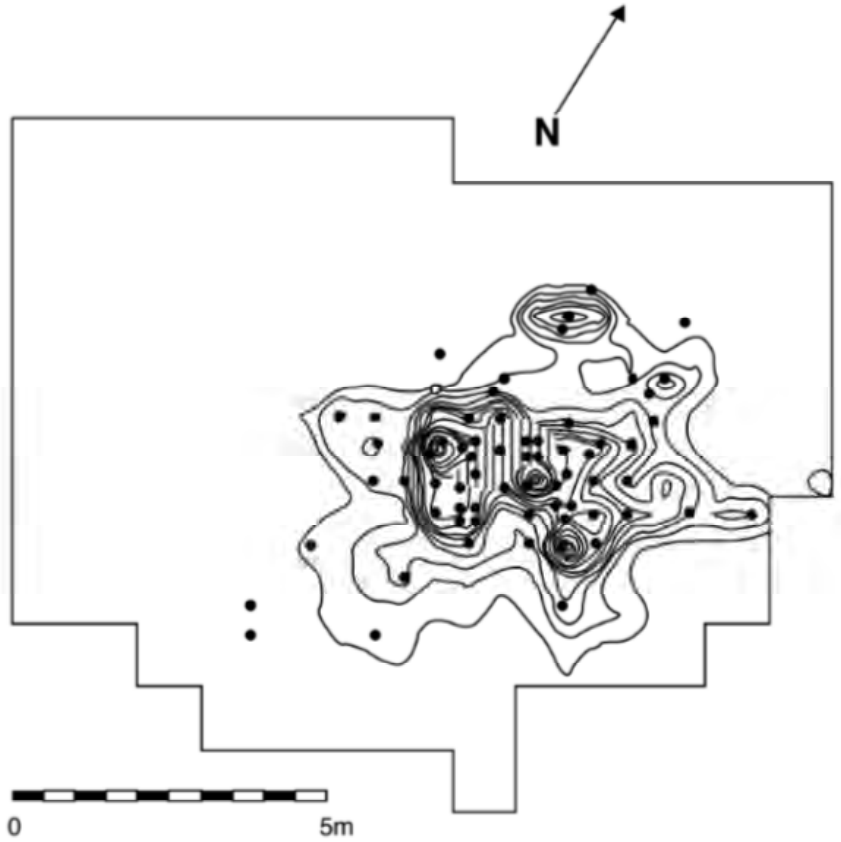


Figure 94: The distribution of all lithic artefacts at the Hamburgian Slotseng site in southern Jutland Denmark (Holm 1991); the distribution of lithics at this location also forms a star-shaped figure.

Figure 95 shows the distribution of all opposed-platform blades, and they seem to form a crescent-shaped distribution at the western end of the blade concentration. It is possible that this indicates that the production of blades from this kind of cores mainly occurred on this side of the hearth. However, the distribution of the site's few opposed-platform cores (Figure 96) shows that this is unlikely as these cores were recovered from the other side of the hearth.

The distribution of the preparation flakes and the cores (Figure 96) shows clearly that knapping took place on either side of the hearth, but – as mentioned above – it is uncertain whether this suggests the presence of two knappers or whether one knapper may have changed place in relation to the hearth. The distribution of the site's few tools indicates that the tools were mainly used in an area south of the scatter of debitage (Figure 97).

As mentioned above (and discussed below), a small number of microblades may date to the Late Mesolithic, but this probably very brief occupation at the site does not appear to have affected the general distribution patterns (particularly Figures 91 and 92).

Discussion

The assemblage from the LUP scatter includes several diagnostic elements, such as raw material composition, reduction technique and operational schema, the character of the blanks and cores, as well as two points.

The raw material composition first and foremost separates this assemblage from Mesolithic assemblages in the Fife, Tay estuary, Angus region, as in this area Mesolithic assemblages are notably dominated by raw materials of the chalcedony family (Coles 1971; Nicol and Ballin 2019). As shown above, post-Mesolithic assemblages in this area tend to be dominated by flint, but with chalcedonies also being exploited. This supports a LUP date of the location's lithics. The fact that some of the flint has soft or soft-ish cortex suggests procurement from a primary context.

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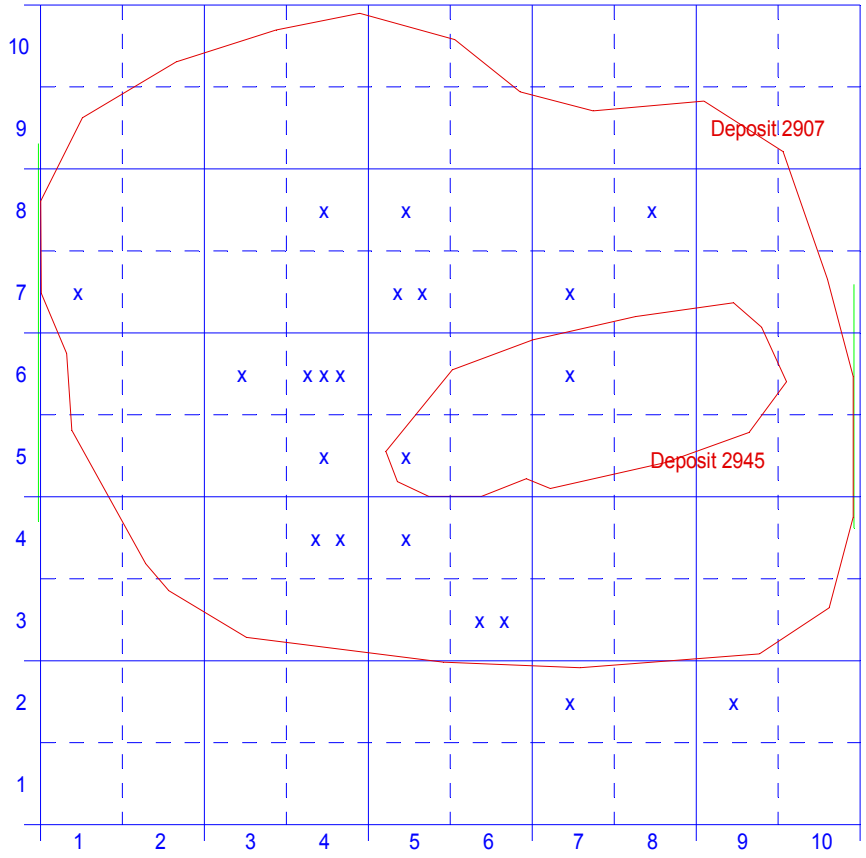


Figure 95: Point distribution of all opposed-platform blades.

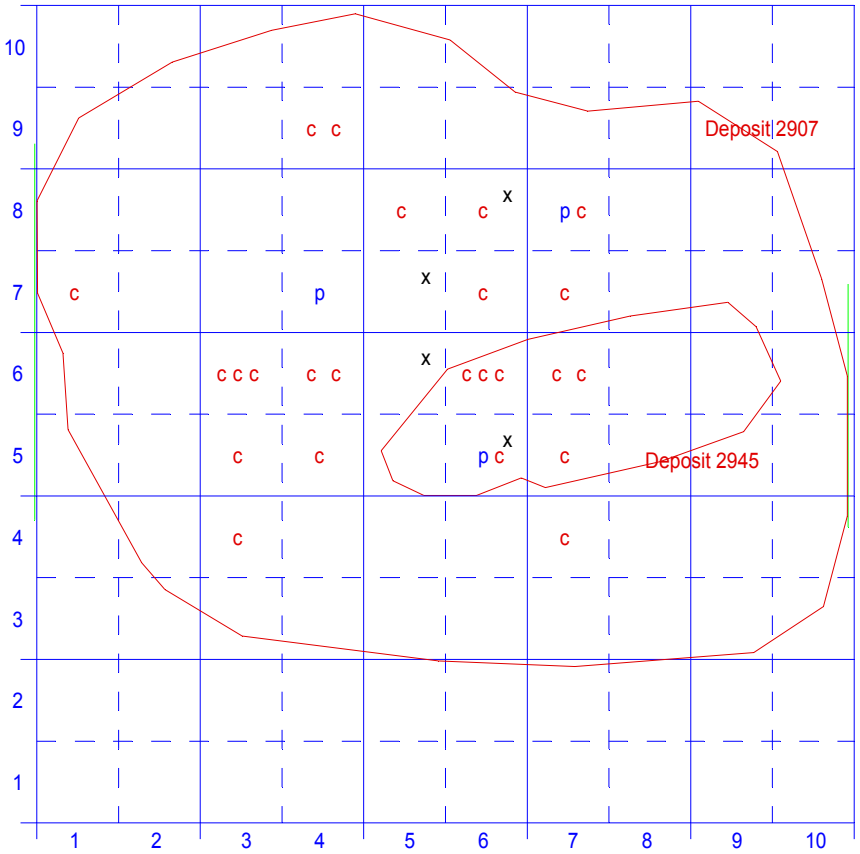


Figure 96: Point distribution of all preparation flakes and cores; c = crested pieces, p = platform rejuvenation flakes, x = cores.

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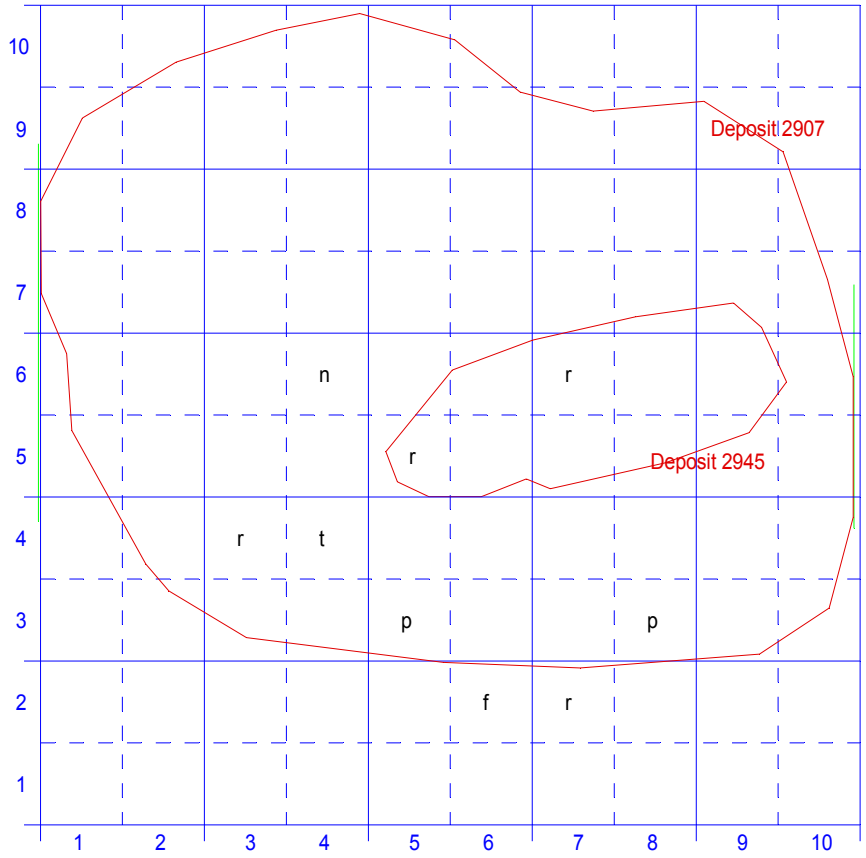


Figure 97: Point distribution of all tools; p = points, t = truncations, f = flake w flattened bulb, r = pieces with edge-retouch, n = notch.

The industry responsible for the production of almost all of this assemblage was clearly a broad blade industry, although some smaller blades were also manufactured (Figure 89). As suggested above, this may indicate a visit to the location in the. However, the fact that most of the microblades are also mainly based on flint, where Late Mesolithic assemblages in the Tay estuary region mainly relied on raw material of the chalcedony family (Coles 1971; Nicol and Ballin 2019), indicates that some of the microblades may also be datable to the LUP, and that any Late Mesolithic visit to the location may have been very brief indeed.

The cores are mainly opposed-platform cores, one being highly regular and cylindrical (CAT 554), whereas the other three are more irregular and heavily exhausted. This also suggests a LUP date, as shown by the LUP assemblages from Howburn in South Lanarkshire, Lunanhead in Angus, Milltimber Zone 4 in Aberdeenshire and South Cuidrach on Skye (Ballin 2019b; 2021b; Hardy and Ballin 2024; Ballin *et al.* 2018a). Most blades are quite straight, in contrast to blades produced from single-platform cores, which are usually somewhat curved along the long axis (early Mesolithic and post-Mesolithic assemblages). It is thought that the extensive use of opposed-platform cores during the LUP period was to allow the production of straight blades for straight blade-based arrowheads. Prior to initiation of blade production, the cores were carefully prepared by cresting as well as faceting of many platforms, also supporting a LUP date (Ballin 2019a).

The intact tanged arrowhead (CAT 591) is very small, with a symmetrical distal tang, suggesting that it may be an Ahrensburgian piece. The tanged point from Tiree (Ballin and Saville 2003) is a well-executed, almost sophisticated piece, but most other Ahrensburgian points from Scotland, such as those from Rubha Port an t-Seilich on Islay, South Cuidrach on Skye and Stronsay on Orkney (Mithen *et al.* 2015; Hardy and Ballin 2024; Ballin and Bjerck 2016), are characterised by being small and formally rather plain. The point tip (CAT 501) cannot be defined more precisely, but with its shallow-angled frontal truncation it compares well with similar fragments from South Cuidrach (Hardy and Ballin 2024).

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The size of deposit (2907), in conjunction with the star-shaped pattern created by the distribution of the blades, suggests that the scatter may have been covered by a tent-like structure, as at Howburn in south Lanarkshire and Slotseng in southern Jutland, Denmark (Ballin *et al.* 2018a; Holm 1991). This is also the preferred form of dwelling amongst present-day Arctic reindeer herders (Nelson 2014, 92-93, 374-75, 382-385) who follow migrating reindeer, just like prehistoric reindeer hunters did. It is thought that the hunters of the Scottish LUP period may mainly have been reindeer hunters, just as contemporary groups in the remainder of north-west Europe were, although during the slightly warmer Allerød period people may to some degree have exploited other forms of deer and elk (Terberger 2006, Fig. 7).

The various distribution patterns inform us that the scatter was probably formed during one visit to the site, and that the site represents a relatively brief visit (distribution of burnt pieces; Figure 92). They also suggest that the family(?) group responsible for the activities at this location may have included two knappers (distribution of blades and preparation flakes; Figures 95 and 96). The primary knapping took place around a central hearth (Figures 92 and 93), and tool use seems to have been separated from the primary knapping area, being located slightly south of the scatter of knapping debris (Figure 97).

One relevant question is why was the LUP scatter not washed away by the Storegga tsunami when it briefly and violently submerged the Guardbridge promontory? Basically, we do not know, but the likely answer is that the scatter had – after more than 4,000 years – been covered by vegetation which had slowly developed a topsoil layer above the scatter. The distribution patterns clearly show that the LUP flints were *not* affected by the tsunami.

Two charcoal samples were obtained from (2945) of the lithic scatter (UBA-51760 and UBA-54739), and they returned dates of 4320 – 4001 cal BC (95.4% probability; Radiocarbon dating - Table 1). These dates support the suggested (very) brief visit to the location at the end of the late Mesolithic period.

Unfortunately, these dates do not indicate when the main visit responsible for the LUP scatter took place. But this was to be expected as at the present time no Scottish sites pre-dating the Early/Late Mesolithic transition has been safely radiocarbon-dated.

The rolled pre-MHT material

As mentioned above, rolled lithic artefacts were found throughout the site, from the lowest to the highest levels (the fort) between c. 20 m OD to almost 30 M OD The finds were recovered from pits, postholes, ditches and deposits in, *inter alia* ST8, ST9, ST10, ST11, ST17, ST31, ST40, ST41, ST42, PG2 and context (2044).

Characterisation

As shown in Table 14, the rolled material includes 117 pieces of mostly chalcedony *sensu lato* (82%), supplemented by a few pieces of flint, quartz and other raw materials. This sub-assemblage includes 108 pieces of debitage, seven cores and two tools.

Most of the debitage is chips, flakes and indeterminate pieces, and only three pieces were identified as fragments of broad blades. The cores are either irregular multi-directional specimens (five pieces) or bipolar specimens (two pieces) (Figure 98). All cores are quite small, with the irregular ones (CAT 4, 42, 74, 116 and 190) having GDs between 12-30 mm, and the two bipolar pieces (CAT 57 and 63) between 15-18 mm. The bipolar cores are both bifacial specimens with one reduction axis (one set of opposed terminals).

The short end-scraper, CAT 258, is based on a large tabular piece. It is relatively thick and irregularly shaped, but at one end a regular, convex, steep scraper-edge was formed. It measures 69 mm by 56 mm by 21mm. CAT 186 is a tiny flake fragment (GD = 12 mm) with fine retouch along one lateral side. Although not all rolled pieces are obviously artefactual, several of the cores and tools are clearly recognisable as worked lithics, such as irregular cores CAT 42, 116 and 190 and bipolar core CAT 57

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	Flint	Chert	Chalc family	Quartz	Others	Total
Debitage						
Chips	3		17	5		25
Flakes	1		35	6	2	44
Blades	1		2			3
Microblades						
Indeterminate pieces			33	1	2	36
Crested pieces						
Platf rejuv flakes						
Total debitage	5		87	12	4	108
Cores						
Irregular cores			5			5
Bipolar cores			2			2
Total cores			7			7
Tools						
Short end-scrapers			1			1
Pieces w edge-retouch			1			1
Total tools			2			2
Total	5		96	12	4	117
%	4		82	10	4	100

Table 14: The rolled lithic artefacts recovered across the site.



Figure 98: Rolled artefacts from the top of the Guardbridge promontory: irregular core CAT 116 (chalcedony); irregular cores CAT 42 and 190 (both agate); and bipolar core CAT 57 (agate).

Distribution

Initially, the excavators divided the Guardbridge plateau (c. 20 m OD to almost 30 m OD) into areas to be investigated, and rolled lithics were recovered from Areas 3-8, and 10-12, as well as an area referred to as 'the back garden'. These areas included all levels, from the low-lying boggy central part to the slightly higher peripheral parts, including the ditches of the fort at the top of the plateau.

Discussion

Unfortunately, this assemblage includes no strictly diagnostic typo-technological elements, but the composition of the collection's raw material – heavily dominated by variants of chalcedony – suggests a Mesolithic date. The LUP scatter in ST13 is heavily dominated by flint, and the post-Mesolithic component of the Guardbridge assemblage, as well as the post-Mesolithic component of the finds from Freeland Farm in the inner parts of the Tay estuary (Nicol and Ballin 2019), are also notably dominated by flint. The rolled nature of the finds provides a *terminus ante quem* date, as these finds must have been affected by the MHT.

Due to the nature of this assemblage, none of these pieces are directly associated with their parent features and they all entered the features with the back-fill when they were dug in the Neolithic or later periods.

At the beginning of the process of analysing this assemblage, the author initially thought that these artefacts could have been thrown onto the plateau of the Guardbridge promontory by storm

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surges at the time of the MHT. At this point of time, the sea level is believed in this region to have been approximately 12 m above present sea level (Dawson and Cressey 2010). However, as the rolled lithics were found between the plateau's lowest and highest points, from c. 20 m OD to almost 30 m OD, this is an unlikely scenario.

It is more likely that the rolled pieces represent Early and early Late Mesolithic sites submerged by the MHT, and which were located in the water at the base of the promontory. These rolled assemblages were then scooped up by the Storegga tsunami which may have had an impressive run-up height – it has been suggested that the tsunami may have had a height of 20-25 m (Bondevik *et al.* 2003) (Figure 99).

However, the run-up of the tsunami may have been higher in some areas, such as inlets where the water was 'squeezed' from the sides, and adding the height of the tsunami to the already higher water level at the time of the MHT, it is quite likely that a substantial body of water washed straight across the top of the Guardbridge promontory, depositing a number of rolled lithic artefacts from submerged settlements at its base across the plateau.

Geological investigations of locations a few kilometres north of Guardbridge, such as at Craigie Hill and Silver Moss, north of Leuchars, have provided evidence of the effects of a Mesolithic period tsunami, and the dating of this event corresponds to the dating of similar geological locations elsewhere in Britain, as well as in Norway, the Faroes, Iceland and Greenland (Smith *et al.* 2004) – c. 6160 cal BC.

The unrolled post-MHT material

All other finds are thought to be datable to the post-MHT or even post-Mesolithic period. Apart from one microburin (CAT 954), most other finds are recognisable as Neolithic or early Bronze Age types. The lithics were recovered from a variety of contexts across the Guardbridge promontory (see distribution section, below). Most of the debitage and the cores are associated with features like pits, ditches and enclosures, and it is thought that these pieces generally pre-date their features. Pit (1235) in ST1 and pit (1661) in ST6, for example, mainly contained minuscule chips and indeterminate pieces, and they must clearly relate to knapping floors disturbed when the pits were dug. The cores and the debitage indicate that knapping floors were present on the promontory in the past – lithic artefacts may have been produced in connection with most of the sites roundhouses – but no actual knapping floors, or parts thereof, were identified. However, the number of cores and debitage in the features is generally low compared with for example finds recovered from some Mesolithic features (pit 16 on the Standingstones site in Aberdeenshire contained c. 1,200 lithics; Ballin

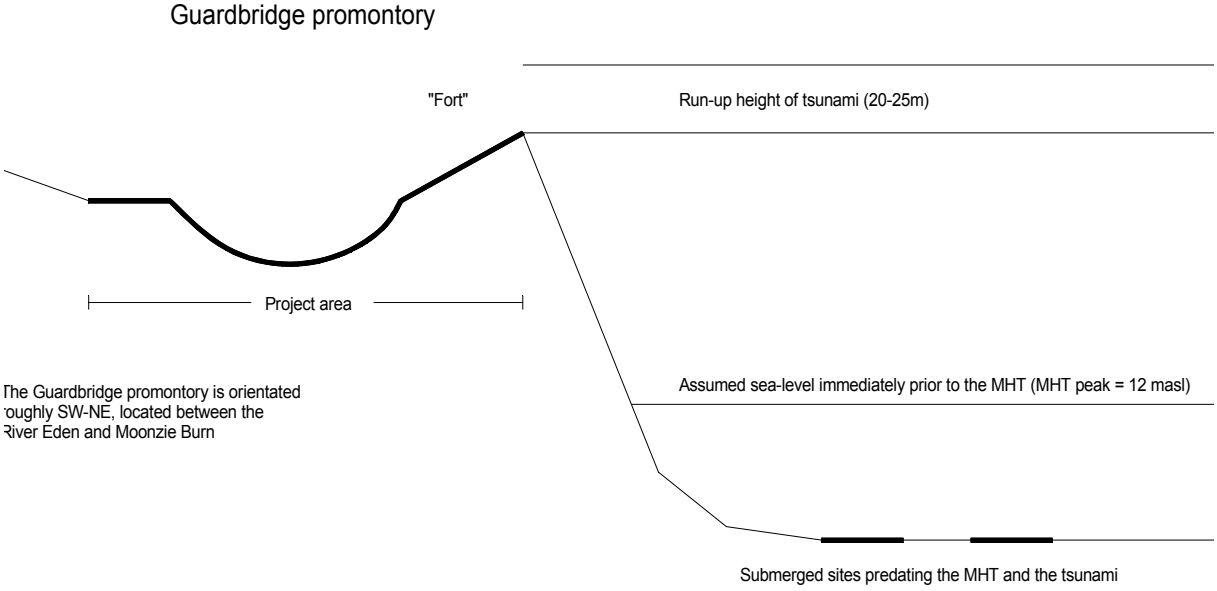


Figure 99: Plan of the excavated Guardbridge promontory plateau, explaining how the rolled assemblage was interpreted. Viewed from south-east towards north-west.

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2019c) suggesting that these knapping floors may have been limited in extent and density, and it was therefore decided to focus on the finds from features which were thought to represent deliberate depositions and other particularly interesting pieces (e.g. those of pitchstone).

Characterisation

As shown in Table 15, the material recovered from the site (less the LUP scatter and the rolled material) includes 547 pieces, 33% of which is flint, 39% chalcedony *sensu lato*, 26% is quartz (mostly chips), supplemented by a few pieces of chert, pitchstone and other raw materials. This sub-assemblage includes 491 pieces of debitage, 23 cores and 33 tools.

Of 491 pieces of debitage, 253 pieces were classified as chips and 145 as flakes, with blades and microblades making up 23 pieces, or 5% of the debitage, and 66 indeterminate pieces were also recovered. Four pieces were identified as preparation flakes, with three being crested pieces and one a platform rejuvenation flake. As the blades were few in numbers and deriving from a variety of structures (possibly representing several periods and phases) it was decided not to describe and discuss them in detail. The debitage includes two pieces of Arran pitchstone, namely, namely burnt chip CAT 825 and microblade CAT 86. The latter is of black aphyric pitchstone from eastern Arran (Ballin and Faithfull 2009), whereas it is impossible to define the other more precisely due to its burnt and discoloured state.

	Flint	Chert	Chalc family	Quartz	Others	Total
Debitage						
Chips	53	1	93	105	1	253
Flakes	58	3	52	28	4	145
Blades	16			1		17
Microblades	4		1		1	6
Indeterminate pieces	11		50	3	2	66
Crested pieces	1		2			3
Platf rejuv flakes	1					1
Total debitage	144	4	198	137	8	491
Cores						
Split pebbles			1			1
Single-platform cores			1			1
Discoidal cores			1	1		2
Irregular cores			8			8
Bipolar cores	4	1	2	2		9
Core fragments			2			2
Total cores	4	1	15	3		23
Tools						
Microburins	1					1
Short end-scrapers	4					4
Side-scrapers	2					2
End/side-scraper	1					1
Backed knives	1					1
Scale-flaked knives	5					5
Plano convex knives	1					1
Truncations	3		1			4
Serrated pieces			1			1
Piercers	1					1
Combined scraper/scale-flaked knives	1					1
Pieces w edge-retouch	11					11
Total tools	31		2			33
Total	179	5	215	140	8	547
%	33	1	39	26	1	100

Table 15: The site's unrolled post-MHT lithic assemblage.

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The 23 cores include one split pebble, one single-platform core, two discoidal cores, eight irregular cores, nine bipolar cores and two core fragments. One chalcedony pebble was split (CAT 170), but without being reduced any further. CAT 282 (Figures 100 and 101) is a regular, conical (bullet-shaped), single-platform blade-core of chalcedony. It has a plain, untrimmed platform and it has been knapped along its entire circumference. It measures 63 mm by 36 mm by 25 mm. Two discoidal cores (one of chalcedony, CAT 397, and one of quartz CAT 441) are quite similar in typo-technological terms but differ considerably in terms of size. They both have one cortical face and one reduced face, but where CAT 397 has a GD of only 20 mm that of CAT 441 is 138 mm.



Figure 100: Conical single-platform blade-core CAT 282. This piece is of multi-coloured, opaque 'indeterminate chalcedony', possibly a form of jasper.

Irregular and bipolar cores are the most numerous core types recovered from the plateau. The irregular cores are all of chalcedonic raw materials, and apart from CAT 162 and 438 (GDs of 44 mm and 51 mm, respectively), all irregular cores are small pieces with a GD between c. 25-35 mm. The bipolar cores are based on many varieties of raw material, such as flint, chalcedony, quartz and chert. They are all intact, with a GD between 55-10 mm. The larger ones, like quartz core CAT 12, may have been reduced by the application of bipolar technique from the start, whereas many of the smaller ones may be platform cores which were exhausted by this approach when they became too small to reduce by platform technique. Two core fragments are both of chalcedony.

Of the 33 tools (Figure 101), almost all are of flint with two pieces being of chalcedony. The two largest broad tool categories are scrapers (seven pieces) and cutting implements (12 pieces). The scrapers include four end-scrapers, two side-scrapers and one end-/side-scraper. Only end-scraper CAT 298 is a well-executed piece. It measures 43 mm by 34 mm by 14 mm, and it is based on a cortical bipolar flake. It has a neat pressure-flaked, convex scraper-edge at one end, with the retouch continuing up along both lateral sides. All other scrapers are relatively small, irregular, expedient pieces.

The knives include one backed knife, five scale-flaked knives, one plano-convex knife, one serrated piece and four truncations. In terms of execution, they form two groups: expedient irregular pieces (the backed knife and the truncated pieces) and highly regular, well-executed pieces (the scale-flaked, plano-convex and serrated knives).

The backed knife (CAT 348) is simply a small flake with steep backing along one lateral edge and a sharp cutting-edge along the other (19 mm by 14 mm by 3 mm). The truncated pieces include two pieces with oblique truncation (CAT 175, 363) and two with straight truncation (CAT 80, 352). CAT 363 is based on a broad blade, whereas the remainder are based on flakes. Two of the flake-based specimens are intact, with a GD of 14-29 mm.

Scale-flaked and plano-convex knives form a typological continuum, both having had one or both lateral sides transformed into cutting-edges by invasive retouch. In the case of the former, only the edges were retouched, whereas the latter are characterised by the lateral invasive retouch reaching the centre of the dorsal face, thus giving these pieces their plano-convex cross-section (Clark 1932; Ballin 2021a). Three of the scale-flaked knives are based on regular broad blades, with CAT 46 and 75 being heavily burnt and having a width between 12-15 mm, whereas CAT 88 is intact and unburnt (39.3 mm by 11.5

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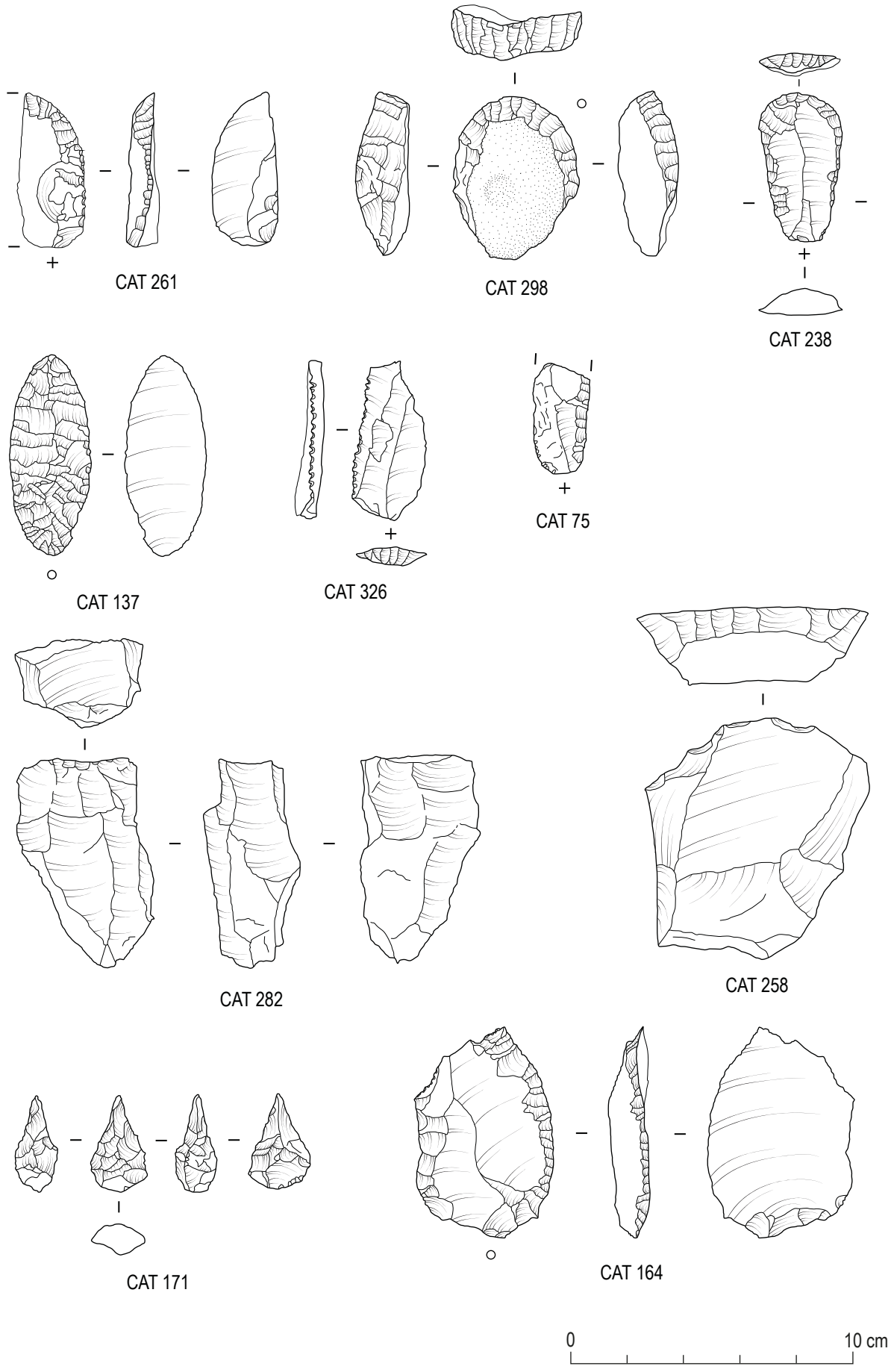


Figure 101: Illustrated later core and tools.

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mm by 4.2 mm). The other two are based on robust flakes, both probably on imported flint (mottled-grey and black). The smaller one (CAT 261; 42 mm by 17 mm by 9 mm) has split along the long-axis but it is uncertain whether this happened before or after it was modified. It has neat invasive retouch along its right lateral side. The larger one (CAT 164; 58 mm by 37 mm by 9 mm) has neat invasive retouch along both lateral sides, and the bulb has been thinned by ventral retouch (Figures 101 and 102). The distal part of the left lateral edge broke off but was apparently repaired. The black flint type of this piece corresponds to that used to produce the tools in the Grooved Ware pit approximately 1 km east of the site (Ballin forthcoming).



Figure 102: Scale-flaked knife CAT 164 (exotic black flint).

Plano-convex knife CAT 137 is an exceptionally well-executed piece. It is based on a broad blade, and it was given a symmetrical, double-pointed, pointed-oval shape that removed the bulb-of-percussion. It is based on high-quality mottled-grey flint which may be exotic. It measures 54 mm by 22 mm by 7 mm. Serrated piece CAT 326 is based on a broad, hard-hammer blade detached from a Levallois-like core. The material is flint-like chalcedony. It measures 43 mm by 9 mm by 5 mm, and it has six teeth per cm. It has notable gloss along the serration, ventral face, indicating that it was used to process vegetable matter (Juel Jensen 1994).

CAT 238 is a well-executed combined scraper/scale-flaked knife (40 mm by 22 mm by 7 mm), possibly also based on imported mottled-grey Yorkshire flint. It is a short flake with a steep, convex scraper-edge at the distal end. Along its right lateral side it has relatively steep backing, and along its left lateral side a scale-flaked cutting-edge. CAT 171 is an elegant little piercer (26 mm by 16 mm by 11 mm) of red, local flint and it was produced in core technique. It has a thick, rounded handle-end and an acutely pointed tip at the opposite end. One microburin (CAT 954) is the only obviously (unrolled) Mesolithic piece on the site. It is a small specimen with a width of 5.1 mm, suggesting a date after 8400 cal BC (discussed below).

Eleven pieces with edge-retouch display various forms of lateral modification. Six are based on flakes, three are blades, one is a microblade, and the blank of one is indeterminate. These pieces differ considerably in shape and size (GD 12-44 mm), and it is thought that this tool group includes artefacts, or fragments of artefacts, with different functions. CAT 92 is an elegant, slender blade (43.9 mm by 12.1 mm by 3.4 mm) with fine lateral and *gloss* along both lateral sides from processing vegetable matter (Juel Jensen 1994).

Distribution

As mentioned in the report's introduction, the more well-executed tools from for example pits may represent deliberate depositions, whereas simpler, less well-executed pieces, as well as 491 pieces of debitage, probably generally represent redeposited material from knapping floors and activity areas which became included in the features' fills when the knapping floors were penetrated and the features then back-filled. As only 52 pieces (10%) of the debitage is from 'deposits', it was thought that no actual knapping floors survived at Guardbridge (apart from the LUP scatter dealt with above), although they almost certainly existed in the past (23 cores were found), and that the evidence relating to primary reduction was too statistically 'flimsy' to allow discussion of the reduction techniques of the various Neolithic and Bronze Age settlers at Guardbridge. It was therefore decided in this report to focus on the finer tools from features (mainly pits), and other special pieces, to assess the nature of these features and their depositions.

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Table 16 shows the main context categories from which the Guardbridge lithics were recovered. A total of 45% of the finds are from pits, with 22% deriving from ditches or enclosures (mostly wall foundations of roundhouses) and 7% from postholes – most of these pieces are waste which entered the features with the back-fill. Six per cent of the finds are from prehistoric and later structures like cists, kilns and wall remains, with only 10% deriving from deposits. Ten percent of the lithics are uncontexted.

Contexts	n	%
Pits	246	45
Ditches/enclosures	123	22
Postholes	38	7
Kilns	9	2
Cists	8	1
Walls/structures	14	3
Various deposits	52	10
Unstratified/uncontexted	57	10
Total	547	100

Table 16: The find contexts of the post-MHT assemblage.

Table 17 shows the onsite provenance of a number of well-executed or otherwise special lithics. The earliest piece is microburin CAT 954 which was found within the curvilinear stone roundhouse ST40. It clearly represents redeposition, and as it is the only piece which is typo-technologically datable to the Mesolithic period, it is possible that it may simply have been dropped on top of the promontory by the Storegga tsunami which also scattered a lot of rolled chalcedony artefacts across the Guardbridge site from submerged earlier Mesolithic sites at the foot of the promontory. As it is unrolled, it may be a relatively late piece from a not-yet submerged site at the foot of the promontory. Unfortunately, none of the contexts in Table 17 provided charcoal for radiocarbon-dating.

Statistically, the site's pitchstone objects are most likely to date to the early Neolithic period (Ballin 2015; 2017; Ballin *et al.* 2018b). The microblade CAT 86 from pit (661) in ST41 probably represents deliberate deposition, whereas the burnt chip CAT 825 from ditch (285) ST9, may just be a piece of knapping waste which entered the feature with the back-fill.

Although in Scotland cores are rarely found as deliberate depositions in prehistoric features, probably Neolithic single-platform core CAT 282 is well-executed, aesthetically pleasing and relatively large and could potentially represent deliberate deposition. It was found in pit (1605), which was located south of ST11/42.

Most of the remaining lithics from Table 17 are well-executed pieces which might very well represent deliberate deposition. The five scale-flaked knives (CAT 46, 75, 88, 164 and 261) are all aesthetically pleasing pieces and apart from one (CAT 75) they were found in pits. CAT 46 was recovered from pit (2218) north of ST13, CAT 88 from pit (1772) west of ST11/ST42, CAT 164 from (1141) between ST20 and ST21, and CAT 261 from pit (1551) in PG4. CAT 46 is heavily burnt suggesting that it may have been placed with a deceased person on a funeral pyre. CAT 75 is also heavily burnt, but it was recovered from deposit (47) in ditch/gully (796) ST1), suggesting that it may not be a deliberate deposition. However, its heavily burnt condition suggests that it may derive from a disturbed cremation and only secondarily entered the deposit in ST1.

Serrated chalcedony blade CAT 326 is a very nice piece, but its *gloss* indicates that it is a used tool. It was recovered from pit (2347) between ST31 and ST40. Combined tool CAT 238 is also well-executed and was found in pit (3003) in ST20. And retouched blade CAT 92 is a highly regular used blade (with *gloss*), recovered from pit (1807) west of ST11/ST42.

End-scraper CAT 298 may be well-executed, but the fact that it was retrieved from the overburden in the fort makes it impossible to determine whether it is simply a domestic object from a settlement surface or a piece from a disturbed ritual or burial pit. The same can be said about the well-executed plano-convex knife CAT 137 which was recovered from deposit (407) above ST41. It is a distinct possibility that both pieces represent disturbed pit depositions.

The fact that scale-flaked knives CAT 164 and 261 and plano-convex knife CAT 137 are of likely Yorkshire flint defines those pieces as potentially precious to their prehistoric owners and therefore

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as more likely to have been deposited in a ritual or funereal feature. It also supports the notion that the plano-convex knife could be from a disturbed burial. Two of these pieces are of mottled-grey Yorkshire flint, whereas CAT 164 is of high-grade black flint. This is the same type of flint used to produce the very large, well-executed objects in a Grooved Ware pit approximately 1 km east of the present site (Ballin forthcoming). It cannot be ruled out that this pit and the present Guardbridge site are contemporary. Although these mottled-grey and black forms of flint are generally referred to as 'Yorkshire flint' (Ballin 2011c), it is possible that the black flint may have been procured from sources even further afield, such as mines in East Anglia (e.g., Grimes Graves; Saville 1981). The rise in the popularity of black flint around the middle/late Neolithic transition in Scotland may either mean that the Scottish 'importers' asked their Yorkshire 'suppliers' to start to separate the flint from north-east England into colour categories – or that they simply changed 'suppliers'. Considering the length of trade routes in the Scandinavian middle and late Neolithic periods (with flint from the mines in Jutland having been found in northern Norway and flint from workshops in Zealand having been found in northern Sweden; Ballin 2016) long-distance flint trade in Scottish/British prehistory should be considered a realistic possibility.

Discussion

Apart from the LUP scatter in ST13, lithics, contexts, features and structures on the Guardbridge promontory are generally thought to be datable to the post-Mesolithic period. One narrow blade microburin (CAT 954) was recovered from ST40, but as no other unrolled Mesolithic pieces were recovered from the site (apart from possibly a small number of microblades from ST13), it is quite possible that some unrolled pieces from not-yet submerged late Mesolithic sites at the base of the promontory could have been picked up, 'tossed' and scattered across the site by the Storegga tsunami c. 6160 cal BC.

Although knapping waste in the form of chips, flakes and cores were incorporated into the fills of a number of pits and ditches, showing that knapping floors had definitely been present at Guardbridge in the Neolithic and Bronze Age periods, no intact or truncated knapping floors were discovered – apart from the LUP scatter.

Although most of the lithics in the pits and ditches are recognisable as knapping waste, which must have entered the features with the back-fill, a small number of well-executed or otherwise special lithics may represent deliberate depositions in ritual or funereal features (Table 17). They include one large and

Type	CAT no	Context	Feature	Structure
Pitchstone microblade	86	662	Fill pit (661)	ST41, S of PG 1
Pitchstone chip	825	286	Fill ditch (285)	ST9
Single-platform core, chalcedony	282	1605	Fill pit (1604)	South of ST11/ST42
End-scraper, flint	298	2621	Overburden	Fort
Scale-flaked knife, flint (burnt)	46	2219	Fill pit (2218)	North of ST13
Scale-flaked knife, flint (burnt)	75	47	Deposit ditch (796)	ST1
Scale-flaked knife, flint	88	1777	Fill pit (1772)	West of ST11/St42
Scale-flaked knife, flint	164	1142	Fill pit (1141)	Between ST20/ST21
Scale-flaked knife, flint	261	1552	Fill pit (1551)	PG4
Plano-convex knife, flint	137	407	Deposit above (368)	ST41, S of PG 1
Serrated blade, chalcedony	326	2348	Fill pit (2347)	Between ST31/ST40
Combined scraper-knife, flint	238	3004	Fill pit (3003)	ST20
Retouched blade w gloss, flint	92	1809	Fill pit (1807)	West of ST11/ST42
Microburin, flint	954	2455	Depos. curvilinear stones (2010)	ST40

Table 17: The distribution of well-executed or otherwise special lithic artefacts.

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highly regular conical blade core (CAT 282), a regular end-scraper (CAT 298), five scale-flaked knives (CATs 46, 75, 88, 164 and 261), one plano-convex knife (CAT 137), one serrated blade (CAT 326), one combined scraper/knife (CAT 238) and one retouched regular blade (CAT 92). Several of these pieces are used tools with edge-damage (e.g., the serrated knife) or *gloss* (one scale-flaked knife and the serrated blade), where the *gloss* indicates that these pieces were used for sickling vegetable matters such as cereals, grasses or reeds (Juel Jensen 1994; also Ballin 2011c).

The likelyhood of these pieces as being special and probably deliberately deposited in pits is supported by the fact that two scale-flaked knives (CAT 164, 261) and the plano-convex knife (CAT 137) may be of imported Yorkshire flint (Ballin 2011c). Two are of mottled-grey Yorkshire flint, whereas scale-flaked knife CAT 164 is of black flint which may have originated even further afield.

Two pieces of Arran pitchstone may represent different scenarios. Microblade CAT 86 is intact and probably represents deliberate deposition like many other pitchstone microblades found in pits commonly associated with fragments of Great Langdale tuff or Carinated pottery (Ballin 2015; 2017; Ballin *et al.* 2018c). CAT 825, on the other hand, is a burnt chip and may simply represent knapping of pitchstone by a hearth, where a fragment accidentally fell into the fire.

As a whole, this sub-assemblage contributes little to the understanding of Neolithic lithic reduction processes, but does add to what we presently know about Neolithic and Bronze Age depositional practices.

Conclusion

The examination and analysis of this assemblage showed that it could sensibly be split into three parts, namely 1) a LUP scatter within ST13 and ST2) a collection of rolled Mesolithic lithic artefacts, and 3) the remainder of the finds, which are thought to date to the Neolithic and early Bronze Age periods.

The LUP scatter is in effect a small knapping floor centred around a single domestic hearth. It is thought that two knappers were present, one sitting west of the hearth and one east of the hearth, with other tool-using activities taking place immediately south of the knapping floor. Most likely, the scatter represents a brief visit by a family group who needed to replenish their supply of blades – approximately one-fifth of the assemblage is blades (one-quarter of the debitage) and only 10 pieces are tools. The distribution patterns, particularly the star-shaped pattern relating to the blades suggests that the scatter may have been covered by a tent-like structure (cf. the distribution of the lithics from the Hamburgian site at Slotseng, southern Jutland, Denmark; Holm 1991).

The fact that a substantial proportion of blades were from opposed-platform cores, in conjunction with the fact that four of the five cores are opposed-platform cores, suggests that the assemblage dates to the LUP period. The discovery of a small, plain, symmetrical tanged point as well as the tip of an indeterminate point, indicates that the assemblage may be of Ahrensburgian affinity (cf. Schwabedissen 1954; Winkler 2019).

The small numerical size of the assemblage, as well as its limited typological span (only one-and-a-half point, one scraper, and no burins), lowers its research potential, although the blades give an impression of the applied reduction techique. However, at present it is the only Scottish single-occupation site from (most likely) the Ahrensburgian period. Other Scottish finds from this period include a number of stray Ahrensburgian points from Tiree, Islay, Loch Torridon and Orkney (Livens 1956; Ballin and Saville 2003; Ballin and Bjerck 2016 Berg-Hansen *et al.* 2019), as well as a potential Ahrensburgian settlement site from Islay which has not been fully processed and published yet, but which certainly includes several phases (Mithen *et al.* 2015).

However, radiocarbon-dates from ST13, supported by a limited number of microblades which form a small secondary peak in the diagram of the blades from this scatter (Figure 89), indicates that the location may have been visited very briefly during the Late Mesolithic, and this could have affected some of the above observations.

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The recovery of more than one hundred rolled lithic artefacts on top of the Guardbridge promontory was a surprise, as this surface is located *c*. 20-30 m OD. If the highest water level during the MHT (c. 5500 cal BC) was approximately 12 m OD, it is unlikely that even the most extreme storm surges at that time would have been able to cover the top with rolled lithic artefacts from submerged Mesolithic sites at the base of the promontory. The most likely explanation was therefore that these objects had been scattered across the promontory in connection with the Storegga tsunami (c. 6160 cal BC) which had an estimated runup height of c. 20-25 m. If the general water level at the time is combined with the runup height of the tsunami, the upper several metres of the tsunami would have passed over Guardbridge, dumping debris in the process.

This assemblage is heavily dominated by varieties of chalcedony suggesting a Mesolithic date of the rolled material. Two other Mesolithic assemblages from the region (Fife, the Tay estuary, Angus) are also heavily dominated by this group of raw materials, namely Early Mesolithic Morton Site A (Coles 1971) and Late Mesolithic Freeland Farm in the bottom of the Tay Estuary (Nicol and Ballin 2019). Sites in the region pre- and post-dating the Mesolithic tend to be dominated by flint.

The lithic assemblage does not have much research potential in itself, but it adds to the body of evidence relating to the research into the Storegga tsunami. This research includes geological work throughout north-eastern Britain as well as throughout the North Atlantic. In Fife, several geological locations have provided evidence on this phenomenon. However, the rolled lithics from Guardbridge do show what sort of archaeological material may be used as indicators of the tsunami, although the specific find location of the assemblage on top of a high promontory may make this a special case.

The remainder of *the lithic assemblage* is mostly Neolithic and Early Bronze Age artefacts from pits and ditches, with most pieces probably being redeposited knapping waste from knapping floors disturbed when these later features were dug through them and the material then entered the features with the backfill. However, a number of well-executed and otherwise special pieces are thought to represent deliberate depositions, probably ritual and funereal events.

These pieces are listed in Table 17 and include first and foremost various cutting implements, such as scale-flaked and plano-convex knives, a serrated blade, a combined scraper/knife and a retouched blade, as well as a microblade of pitchstone. Most of these tools are probably middle/late Neolithic specimens, but the pitchstone microblade is thought to date to the early Neolithic. Three of the probably deliberately deposited pieces are of exotic flint, which also indicates that the group may represent tools perceived to be special. Two pieces have macroscopic *gloss*, indicating that some of the group's cutting implements may have been used for sickling vegetable matters like cereals, grasses or reeds (Juel Jensen 1994), and two pieces are heavily burnt. This suggests that most of the deposited artefacts may have been deposited in connection with fertility rituals (harvest implements) and others in connection with burials (burnt).

Overall, the lithic finds have contributed significant new evidence relating to the Scottish LUP period, the Storegga tsunami and its likely impact on the Mesolithic coastal population at the time of this event, as well as depositional practices in the Scottish Neolithic and early Bronze Age periods.

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Stone artefacts

By Beverley Ballin Smith

Introduction

The excavations of the extensive area demarcated for development at Seggie Farm, Guardbridge, produced a medium-sized assemblage of 40 worked stones from the evaluation, pit groups, structures and the ditches of the fort. Most of the tools identified are related to the prehistoric excavation of the area but there are others which suggest crafts or domestic industries of a later period (see Table 18 and *Coarse Stone Catalogue* – Appendix 2).

The stones were brushed or washed before examination. Where possible they have been examined to identify their geology, weighed, measured, photographed and examined in detail for tooling or wear marks, and their attributes and statistics were compiled in an archivable database devised using Microsoft Excel. Unworked pieces have been separated from the worked stone and discarded. The assemblage was analysed according CIfA's *Standards and Guidance for the collection, documentation, conservation and research of archaeological materials* (2014, revised 2020).

The raw material origins

The excavated area at Guardbridge lay on a Devonian raised beach of Glenvale sandstone close to the confluence of the River Eden that flowed from the south, with that of the Moonzie Burn from the west and the Motray Water from the north. Each of these water courses would have brought rocks from different geological zones down their channels to be deposited in St Andrews Bay. This situation, combined with the River Tay's large estuary to the north, meant that a wide variety of raw materials from different sources was available to the prehistoric inhabitants of Guardbridge. In addition, the extensive local sandstones forming the raised beach (BGS Geology Viewer 2025) and boulders and cobbles in the overlying till or subsoil, were also exploited.

Sandstone was used for artefacts such as spindle whorls, loom weights and whetstones, usually fine-grained and blonde or grey in colour, although darker pieces of Old Red Sandstone and a mudstone were also utilised. Old Red Sandstone was also chosen for the axehead SF 121, but whether that was from rocks local to the area, or the finished artefact was brought in from elsewhere, is not known.

Identification	Nr of pieces	Unstratified	Pit groups	Structures	Others
Spindlewhorl	6	u/s	PG1, PG2, PG3, PG12		NW of fort
Loom-weight	2		PG1/ST41	ST35	
Pot lid	1			ST3	
Axeheads	3	u/s	PG2, N of PG10		
Grinder, Grinder/Hammerstone	3	u/s	PG2	ST8	
Hammerstone	2	u/s	PG1		
Pestle	3	u/s	PG1	external to ST6, E of ST20,	
Pounder, Pounder/Hammerstone	5		PG1, PG3	ST13, ST40,	Fort ditch
Whetstone	3	u/s		ST12, SW of S31	
Burnisher	1			ST40	
Tuyere?	1		PG1		
Agricultural tool	1				SW of fort
Lamp	1			nr St12	
Mortar/Knocking stone	1			ST41	
Pivot stones	2		N of PG10		Evaluation
Saddle querns	4	u/s, u/s	PG2	external to ST6	
Tether stone	1			SF44	
	40				

Table 18: Stone tools and their locations.

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A boulder of andesite used for a possible quern may have originally derived from the Ochil Volcanic Formation that outcrops on the southern edge of the River Tay estuary. Volcanic plugs, vents and dykes of various geological periods are present to the south and north-west of Guardbridge and water-worn cobbles most likely derived from these features include quartz, possibly quartzite, but also fine, hard rocks such as dolerite – all were used at Guardbridge.

It is possible that mica schist and quartzite originated from the central highland areas of Scotland, and were brought down through the action of glaciers or by the River Tay to be picked up on beaches near to Guardbridge. The raw materials of some tools have not been identified because they are still in cobble form or their surfaces have been affected by long immersion in water.

The hornfels axehead, SF 924, was identified by Torben Ballin (pers. comm.) as coming from Creag na Caillich near Killin, Perthshire, some 85-90 km away from Guardbridge, at the west end of Loch Tay. Another axehead was also identified as Great Langdale tuff from the Lake District, approximately 350 km distant. The axes and their origins are discussed further below.

Results of the analysis (For further details and images see the *Coarse Stone Catalogue*)

Perforated pieces – spindle-whorls and loom-weights

Four out of the five spindle-whorls are complete examples but SF 197 survives as one-third of a whorl. All the pieces are fine-grained and include sandstone and soft mica schist but the lithology of two examples remains unidentified. All are undecorated. They vary in weight from c. 21 g to 54 g but their diameters are a little more consistent ranging from c. 38 mm to 48 mm. The thickness of the whorls lies between c. 11 mm and c. 17 mm, and their perforations are between a minimum of 5 mm (two examples) and 8 mm in diameter.

There is consistency in their manufacture in that they often have faint scratch marks left by a harder rock or a knife that was used to smooth or polish their surfaces and sides. In all whorls, except for the example of SF 197, which was chipped from both flat surfaces of the piece, the perforations were made by drilling through the stones. All the drilled examples have perforations which widened into splays on their surfaces, indicating that the pieces were used - at the end of a spindle for making woollen yarn. However, the perforation in SF 1463 is slightly off-centre, and indicates the whorl was used obliquely on the spindle. Almost all whorls have slightly chipped edges, either through use or from post-depositional movement in the soil. The fill of a pit from ST41/PG1 in which spindle-whorl SF 278 was located provided an early Iron Age date of 751–412 cal BC (UBA-51746).

SF 492 is a fragment of a perforated whorl made of mudstone that has laminated. It would have had a diameter of c. 30 mm and its worn perforation is 6.5 mm in diameter. What sets this apart from the other whorls is that it probably had a tight band around its circumference, which wore a V-shaped notch into its side. It is possible the band held the stone together if it had cracked and prolonged its use, indicating it may have been a favourite tool.

Only two intact loom-weights were found during the excavations. Both are of sandstone, but SF 310 is a cobble and SF 479 a chipped piece of rock. Neither weights are perfectly round but both are perforated through the middle of their larger surfaces so that they could be suspended by warp threads on an upright loom. The 16.8 mm diameter perforation in SF 310 was made by chipping with a narrow pick that left surface scars around the hole. In contrast, the 13 mm diameter perforation in SF 479 was drilled through the stone producing a much smoother area around it. Both weights indicate use by additional smoothing around parts of the perforation, but there is no corresponding wear on the surfaces of the stones. Both weights are similar in size but SF 310 is heavier due to the thickness of the stone. SF 479 was located in the fill of a pit besides ST 35, which was dated to 747–402 cal BC (UBA-51748) the early Iron Age.

Stone or clay spindle-whorls are probably one of the most commonly found artefacts on excavations of later prehistoric domestic sites and their use carries on into the Medieval period. Until the introduction of the spindle wheel in medieval Europe from Asia, possibly as early

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as the thirteenth century, and Britain possibly before the sixteenth century (Baines 1982, 44-45, 59), the spindle and its whorl would have been an essential piece of household equipment. It was the only mechanism by which enough thread or yarn could be made that could then be put to other purposes, such as making cloth. Like the spindle-whorl the warp-weighted loom[5] for cloth-making, has a long history, with examples in Europe known from as early as the Neolithic and Bronze Ages (Hoffman 1964, 18). The finding of clay loom-weights at Northbar, Erskine in dated middle Bronze Age contexts (Ballin Smith forthcoming a and b), suggests the technology was already in use in Scotland at that date. The presence of loom-weights also presupposes that sheep breeding or selection was also taking place to produce a woollier sheep from the hairy original (see Ryder 1971, 500), from which softer woollen fabric could be made. The loom-weights from Guardbridge indicate that stone was the preferred material for their manufacture, whereas at other settlement sites where stone was not readily available clay was used.

Pot lid

Only one pot lid, SF 236, was recovered from the excavations. It is made from a split mica schist cobble, and although its surfaces are smooth the edges were partly formed by grinding. Its diameter indicates that it was probably used on a small to medium-sized pottery vessel.

Thin circular pot lids can be common on Iron Age domestic sites, where the right stone was available, and where they were a simple and expedient way at covering the mouths of clay vessels. At some excavations, such as at the Iron Age settlement at Howe, Orkney, a large number were found in various diameters, indicating not only the ease of their manufacture, but also the variety of pottery vessel sizes (Ballin Smith 1994, Illus 119, Table 52, 204).

Axeheads

Three polished Neolithic axeheads were found across the excavated area (Figure 103). SF 121 of Old Red Sandstone was badly damaged but part of its cutting edge and shaft has survived.



Figure 103: The three Neolithic axe heads.

5 An upright loom where the warp fibres are held in tension on it by weights suspended at the bottom of the frame.

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Even in this fragmentary state, it is noticeable that the artefact had taken considerable time to make and was probably a prized possession. However, sandstone is a relatively soft stone and the axehead may have broken easily. Once it was shattered at its cutting edge and no longer useable as an axe, it was reused as a hammer at its narrower end, which caused further significant damage to the piece.

SF 924 is the best preserved of the axeheads as it made from a hard rock, calc-silicate hornfels, of local importance (Clough 1988, 9, Table 3). It was made by flaking, grinding and polishing to a smooth shape with faceted sides and a broad cutting edge which may have been used. This is a small axe and the stone came from Killin, in Perthshire. In axehead studies it is a type XXIV. Coope (1979, 99-101), suggests that shaping and finishing of the axehead would probably not have been done at the quarry but nearer to a settlement and probably by a versatile manufacturer who knew how to use the available technology, and experiment with different stone types to produce the finished piece.

SF 110 is another damaged but similar sized and shaped axehead to SF 924, but the origin of its lithology is the tuff found at Great Langdale, Lake District. It is classified as a type XI (Clough 1988, 9, Table 3).

Excavation of the site at Killin produced radiocarbon dates from Site 4, suggesting use of the site took place between c. 2900-2300 cal BC, which indicated that the quarrying was later than that of Great Langdale (Edmonds, Sheridan and Tipping 1992, 106, 108). However, the formal similarities (Figure 104) between the Great Langdale and the Killin axeheads suggest that they are contemporary (pers. comm. Torben Ballin).

Cobble tools

Tools (14) made from cobbles are the largest category in this assemblage, but they are not all simply expediently chosen stones for a purpose, used and then discarded. Some of these tools because of their wear marks can be called specialist tools. Their use has often been extensive and produced patterns of wear that are distinctive, suggesting they were used over a long period of time and may have been part of a domestic tool kit. Some tools with their differing wear patterns indicated they had two

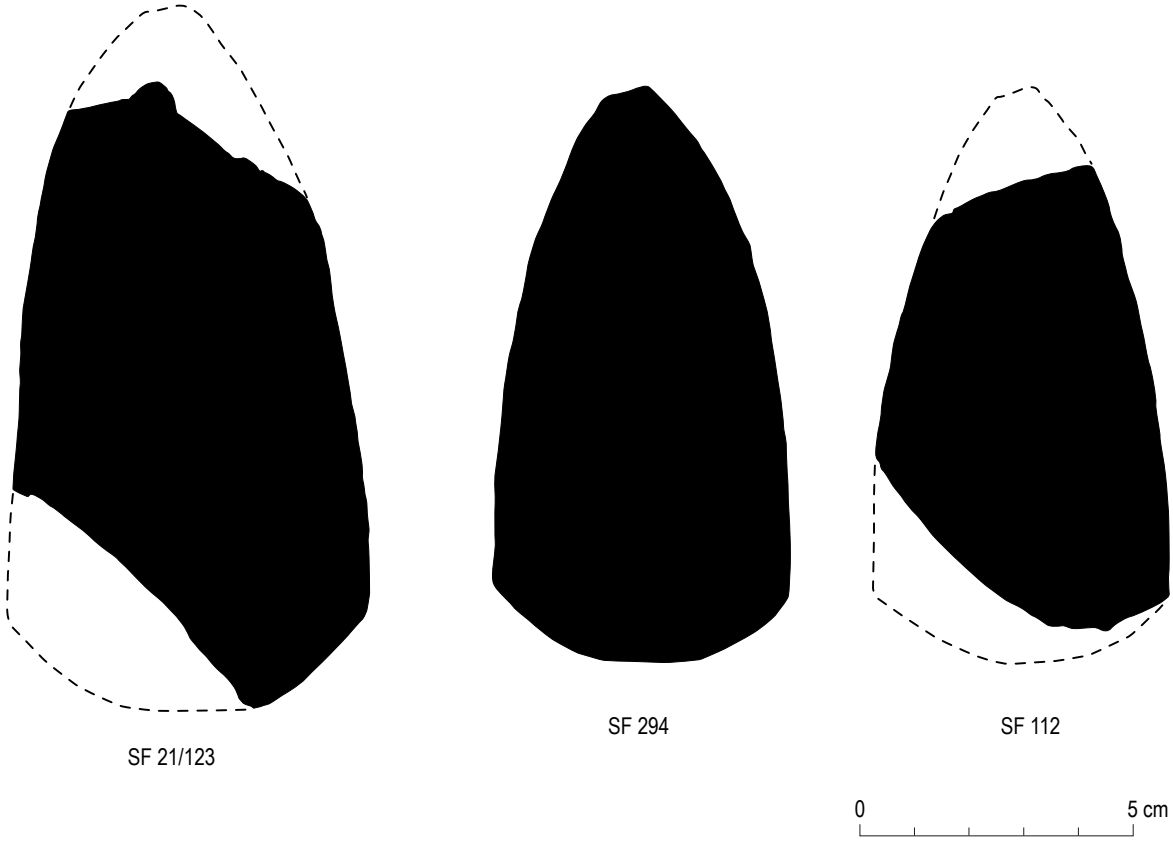


Figure 104: Similarities in shape between the three axe heads.

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functions. This is not unusual, as stones could be repurposed when necessary. SF 470 was utilised in three different ways suggesting it was a combination or multiple-use tool (Ballin Smith 1994, 196). These tools are common on Iron Age settlement sites before the advent of the use of iron, and are often found in high numbers (ibid), although they are not limited to that period.

There are five *pounders* where hand-sized round cobbles have generally been selected: the largest being 1350 g in weight to the smallest at 140 g. Quartzite, quartz, dolerite and dense micaceous sandstone were utilised for the light hammering that produced areas of pecking on these tools. The best examples are SF 158 and SF 172. The former is a round cobble of quartz that has been extensively pecked all around its circumference and across the surviving end, possibly to allow it to fit well in the hand. The other part of the stone has been used as a hammer (a pounder/ hammerstone). SF 172 is a heavier tool of quartzite that has wear from pecking around most of its circumference with little of the original surface surviving. Both these tools are complete and indicate extensive use.

Tools with ground edges cover two tool types, *pestles* and also *grinders* of which there are six examples in total. Pestles have one end that has been worn by the action of grinding (smooth wear) and the other end worn by pounding (indented wear). Grinders were often used at one end of the cobble or around its circumference and in these examples do not display other types of wear. Similar to pounders, these cobble tools are usually more elongated in form than rounded, although both exist in this assemblage. The cobbles used are predominantly quartz, dolerite, and quartzite with one mica schist example.

SF 52 is a heavy cobble pestle of quartz at over 1.5 kg, and its narrow end has slightly faceted wear where it has been used as a grinder. The broad end has Y-shaped wear caused by slight pecking at the apex and also down both sides of the stone in narrow stripes. A second possible pestle is SF 666, a thin cobble of mica schist that spit from end to end of the tool. Only one end survives to indicate the tool was used for grinding and later for pounding. The wear is faceted.

One of the finest and well-used tools is SF 114 of fine-grained dolerite. It is a curved, hand-sized, thin cobble that has been made very smooth through use. Its broad end has been worn into facets through grinding and its narrower end has suffered damaged through it been used as a hammer. Technically this is a grinder/ hammerstone. Another split cobble is SF 553 where its surviving edge or end has been ground flat through use as a grinder.

Two cobble tools are identified as hammerstones. SF 110B is a round but thin cobble, where one end has been used as a hammer. SF 470 is a flattened cobble put to different purposes. Its narrow end has been shattered as it was used as a hammer. One side of the tool has a discrete flattened area possibly from its use as a whetstone, and very light pecking is noted at the surviving broad end, where it was used for pounding – a typical multiple-use tool.

Whetstones

Three whetstones were found at the site: SF 211, a blonde sandstone block, SF 448 a possible iron stone block and SF 565 a small fine-grained sandstone cobble. Both SF 211 and SF 448 have each one face of the stone made extremely smooth and flat by the whetting or honing of metal blades.

SF 565 is a small hand tool that displays a significant linear depression and groove on one face. Another 2 mm deep by 2-5 mm broad groove is also present down one side of the tool, with other faint grooves noted on other surfaces indicating wear from sharpening a metal blade. A similar fine sandstone tool to SF 565 was found at Broxmouth. SF 1024 was clearly associated with iron-working in House 1 that was dated to the middle Iron Age (Cool 2013, 359-60, Illus 10.53).

These three Guardbridge stones appear to be rare examples on a site which produced other copious evidence of metal working. The fill of an enclosure ditch (1448) that contained SF 565 was radiocarbon dated to 3010 – 2880 cal BC (UBA-51749), the late Neolithic. It is obvious that the tool (SF 565), possibly from the Iron Age, is an intrusive object into the ditch.

Specialist fine tool

A small and elongated but rounded ended pebble of quartzite is unusual in that it is smooth all over but has worn and flattened cambered

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sides that reduce towards its ends. The worn sides are quite distinctive and are convex in plan. The large surface areas of the pebble also appear flattened, probably through use. The tool has been identified as a rare quadrilateral burnisher and other examples have been recognised from the excavations at Whithorn, where they have been associated with the monastery of St Ninian and possibly with specialist metalwork crafts (Nicholson 1997, 458).

Possible tuyere

A rough, rectangular sandstone block, SF 123, is an unusual piece as it is heavily burnt and dark brown in colour. It is irregularly shaped but perforated centrally by a c. 30 mm diameter hole, which was created by a pick. It is possible, but not confirmed, that this is a tuyere, to house the bellows to a small bowl furnace for smelting iron ore. Clay has often been used in the latter part of prehistory (Hodges 1989, 68), to protect the bellows from the heat of the furnace, but in this instance a sandstone piece may have fulfilled that function. Alternately, it may have been an integral part of the furnace into which the tuyere and bellows fitted. The use of stone for a tuyere support was noted at Culduthel, Inverness, where the eye of a fragmentary rotary quern of garnet mica schist was put to use (Hatherley 2021, 63, and McLaren 2021, 114, 135, SF0457 and SF0458). In the Northern Isles during the Norse period, steatite was also used for tuyeres (Foster and McLaren 2019, 85-86).

Although residues from metal smelting and working were found at Guardbridge, no specific features were identified with these activities (see *Vitrified Material*)

Agricultural tool

SF 941 is a possibly split but flaked cobble or stone with a broad curved cutting edge at one end. The relatively short and thick shaft of the piece has been shaped by flaking that produced a slight waist on one side of it, possibly for hafting the tool. Further evidence for the interpretation of this piece as a possible digging or agricultural tool is a narrow but there is a pronounced band of wear to the rear of the worn cutting edge. The tool is possibly shaped from andesite, a hard igneous rock, most likely found locally.

Comparable tools to SF 941 have survived on the Northern Isles where they have been recorded from predominantly Bronze Age contexts. For example, C56 from the Bronze Age structures at Sumburgh in Shetland (Downes and Lamb 2000, 88-91, Fig 32) is a split sandstone cobble with a worn worked edge at its broad end. Other similar tools from the same site were also distinctly flaked on their sides to aid hafting. Other flaked and worked stones were noted at the late Neolithic/early Bronze Age Scord of Brewster, Shetland. Here Rees (1986, 76, Fig 63), however, has described them (Group B) as axe-shaped tools where their broad end is rounded but wear appears on both faces of the working edge, unlike SF 941, which has wear only on one face.

On the isle of St Kilda igneous rocks such as dolerite were used for what are described as mattock blades. These are also flaked tools but they are broader than SF 941. They are predominantly broken across their shafts, but they had a rounded working edge that indicates wear on one surface only (Ballin Smith 2021a, 40). Although different in appearance from the St Kilda examples, the Guardbridge tool probably had a similar function, as a hafted turf cutter, mattock or spade. The St Kilda examples are possibly from late in the Bronze Age and into the Iron Age, but where metal tools were not available they could have continued in use into the medieval period. The Guardbridge tool remains undated, but its use in the Bronze Age is feasible.

Lamp

A substantial block of yellow sandstone SF 559, with a large circular pecked hollow or shallow basin in its upper surface is identified as a possible lamp from a pit near ST12. The reddening of one (damaged) side of the top of the basin suggests that is where the wick would have been supported and burnt using oil contained in the basin.

Stone lamps are fairly rare in the archaeological record because they have either burnt through and therefore are fragmented or they have not been recognised as lamps. The pecked and unsmoothed hollow of SF 559 suggests an Iron Age date, and there was evidence of Bronze Age and Iron Age activity near the pit in which SF 559 was found. However, given the size of

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the stone it could have derived from a later period. The smaller stones identified as lamps, with pecked hollows, flat bases and evidence of burning, were found during the middle and later Iron Ages from the broch and Pictish settlement at Howe, Stromness Orkney. The best but highly burnt example from this site has a rounded base with a smooth interior hollow (Ballin Smith 1994, 207-209, illus 125). A similar suite of hollowed large cobbles or small boulders was found at Broxmouth associated with the middle Iron Age houses and hillfort ditches, but only one was identified as a lamp because of its burnt rim (Cool 2013, 357-59, Illus 10.51 and 10.52). It is suggested that different shapes and sizes of lamps were used, depending on the stone resources available, and the historical time period in which they were used.

Mortar/knocking stone

A fragment of a red sandstone boulder with a large deep smoothed hollow, SF 505, was found within ST41 and identified as a mortar, sometimes also called a knocking stone. It was the equivalent of a modern day (pestle and) mortar but on a larger scale, and would have been used for the dehusking of certain grains such as *bere* barley (Fenton 1978, 388). The structure with which it is associated produced a radiocarbon date of the early to middle Iron Age date (UBA-51746). It is possible the stone is contemporary with the structure, as it is unlikely to be earlier than the Iron Age.

Pivot stones

Two small boulders, SF 1 and SF 989, with worn hollows were probably used as pivot stones. The stones are most commonly found on Iron Age excavations, such as at the foot of entrances where the hanging side (the hinge side) of the door would protrude above and below the door and would be fixed top and bottom in a hollowed stone (the pivot or swivel stone). The door could be opened and closed by the wood of the hanging side swivelling in the pivot stones. Rarely are upper stones found, but lower stones such as these from Guardbridge show evidence of wear causing smoothing of the hollow. SF 989 was found in the fill of kiln (2113). It was sooty and also the stone had been turned over and reused on its other surface. This type of reuse has been noted previously on other examples such as the broch of Howe (Ballin Smith 1994, 209-210).

Saddle querns

A total of four saddle querns were recovered from the site, but two of them were unstratified. SF 156 is a possible quern and it was reused as packing in a post-pit (257) in PG2 and SF 582 was found externally to ST 6. All the querns were made from boulders, mostly igneous or metamorphic rocks such as andesite and hard mica schist. They were substantial stones weighing between 4 kg and 16 kg and at, or over, 260 mm in length by 180 mm in width by 90 mm in thickness. They also had visible concave wear in their upper surfaces from the use of a quern rubber grinding grain to flour on them.

SF 481 had a flaked lower surface which may have been chipped deliberately to level the boulder, but as mica schist is prone to flaking it may have occurred naturally. Its worked surface was worn smooth but faint, parallel linear striations were noted that indicated the direction of grinding by a quern rubber. SF 582 is similar to SF 481 as the stone may have been pecked to shape it before use and its working surface was pecked all over to roughen it before it was worn smooth in its centre.

SF 684 was a split elongated boulder. It had been pecked all over to produce a smooth shaped quern with rounded ends. Its working surface is slightly concave longitudinally from its broad to its narrow end and the former has been worn smooth, while the rest of the working surface shows evidence of pecking and lighter wear.

Saddle querns, used with quern rubbers or hand-sized pounders, are commonly found on prehistoric sites until the middle Iron Age when rotary querns were introduced. A saddle quern of good quality and hard wearing stone was probably a significant investment and would often be in use until it was worn through, or could no longer be roughened by repacking. An example of such a well-used and well-curated saddle quern was found recently at Rosemarkie that weighed c. 78 kg (Ballin Smith 2024). Once positioned in a building for use, it is likely that a quern remained *in situ* and was rarely moved simply because of its weight. The Guardbridge stones are lighter in weight than the Rosemarkie example and at least one of them was reused to support an upright timber in a posthole.

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The use of mica schist for querns and quern rubbers was common but some stone was less hard than others and the benefit of use of the more fragile examples for producing edible flour is debated (ibid), as over time and with continued use, the mica sheets in the rock broke down and formed flakes or dust that would have been incorporated into the flour – creating a gritty substance. Mica-schist may have been a resource that was easy to acquire and use, although its longevity for querns, depending on his hardness, was probably short-lived.

Tether stone

SF 1215 is a perforated, hard mica schist boulder, associated with collapsed stone walling by the fort. During the excavation it was considered to be the upper quern from a rotary set and the only example of a rotary quern from the excavated area. However, certain characteristics are lacking that identify it as a quern. Its perforation is small. Although the splay around it is c. 80 mm in diameter, the actual perforation is not vertical but angled and measures only 35 mm in diameter. The upper surface of the stone is slightly domed, as expected if it were a quern, but the lower surface is flat and its displays no sign of having been worked, or worn.

It is possible that the stone was intended to be a quern, but it is more likely the stone was used as a weight or anchor stone at the end of a rope used to tie down the thatch of a roof (Fenton and Walker 1981, Figs 44 and 45), or alternatively it could have been a tether stone, again with a rope, to prevent a cow or horse from wandering. There is some wear around the perforation indicating its use a weight for one of these or similar purposes.

The stone assemblage from Guardbridge is not large considering the long occupation of the site and the number of structures found there. However, the assemblage represents a range of domestic objects, with occasional important and rare pieces such as the axeheads, covering a long time scale from the early Neolithic to possibly as late as the late Iron Age. With other items of material culture, such as pottery, it is hoped that the stone tools provide a narrative to increase our understanding of lives of people at this place over time.

The cannel coal and oil shale jewellery

By Fraser Hunter

The excavations produced four cannel coal/ oil shale artefacts and one fragment of what is probably a gathered block of raw material (Table 19). Two of the artefacts are unfinished, confirming manufacture on site: bangle SF 278 and pendant roughout SF 497. The other two finished items are also bangles, both showing attempts at repair after breakage. This suggests that the raw materials were not always readily available for replacements, although they are recorded in eastern Fife. Oil shale is known from Pitcorthie, 2 miles north of Anstruther, and cannel coal and oil shale in thin seams near St Andrews (Gibson 1922, 18-20). They are notably more abundant in central and western Fife (ibid, 18-25), though the availability of exposures accessible in the past is unknown. Visual inspection identifies the raw materials as predominantly cannel coal (SF 192, SF 278 and SF 496 are visually very similar), a different cannel coal or canneloid shale (SF 1269) and an oil shale (SF 497). The three visually similar items, one a gathered block, suggest a locally available source.

SF No.	Identification	Material	Notes	Date
192	Bangle, tall D section	Cannel coal	Repaired	Iron Age
278	Bangle, rounded D	Cannel coal	Unfinished; repaired	Early Iron Age
1269	Bangle, D	Cannel coal or canneloid shale	Repaired	Late Bronze Age
497	Roughout, pendant?	Oil shale	Unfinished	Iron Age?
496	Gathered block	Cannel coal	Unworked	Late Bronze Age

Table 19: Summary of cannel coal and related finds from Guardbridge.

The only typologically distinctive item is the tall D-sectioned bangle SF 192, characterised by a width more than twice its height. These have been reviewed recently (Hunter 2023) and found to be a distinctively Iron Age type with associations spanning the pre-Roman Iron Age and a broad distribution; unfortunately, this example has no contextual dating to refine the chronology.

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Roughout SF 497 may be a ring pendant, another Iron Age type (Hunter in Cook 2012, 33) but without contextual dating here. Radiocarbon samples provide late Bronze Age and early Iron Age dates for bangles SF 1269 and SF 278, which will prove valuable in ongoing assessments of the development of such bangles; while the D-shaped section of SF 1269 seems chronologically widespread, the rounded D of SF 278 is more unusual.

In a wider context, cannel coal and related materials are recorded (in small numbers) from some 16 sites in the area, mostly from northern and north-east Fife (Table 20; Figure 105). Bangles are the most common find-type, being recorded from 13 sites, with dates from the late Bronze Age

Catalogue (Figure 106)

SF 192 Tall D-sectioned bangle; interior near-flat with residual abrasion scars, predominantly angled; sharp turn into smoothly-curved well-finished exterior. Three separate attempts at repair after breakage can be seen at one end: lightly scribed lines on the interior near the break, suggesting a line for it to be trimmed to; notches cut into the edges around where this line was; and two opposed indents, centrally placed close to the same line, for an intended drilled perforation to fasten two pieces together. Only the notches could have been functional, to tie the broken ends together, so were presumably the final decision; this would have been less elegant than the drilled repair, but also much less difficult to accomplish. The lack of any shaping of the broken surface suggests it broke again before completion; the other end shows no repair. Material identified as cannel coal from its compact nature and conchoidal fracture (visually very similar to SF 278). Internal diameter 80-85 mm (12% survives); L 59.5 mm, W 9.3-9.8 mm, H 23.8-24.0 mm. Upper fill (292) of pit in PG2 (no radiocarbon date from context or pit group)

Site	Bangles	Beads	Pendants	Other	Roughouts	Date	Site type	References
Clatchard Craig	2	1			y	IA/EM	hillfort	Close-Brooks 1986, 166-7
Cowbakie Hill / Craigie Hill	1							DES 1991, 22
Craig Rock		1				EM	hillfort	DES 2019, 88-9
Craighead	1				y			DES 1996, 46
Craigluscar	ro			finger ring ro	y	IA	fort	Hogg 1951, 170
Drumoig	1					?	?	Unpub (GUARD)
East Lomond Hill	y					IA/EM		Unpub (Aberdeen Uni)
Guardbridge	2 + 1 unfin		unfin		y	LBA-EIA		This paper
Jonathan's Cave, East Wemyss	y	1		perf disc		EM	cave	MacKie 1986, fig 3 nos 1-2
Norman's Law	2		ring			IA?	fort	PSAS 88, 239 mo 26 & Aberdeen Uni
Orrock	1					LBA	hoard	Piggott 1948, 307-8
Scotstarvit					y	IA	enclosure	Unpub (NMS)
St Andrews cathedral area			ring			EM	burial	Hay Fleming 1909, 411-2, fig 21
St Andrews hoard	3					LBA	hoard	Cowie *et al.* 1991
Strathmiglo (NE of)	1					?		Unpub (TT 26/23)
Strathmiglo (S of)	1					?		Unpub (TT 26/23)

Key:

LBA	*late Bronze Age*	*TT*	*Treasure trove*	*perf*	*perforated*
IA	*Iron Age*	*ro*	*roughout*	*unpub*	*unpublished*
EM	*early medieval*	*unfin*	*unfinished*	*DES*	*Discovery and Excavation in Scotland*

Table 20: Later prehistoric and early medieval finds of cannel coal and related materials in Fife.

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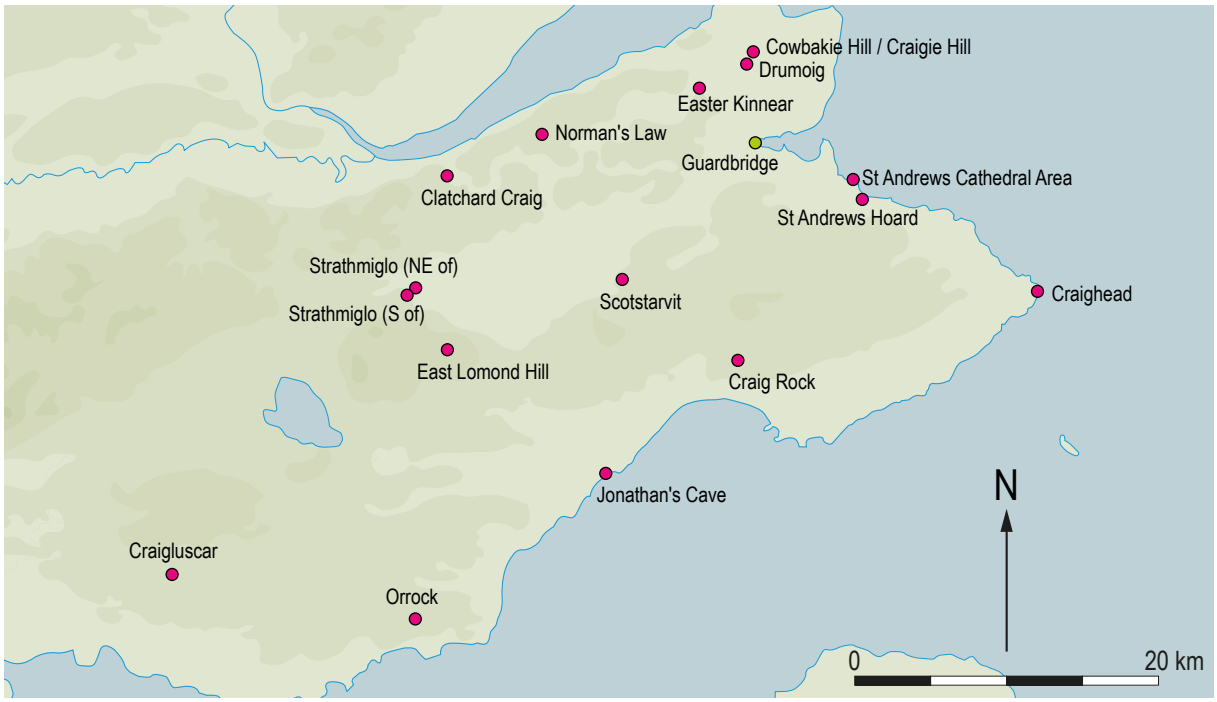


Figure 105: Distribution of cannel coal across Fife and Tayside.

SF 278 Unfinished bangle, the interior notably convex, the exterior parabolic with slightly convex faces and a marked central facet 3-4 mm wide, giving a sub-triangular appearance. Broken in the final stages of finishing. The interior shows a sequence of knife-cut facets overlain by coarse vertical abrasion and then finer circumferential abrasion. Exterior shows residual coarse abrasion from shaping the facet, with fine circumferential and angled abrasion on the faces. Broken at both ends in a conchoidal step fracture; crude transverse lines on the interior at one end suggest an intent to cut it square and repair it but this was not carried out, perhaps due to further damage. Internal diameter 70-75 mm (16% survives); L 45.5 mm, W 13.4 mm, H 12.5-12.7 mm. Material identified as cannel coal from its compact structure and conchoidal fracture. Context 464/465, posthole in ST41. Radiocarbon date from pit: 751 – 412 cal BC (UBA-51746).

SF 496 Rectangular fragment from a larger block of cannel coal. One edge and one face natural, other face split, ends broken; straightness of final edge is probably a natural fracture on a plane of weakness. Possibly a gathered block that was never worked. Material identified as cannel coal from conchoidal fracture; slightly laminar. 99.5 by 38 by 19.5 mm. Lower fill (1367) of pit (1308) in PG7. Context not dated, but another context in PG7 has LBA dates 1387 – 1130 cal BC (UBA-54726).

SF 497 Discoidal roughout with incipient central perforation. Flat faces in part natural, in part flaked and abraded. Edge bifacially shaped and then abraded to round it off. Central marking-out point on one face and opposed conical hollow on the other (D 3.2 mm, depth 3 mm) from an unfinished perforation. The weight of 14.86g is light for a whorl; probably intended as a ring pendant. Material identified as oil shale from its laminar character. Abandoned due to breakage. D 47 mm, T 7.3 mm. PG7, pit fill (1354); not dated.

SF 1269 D-sectioned bangle fragment, interior convex, exterior slightly parabolic. Interior retains toolmarks from manufacture, with plentiful angled abrasion scars polished from use. Exterior well-finished. Evidence of attempted repair after breakage; one end is slightly dished from (coarsely abraded?) lines, presumably to reshape it for repair, but this was seemingly abandoned when the other end broke. Area of damage near edge is likely to be post-depositional. Internal diameter 70-75 mm (14% survives); L 33.2 mm, W 10.3-10.6 mm, H 12.7-13.2 mm. Material: cannel coal or canneloid shale (conchoidal fracture; more grainy than other cannel coals in the assemblage). Upper fill (2820) of pit in ST20. Context not dated but structure has LBA dates.

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Figure 106: The cannel coal.

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The prehistoric vessels

By Beverley Ballin Smith

Introduction

This assemblage comprises a total of 127 vessels from Guardbridge. The earliest are from the early Neolithic, followed by a number of pots from the middle and later Neolithic. A limited number of vessels that suggest funerary and domestic activities are identified as early and middle Bronze Age in date. There are a number of vessels that are probably later Bronze Age or early Iron Age, a small number of vessels from the middle Iron Age, and a larger number of vessels have not been identified to a specific period. Sherds were widely distributed across the excavated area, and although there seems to be pots from specific periods related to particular pit groups or structures, the overall pattern is mixed, due to the layering of structures of later times over and into earlier ones. Some of the identification of sherds and their allocation to specific time periods is tentative, but the assemblage clearly demonstrates the longevity of occupation on the area.

Analysis and description of the pieces

The assemblage is a collection of prehistoric pottery totalling 1273 sherds. All the pieces were gently brushed before analysis and examined using a x6 hand lens. Their attributes and statistics were compiled in an archivable table devised using Microsoft Excel. The assemblage was analysed according to the revised guidelines for the study of prehistoric pottery of the Prehistoric Ceramics Research Group (2010) and its *Standard for Pottery Studies in Archaeology* (2016), as well as the CIfA's Standards and Guidance for the collection, documentation, conservation and research of archaeological materials (2014, revised 2020).

Almost all the pottery was recovered by hand, and although there are some sherds that provide profiles of vessels, no complete vessel was found or reconstructed. Additional small numbers of sherds, often small in size, abraded were located in soil samples. The composition of the assemblage is displayed in Table 21, where the largest numbers of diagnostic sherds were rims and bases.

The total weight of the assemblage is recorded as 27 kg. All vessels are incomplete, and therefore the recorded weights are only those of the sherds that survived. The most complete vessel (from the number of conjoining rim and body sherds) was V2, which was one of the heaviest surviving pots, but only a little more than half of it survived. It is noticeable from Table 22 that the vessels with the lowest average wall-thicknesses and therefore the lightest vessels were from the later Neolithic and the early Bronze Age, when fine pots, although few in number were made. The vessel with the thickest walls was an urn, Vessel 44, but its sherds were not the heaviest.

Period	Total no. sherds	No. Rim sherds	Carinations/ lugs	No. Base sherds	No. Body sherds	Total weight (g)
Early Neolithic	98	34	1	0	63	2553.4
Middle Neolithic	79	33	0	5	41	2551.8
Later Neolithic	62	6	0	4	52	1284.2
Possibly Neolithic	5	2	0	1	2	285.3
Early Bronze Age	29	10	0	6	13	462.9
Middle Bronze Age	17	1	0	0	16	506.6
Middle(?) Bronze Age	108	23	1	7	76	2731.2
Later(?) Bronze Age/Iron Age	316	58	0	43	215	7616.7
Iron Age	26	0	0	12	14	778.7
Uncertain vessels	112	35	0	7	70	2655.1
Totals	852	202	2	85	562	21425.9
Non-vessel sherds	421	12	0	11	398	5574
Overall totals	1273	214	2	96	960	26999.9

Table 21: Sherd numbers of vessels by period and type including total weights.

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Period	Total no. sherds	Total weight (g)	Average sherd weight (g)	Average wall thickness (mm)
Early Neolithic	98	2553.4	26	11.2
Middle Neolithic	79	2551.8	32.3	13.7
Later Neolithic	62	1284.2	20.7	9.6
Possibly Neolithic	5	285.3	57.1	12.2
Early Bronze Age	29	462.9	21.1	7.7
Middle Bronze Age	17	506.6	29.8	19
Middle(?) Bronze Age	108	2731.2	25.3	13.2
Later(?) Bronze Age/Iron Age	315	7616.7	24.2	9.6
Iron Age	27	778.7	29	12.2
Uncertain vessels	112	2655.1	23.7	9.5
Totals	852	21425.9		

Table 22: Average sherd weights and thickness for vessels.

The heaviest sherds were from the Neolithic and although their average wall thickness was less than 13 mm, their weight indicates that reasonably large sherds survived. The large number of sherds of uncertain provenance or period, or both, has the lowest average sherd weight and this is indicative of their higher degree of fragmentation and abrasion.

The wall thicknesses and weights of the sherds are largely determined by the size and amount of stone temper added by the potter to the clay (see below). Some individual pieces of stone were large and were therefore responsible for the higher weight of some pots, their thicker walls, and the visible temper showing through the vessels' surfaces.

Groups of sherds considered to belong to a particular vessel have been given a vessel number prefixed by a V. The location of sherds is indicated by ST for the structure or PG for the pit group they were associated with. Unstratified (u/s) sherds are indicated as such in the accompanying tables and in the archive table of the pottery analysis.

Post-depositional changes

Changes to the assemblage due to taphonomy are varied - from mechanical abrasion during soil movement causing fragmentation, to water percolation removing the finishing from sherd surfaces. Some sherds may have been over-fired, most noticeably during the middle Neolithic and possibly during the original firing of the vessels. However, others appear to have been affected by secondary heating or burning, which has changed their colours to orange and grey and made them light in weight for their size. Sherds of V58 show considerable vitrification, either from an accidental fire or from other processes taking place in ST40. Root penetration is present in some sherds that lay close to the field surface, but it has rarely been an issue in this assemblage. Fragmentation and surface abrasion leading to loss of detail of sherds is problematic and is as much a product of use, as of post-depositional changes. In general, some of the sherds are in remarkable condition considering their age and the burial conditions in which they were found.

Manufacture of the pottery

The clayey subsoils of Fife are particularly advantageous to the manufacture of pottery with modern potteries in existence in St Andrews, for example. The subsoils around Guardbridge include clay, silt, sand and gravel, and examples of both raw clay and prepared clay were found on the site (see also *Daub and Fired clay*), some of which may have been intended to be used for pottery. The clay sources used for pottery making would have been locally dug from the subsoil or stream sides, with the clay prepared for use with the addition of organic temper in the form of chopped dried straw or grasses to 'open' it up through wedging to make it pliable. Before use for pottery making further mixing took place with the addition of quartz sand, ground quartz or in rare cases diorite rock. Other minerals such as those found in fine gravel or even fragments of sandstone could have been added to the prepared clay but most of the mineral temper has not been identified due to the often well-

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fired condition of many of the sherds/pots (thin-section analysis has not been carried out on this assemblage). Mineral temper was added to give strength to the clay and the finished vessel as it reduced the thermal shock to the pot during firing and use of the vessel on the hearth.

The pots made during the Neolithic and during the earlier part of the Bronze Age were started by the thumb-pot method with the potter opening up a lump of prepared clay using the thumb to form the base and the lower part of a vessel. Coils of more prepared clay were repeatedly added to the partly formed pot to give it height and shape. In this assemblage the joins between the coils were generally not noted indicating the pottery was well made. The final coil added to the pot was the one from which the rim was formed and shaped according to the type of vessel made and the period to which it belonged. The shape of rims can be highly diagnostic attributes.

A variety of different types and shapes of vessels were manufactured with some from the Neolithic having carinations (shoulders) and lugs (proto handles). Carinations were often pinched out from the body of the vessel, where two coils were joined, and indicated a significant change in shape of the pot between the belly and the neck. Table 23 indicates the diameter of rims that could be measured, and shows the ranges of different pot sizes were made at different times. A smaller number of bases were also measured (Table 24).

The lower number of base sherds than rims is due to the pots sitting in the hot ashes of the hearth where they often burnt through. In the early Neolithic and also into the middle Neolithic, pots were made with rounded and not flat bases and the identification of surviving base sherds is difficult. During the middle Neolithic, some of the vessels of this assemblage begin to have small flattened areas at their base but these were not true flat bases (see V2). The latter was a later development that came in during the later Neolithic (Sheridan 2016, Figures 6 and 7) and especially during the early Bronze Age, where free-standing pots of different shapes were required for different purposes (see V80). It is not until later on in the Bronze Age but most prominently in the Iron Age in this assemblage when bases were made by coiling clay to the desired circular diameter first and then with additional coils added to form the height and shape of the vessel.

Firing

In general, the firing of the Guardbridge vessels seems to have been successful during all periods, but there is evidence that some pots in the Middle Neolithic were either overfired or had been subject to prolonged heat in the base of a fire-pit into which they had fallen. The clays of the area and the additional temper were well integrated indicating that sufficient temperatures were reached during the firing process.

Period	90	100	120	130	140	150	160	175	180	200	220-225	230	240	250	260	270	280	290	300	320	340	400	Totals
Early Neolithic							1		3	3	3	2	1						2	1	1		17
Middle Neolithic							1		1		3				3								8
Later Neolithic/ Neolithic			1				1		1						1					1			5
Early Bronze Age			1			1																	2
Middle Bronze Age	1								3		3				1							1	9
Later Bronze Age/Early Iron Age		2	2	1	2		1	1	3	5	3		2	2		1		1					26
Iron Age																							0
Uncertain		1			1		1	1	1	3	1						1						10
Totals	1	3	4	1	3	1	5	2	12	11	13	2	3	2	5	1	1	1	2	2	1	1	77

Table 23: Rim diameter (mm) of vessels measured by period.

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Period	80	85	100	120	140	160	180	240	Totals
Early Neolithic									0
Middle Neolithic									0
Later Neolithic/Neolithic								1	1
Early Bronze Age	1	1							2
Middle Bronze Age									0
Later Bronze Age/Early Iron Age			2		1	1			4
Iron Age						1	1		2
Uncertain					1		1		2
Totals	1	1	2	0	2	2	2	1	11

Table 24: Base diameter (mm) of vessels measured by period.

Vessel descriptions

Early Neolithic Carinated Bowls

Pottery during the early Neolithic from before c. 3600 BC to c. 3500 BC was found in the centre and western parts of the excavated area and concentrations of pottery are associated with pit groups and specific structures (Table 25). The distribution is discussed further below.

The earliest pots were, on the whole, well-made round-bottomed vessels with well-shaped everted rims that examples such as V3 (Figure 107), V4, V9 and V40 are very characteristic of. The rims of these vessels broke off at the neck, but other smaller rims sherds were found that were simply rounded or more oblique and included more of the vessel profile. These early vessels had necks that could be straight and/or long to the shoulder, which divided the upper part of the pot from its belly.

Structure/ Pit Group	Early Neolithic	Middle Neolithic	Later Neolithic	Possibly Neolithic	Early/ Middle Bronze Age	Middle Bronze Age	Late Bronze Age/Early Iron Age	Iron Age	Undated	No of vessels per structure
PG1	V115	V2	V121			V114	V117	V116	V118	16
	V122	V81							V119	
	V123	V82							V125	
	V124					V83			V126	
PG2										
PG12						V33	V31		V34	4
							V32			
ST1	V90	V79					V91			8
	V91	V92					V94			
	V93						V95			
ST2						V83	V87		V89	4
						V88				
Between ST1 & ST2									V101	1
ST6 & around		V27	V25				V26			3
ST9									V109	1
ST11 & around	V3	V5		V7		V17	V42		V11	18
	V4	V12								
	V6	V19								
	V8									

Table 25: All vessels from Pit Groups and Structures.

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Structure/ Pit Group	Early Neolithic	Middle Neolithic	Later Neolithic	Possibly Neolithic	Early/ Middle Bronze Age	Middle Bronze Age	Late Bronze Age/Early Iron Age	Iron Age	Undated	No of vessels per structure
ST11 & around	V9									
	V10									
	V13									
	V14									
	V15									
	V16									
	V18									
ST12 east						V111	V24		V110	4
							V107			
Between ST12, S15, ST16			V23					V22		2
ST17 & around							V96	V120	V98	6
							V99		V97	
									V100	
ST18		V92	V104				V102	V105	V98	6
							V103			
ST19										
ST20 & around	V36				V39		V37		V35	8
	V40				V44		V38			
	V41									
ST21									V48	1
ST22 & around							V49			4
						V50	V51			
							V127			
ST23 & around			V45						V43	3
			V46							
ST26					V43					1
ST27		V2					V53		V48	3
ST30 & around		V5				V20			V28	3
ST31		V55				V57	V54			4
		V56								
ST34 & around					V80				V108	2
ST38							V47		V48	2
ST40						V68	V58	V67	V62	24
						V73	V59		V63	
							V60		V65	
							V61		V66	
							V64		V69	
							V70		V74	
							V71		V75	
							V72		V77	
							V76		V78	

Table 25 (continued): All vessels from Pit Groups and Structures.

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Structure/ Pit Group	Early Neolithic	Middle Neolithic	Later Neolithic	Possibly Neolithic	Early/ Middle Bronze Age	Middle Bronze Age	Late Bronze Age/Early Iron Age	Iron Age	Undated	No of vessels per structure
ST40							V84		V86	
							V85			
ST41									V106	1
North of fort			V30							1
u/s	V27	V1				V52	V29		V21	7
									V112	
									V113	

Table 25 (continued): All vessels from Pit Groups and Structures.

V13 (Figure 107) has a slightly rounded and everted rim to a straight long neck that changes its shape at the bottom of the neck to meet the acutely angled and prominent carination. From the carination the body of the vessel would have been predominantly bulbous. The rim indicated a vessel with an open rim diameter of 200-220 mm and the pot could have been at least 250 mm high. Sooting and carbonised food remains suggest it was a cooking pot.

Several sherds were reconstructed of the neck and prominent carination of V36 but the rim is missing. Three heavier pots with thick walls, V14, 15 and 16 (all Figure 107) display the characteristics of these early Neolithic vessels. Each of their rims is everted and rolled with those from V14 and V15 being slightly flattened on top. The rim of V16 lost its everted curve and became slightly flattened against its long straight neck. The sherd broke above the carination. In V14 and V15 the carination survives as a prominent rounded to angular feature of the bowls, but with the necks of these vessels being concave rather than flat.

However, further examples of more angular carinations are rare as weaker and more rounded forms were preferred, or were the ones that survived. V115 (Figure 107) has a simple rounded rim and a short neck to a high carination, indicating the vessel was less bulbous than others. It was also at the smaller end of the range of vessels of this period, measuring c. 180 mm in rim diameter (Table 23). It also has no carbonised food remains or sooting and perhaps indicating it was a storage vessel. The carination in V41 was also weak, suggesting these pots deviated from in form from, for example V13, and therefore may have been made later in the period. V41 was a c. 200 mm rim diameter cooking pot as the internal carbonised food remains indicate.

It has been noticed in the large assemblage of early Neolithic pottery from Carnoustie in Angus (see Ballin Smith 2025), that the large and somewhat heavily everted and rounded rims to these vessels could have been functional. They may have been shaped to take a strap or twine beneath the rim so that the vessel could have been suspended over a fire. Alternatively, a straight and longer neck plus an everted rim would have allowed the pot to have been lifted and moved more easily without it slipping though the hands.

Although there were specific vessel designs during the early Neolithic, there was also a great deal of experimentation. Vessel shapes subtly changed and therefore presumably the function of some vessels as discussed below (Middle Neolithic vessels). The carination was one area that received attention but was still present in examples such as V6 (Figure 107) where it took a much more rounded form. This vessel had a rounded, everted and wide rim and it was a large open mouthed cooking pot c. 320 mm in diameter with copious carbonised food remains on its rim and also below the carination. The pot differed in another aspect from most of the other vessels of this period in that its obliquely shaped neck is decorated by vertical, roughly parallel and narrow incised lines, producing a ridged appearance.

Other unusual variations concerned carinations, or the positions of where they would have been on vessels. V8 was a heavy vessel with

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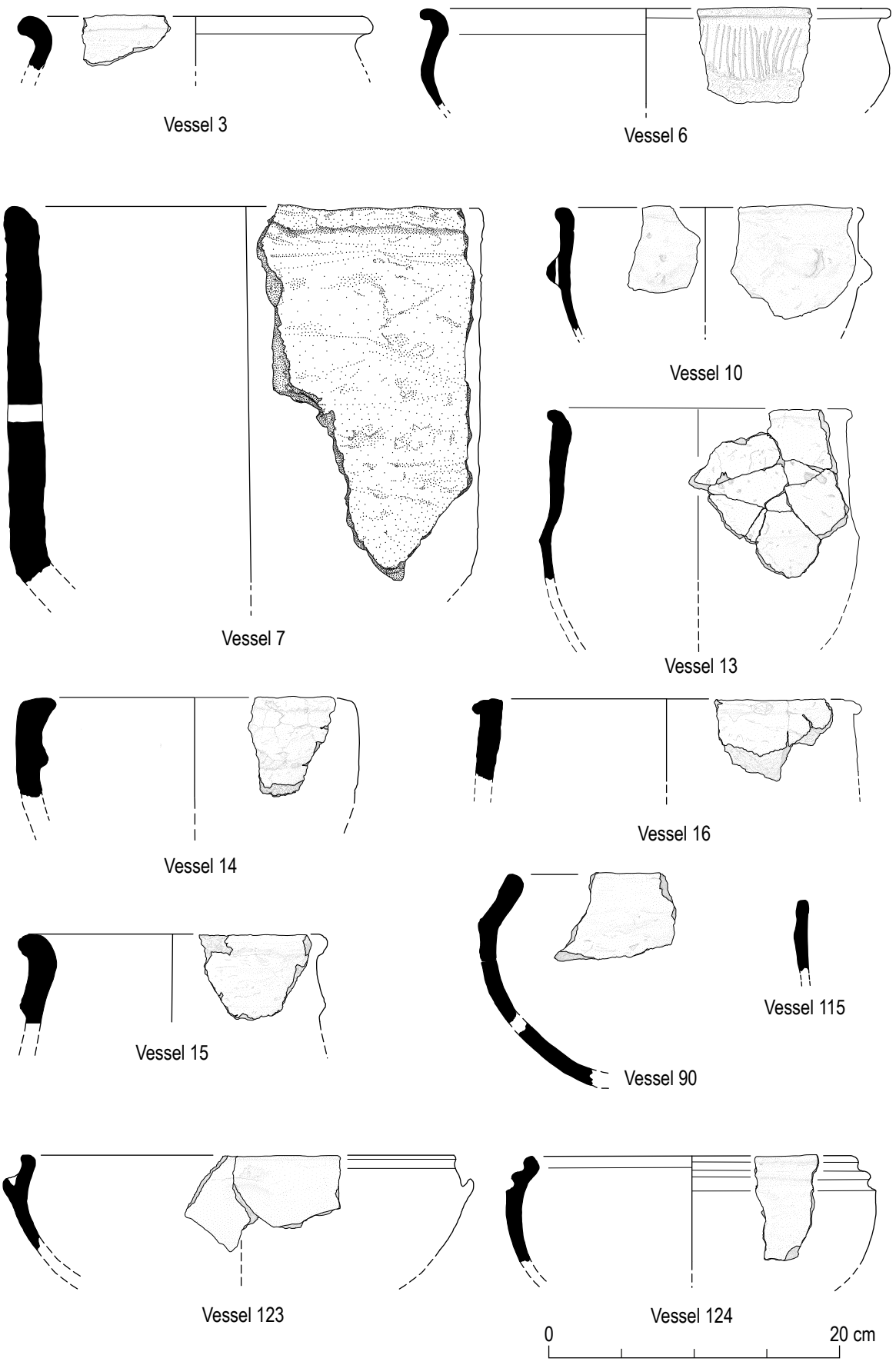


Figure 107: Early Neolithic pottery.

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a minimally everted but rounded rim with a straight neck. The non-joining body sherd has a broad and flattish protrusion c. 10 mm wide from the vessel wall where the carination would have been. This protrusion is a broad lug, a proto handle, c. 50 mm in length and is not particularly functional. It is suggested there may have been at least another two round the broadest part of the vessel.

Further experimentation in the region of the carination can be seen on V10 (Figure 107). The relatively thin but hard-fired and well-made pot has a rolled and everted rim but with a straight/concave neck to its rounded belly. There is no carination, but two perforated elongated lugs are present. As with the previous example an additional lug was missing. One lug measures 42 mm by 21 mm and is perforated by an off centre c. 4 mm wide hole. The perforation has worn completely through the perforation to form a broken channel. The other lug is similar in size at 42.3 mm by 24.7 mm and was perforated prior to firing. The aperture at the top of the lug is square and thin but elongated at the bottom suggesting the hole was presumably created by a twig or bone pushed through the clay that was added to the side of the vessel. The two lugs are located c. 32 mm below the rim top and their presence suggests the vessel was suspended from twine or sinew secured through the perforated lugs. Additional evidence suggests that this vessel could have been burnished and that it was probably suspended over a fire as it had soot and carbonised food residues on its surface.

Another example was V90, a plain bowl with a rim diameter of c. 260 mm. Its thick rim is rounded and inturned reducing the bowl mouth and it has a short neck. Like V10 the carination is identified as a small pinched lug but unlike it the lug is not pierced but forms a small swelling on the side of the bowl, which may not have been particularly practicable. This pot did not have any carbonised food remains or sooting and could have been a storage vessel.

V123 (Figure 107), produced a different variation on the lug. It is two conjoined fragments of a fairly shallow bowl c. 300 mm in diameter, with a rounded and everted rim and a short concave neck to a neat and hollowed lug. The lug appears to have been pinched out of the clay, where there would have been a carination. A fingertip was pressed into the clay above the lug to form a slight hollow in between the lug and the vessel wall. The lug protrudes c. 10 mm from the vessel surface and there is also a slight hollowing below it, and it is in fact a proto-handle.

A variation on the carinated bowl is V124 (Figure 107), which has an unusual rim indicating a bowl of c. 220 mm in diameter. The rim is rounded and is inturned to narrow the mouth of the vessel. It is also flattened on the top and to the interior where a slight bevel has been created. The sherd is exaggeratedly curved inwards from its carination to the rim and between the two are two deep concave channels with a prominent ridge between which has a partially flattened edge. The decoration is described as corrugated (Alison Sheridan pers. comm.). The top channel may have been finished by dragging a finger though it but the lower channel is not as wide and was possibly made by a stick. Both V123 and V124 were found within the fills of PG1.

Another vessel which exaggerates some aspects of the carinated bowl is V7 (Figure 107). Although this was found close to ST11 with other early Neolithic bowls, it is uncertain whether this is an intrusive piece, possibly from later in the Neolithic. The sherd indicates a vessel c. 320 mm in diameter and its rounded rim is slightly ridged on top. The rim is also very slightly everted and the neck is long and straight to the belly. There is no indication of a carination or lug, but there is evidence of a damaged perforation on the edge of the largest sherd, which was chipped through the vessel after firing. The perforation measures 8.5 mm in width and is broken across suggesting the vessel could have broken during the process of its manufacture.

The variation in vessel form and the experimentation at Guardbridge is unusually during the early Neolithic, but the lugs and proto handles are noted elsewhere, for example at Carnoustie, to the north of the River Tay. However, the shapes of the bowls described above are rare examples that indicate bowls were not just used for cooking or storage but some might have had other specific or special uses. The rim of V124 and that of V6 are decorated and to an extent that the appearance of these vessels was as important as their function. The replacement

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of the carination with a lug or proto-handle may have been a means of finding a practical solution for the handling or suspending of vessels safely. It is to be remembered that all these vessels had round bases and that their characteristics took a long time to change. Perhaps there was a tension between traditional aspects of making pottery and developments that were needed to make vessels more serviceable. The changes noted in the pottery forms above would have taken a long time to develop.

Finishing

The surfaces of early Neolithic vessels were finished by burnishing, although evidence for this has not survived well or copiously on the Guardbridge vessels. Burnishing, however, has been commonly found on vessels of this period in other places such as at Carnoustie (see Ballin Smith 2025). Burnishing the exterior surfaces of vessels with a smooth stone before firing removed bumps and moulding marks but also gave the vessel a smooth and shiny surface, especially if the clay body naturally contained flecks of mica. The finish may have made the exterior of the vessel less porous but it also improved its aesthetic appearance. The top of rims were also burnished and in doing so faint ridges would form. The top of the rim of V3 (Figure 107) shows this, possibly the only surviving example from the excavated area, with the exception of V7.

Middle Neolithic Impressed Ware Bowls

The changes in pottery styles that were noted in the early Neolithic were developed further in the middle Neolithic from c. 3500 to 3000 BC, but stylist changes also included decoration. It is this decoration, made by impressing decorative motifs into the pot while leather hard that gave this vessel type its name. Decoration can be found on the interior of rims as well as on the exterior of vessels, but the exterior decoration can be either limited in extent or copious. A number of different tools and a wide range of motifs are seen across these vessels, indicating variety and creativity. The majority of pots from this period are thick walled and heavy (Table 22), sometimes vessels were not well-made, the occasional coil join was not masked, often their finishing was poor and frequently the sherds are burnt. This contrasts significantly with the often careful manufacture of the earlier Neolithic bowls. On occasional examples, some of the incised designs look hurriedly executed possibly when the vessel was not leather-hard and the clay still too wet, or there was little care taken to complete the design successfully. There may have been changes in the clay and temper mix or in firing temperatures as some sherds from this period show splitting or lamination.

One of the bowls V1 (Figure 108) had a simple decorative design. The 220 mm diameter bowl has a straight to very slightly inturned rim which has a round narrow top and the sherds indicate that the bowl was gently curved and possibly c. 150 mm or more deep. The top 29 mm of the vessel to the rim top is decorated with three horizontal rows of slightly oblique but fine impressions. The tool used could have been an irregularly shaped piece of wood or bone, c. 7 mm long by 2.4 mm wide that was pressed into the clay. One row of the same impressed motifs runs round the interior surface of the rim just below the rim top. The individual impressions are up to 2 mm deep and the rest of the pot is plain.

V2 (Figure 108) is interesting not just because of what the vessel it is, but because conjoining sherds from it were found in pits in PG1 and also in ST27 some 110 mm distance from each other. Several sherds join to provide an almost complete profile of this collared vessel. Approximately 70% of the rim survives indicating that it had an interior bevelled top, and a straight neck or collar to the slightly protruding carination. From the carination the bowl gently curved down to its base, which was roughly flattened and possibly thinned. There is a suggestion that in forming the vessel it may have been placed on a rough flat surface and the base made by pressing the clay down on it. There is a slight change of angle between the belly and the base but there is no clear distinction between them. The base is slightly indented and that might have occurred through use.

The vessel would have stood c. 125 mm tall. The interior of the rim is decorated with three parallel rows of stab marks that run round the bevel, made by a rounded pointed tool, possibly a stick. The incisions are c. 1 mm wide, and up to 4 mm long. The collar has slightly curving parallel rows of lines of stab marks that are vertical in part but

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otherwise lean to the left. The decoration began at the rim edge and was worked down to the carination with the tool pointed upwards to the rim. Six to nine stab marks form each row but they are not consistent in depth or in distance. The rows vary in distance from 2 mm to 8 mm apart.

The largest rim sherd of this vessel is distorted and that may have occurred during re-firing or re-heating in the pit in which it and some of these sherds were found. The plain belly of the vessel is poorly finished as no smoothing or burnishing of the surface was noticed as finger moulding marks survive, but there indications from grass impressions that the vessel was wiped before it was dried and fired. The interior of the vessel is cracked, lumpy and also badly finished. Similar middle Neolithic examples to this vessel have been found at Meadowend Farm in Clackmananshire (Sheridan 2018, illus 19 and 20).

Another collared vessel is V55 (Figure 108) c. 260 mm diameter but only the heavy rim survives. It is straight to slightly concave with an acute internal bevel. The exterior of the rim/collar has broken away above a thickening or widening of

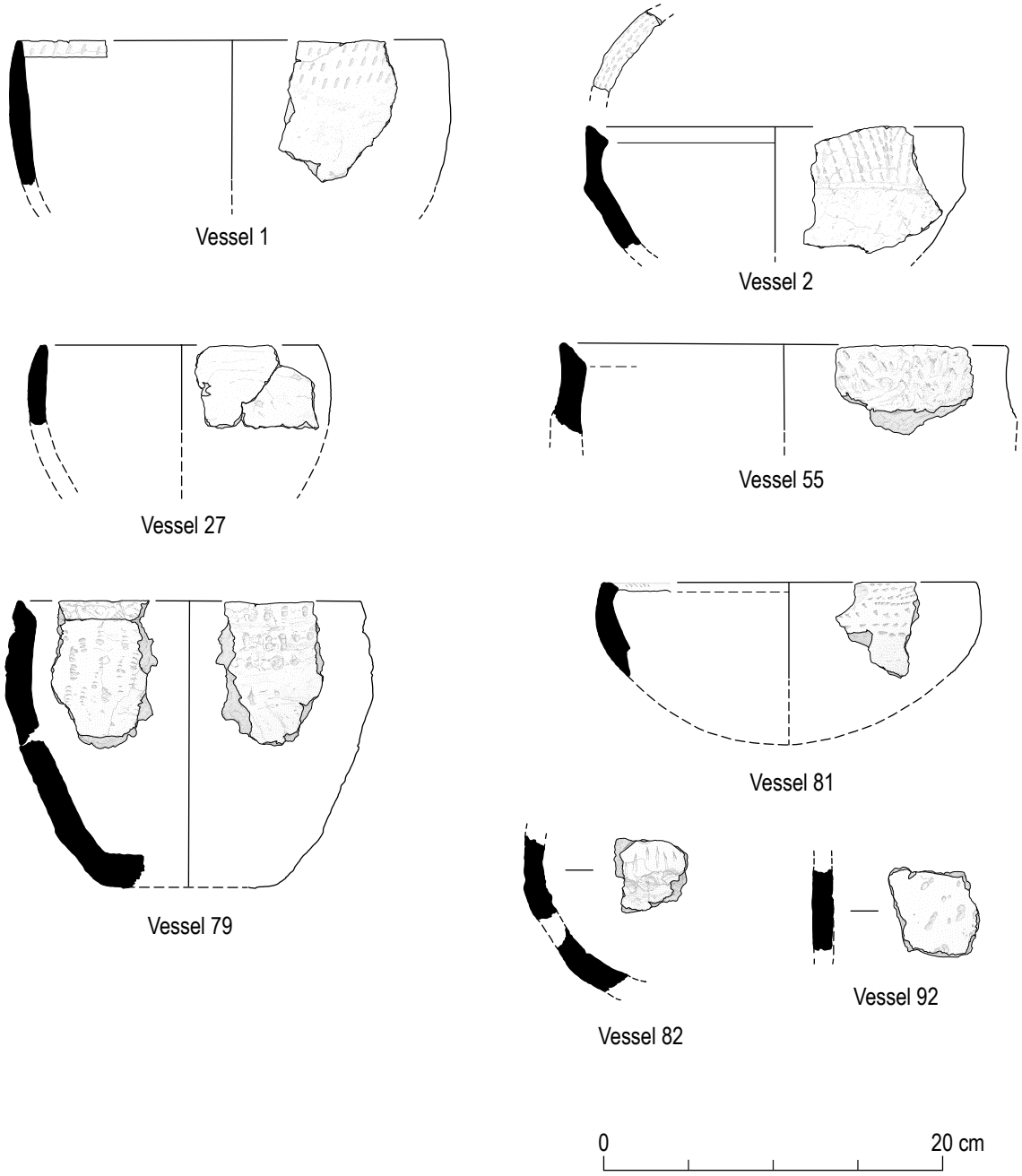


Figure 108: Middle Neolithic pottery.

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the vessel at the carination. The rim is decorated externally and the bevel is also decorated, both with an indistinct pattern of what could have been oblique rows of finger nail incisions or pinch marks. The bevel has both vertical and oblique marks possibly indicating that one decoration has been overlain by another. The vessel, like the decoration, is not well made or finished. A very similar collar but with more distinct decoration was found in a pit in a sand quarry at Brackmont Mill, Fife, some 3.5 km north of Guardbridge (Longworth 1968, 69, no3, Plate V).

V79 (Figure 108) is one of the heaviest vessels of this period, with thick walls and a more distinctly flattened base than in the previously described examples. The more distinct base is 21 mm thick and the vessel rim measures 260 mm in diameter but its sherds are in poor condition and the pottery is badly cracked. The rim has an acute interior bevel but externally it is vertical to a slight swelling (a hint of a carination) with a tapering body to the base. The exterior of the rim is decorated by three rows of impressed motifs made most probably by a small bird humerus with a slight depression between the rows creating a raised band. The decoration is coarse and not particularly well done, indicating the clay may have been too wet when it was decorated. The rim bevel and the top 40-50 mm of the interior of the pot on one rim sherd only is decorated with an impressed tool of a four-toothed comb to create a random design, which is oblique on the rim bevel and vertical on the interior. Interior surface decoration is rare, and it suggests that this vessel might have been a trial piece.

In comparison with V79, V81 (Figure 108) is a much finer vessel. It is a large shallow bowl with a rim diameter of c.220 mm. The rim is inturned and flat-topped forming a bevel, and presumably the bowl would have had a flattish base like V2. The vessel walls gently curve from the rim top to the base and there is no neck. The two conjoined rim sherds are decorated on their tops and on their external surfaces. The rim top was mostly bordered on its edge by a single row of horizontally positioned stab marks made by a fine S-shaped tool and a row of fine, short oblique lines decorate the bevel. The vessels' exterior is decorated by three parallel rows of similar stab marks to the rim with short gaps between each. Below is another row of stab-marks that are closely positioned one after the other. Approximately 4-5 mm below this where the vessel is widest is a roughly horizontal row of oblique stab marks with two rows of deeper horizontal stab marks 5 mm below them possibly made by a different tool. The exterior surface of the vessel has been smoothed.

Other examples have survived of decorated vessels. V82 (Figure 108) is poorly made, badly cracked and possibly not well-fired. No rim survives but a sherd of the upper part of the vessel above the shoulder is decorated. Seven vertical stab/drag marks appear to infill a triangle, of which one deep, oblique incised line survives at the upper left side of the piece. At the bottom of the decoration on the shoulder there is evidence of three rounded finger indentations or pinch marks, which have not survived well. Part of the base and wall of this vessel survives as a separate sherd.

V92 (Figure 108) is a single decorated body sherd with one other sherd of the same vessel. The pottery is decorated by seemingly randomly distributed pairs of small oval impressions, possibly from impressed grain. The pottery is in poor condition and prone to lamination.

Several smaller plain and globular pots were noted in the assemblage that probably to belong to the middle Neolithic. The smallest V19 is c. 100 mm in diameter with a slightly round-top to the rim. V27 (Figure 108) was slightly larger at c. 160 mm diameter but this vessel had a flat to rounded topped rim that was slightly inturned. Moulding of the rim and coils are visible and the surface of the pot was only roughly smoothed. V12 was another heavy plain bowl, c. 180 mm diameter with a rounded topped, slightly inturned rim. Lower portions of the sherds of this vessel are burnt and finger moulding marks were not removed during the finishing process. V5 is a small bulbous vessel with a rim diameter of c. 100 mm. It has a malformed flat-topped to slightly bevelled, to slightly inturned rim. Sheridan suggests that some of these small plain pots are cups and similar examples from the same period have been found at Meadowend Farm, Clackmannanshire (Sheridan 2018, Fig 16).

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Late Neolithic Grooved Ware

Towards the end of the Neolithic after c. 3000 BC to the transition between the late Neolithic and the early Bronze Age before c. 2450 BC there were other changes in pottery styles demonstrated at Guardbridge by two types of Grooved Ware vessels – thin-walled ones and thicker-walled ones. Both are decorated with incised lines.

V23 (Figure 109) is two small light-weight sherds of a fine Grooved Ware vessel. The rim is narrow and indicates a vessel c. 180 mm in diameter. It has with a rounded top but is incised both sides with a fine horizontal line c. 2 mm below the rim top. The remains of another finely incised horizontal line are noted 3-4 mm below that on the external surface. The non-joining body sherd has an 8-9 mm wide and flat applied cordon inset into a V-shaped recess in the vessel body, with horizontal incised lines to demarcate it top and bottom. This form of plastic decoration has been noted at Skara Brae and Ness of Brodgar, Orkney (Towers and Card 2015, 58, figure 5).

V25 (Figure 109) is a slightly larger and heavier vessel that V23 but with a rim diameter of c. 260 mm. The rim is flat-topped to slightly bevelled and is possibly from an open bowl. It is decorated externally by two widely spaced horizontal incised lines with evidence of a third. The top line is incised 8-9 mm below the rim top, the next is 11 mm below and the third is c. 10 mm below that. The lines are c. 2 mm wide and 0.5 mm deep. There is no decoration on the rim top. Three other body sherds have evidence of one, two, and four incised lines. The decoration on the largest sherd comprises three incise lines radiating out across the body with an additional fourth line. The lines are up to 3 mm wide. The horizontal and radiating lines suggest the pattern on the vessel may have been a complex of horizontal lines intersecting with oblique lines on the bowl. An example similar to this was found at Forest Road, Kintore, Aberdeen (Copper 2024, Fig 4.4).

V30 (Figure 109) is another fine bowl c. 160 mm in diameter. The rim is vertical with a slight bevel to the interior and there is a noticeable horizontal line where the clay has been folded over during the moulding of the rim. The sherds are decorated with six bordered fields c. 5 mm wide each with a single wavy line created by pushing a thin round ended bone or stick at a slight angle into the clay from both the top and bottom of the field. Apart from the upper two fields which are horizontal the others are angled creating long triangular plain fields between them. Sheridan suggests this decoration is false relief and a version of the wavy line motif commonly seen on Grooved Ware vessels from Barnhouse, Orkney (Sheridan 2023, Figures 2.2 and 2.4). However, another Grooved Ware sherd with similar decoration has also been found as a surface find in the dune system at Tentsmuir, Fife, north-east of Guardbridge (Longworth 1968, 78, Fig 8, no 5)

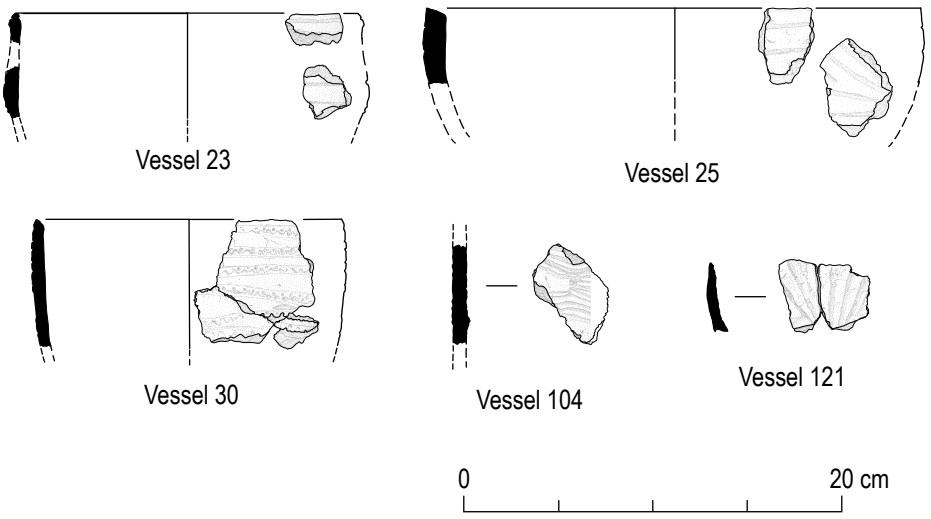


Figure 109: Later Neolithic pottery.

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In contrast to the above V45 is a heavy vessel with walls 13 mm thick, as opposed to the 10 mm or less for the thinner vessels described above. It survives as one rim sherd, a base edge and body sherds representing a bucket-shaped vessel with a base c. 240 mm in diameter. One small fragment of a squared rim has a slight groove on its top and an applied wide strip on its exterior (see V25 above). Five other pieces with incised grooves c. 3-4 mm wide survive, possibly to take applied strips, but they have lost their interior surfaces indicating that part of the vessel was not well-fired. Several sherds also broke at the coil joins. The lower part of the vessel seems to carry with fine incised criss-crossing. On some other body sherds there is the suggestion that cord was impressed in horizontal, but abraded short lines.

V46 (Figure 110) is one of the smallest from this period with a rim diameter of c.120 mm. The rim is straight and probably from a fine oblique sided bowl. The rim top is grooved to the interior with the addition of a small hollowed pellet, forming two small raised portions either side. The decoration is incised by a stick or bone c. 3 mm wide. Below the rim are four roughly horizontal lines, followed by a blank field, then two parallel lines angled with a triangular blank field between them and the next two horizontal lines. A curved blank field follows down the vessel with evidence of two horizontal lines bordering. This vessel is similar to vessel 54, part of the large Grooved Ware assemblage found at Balfarg Riding School (Copper 2024, Figure 4.2)



Figure 110: Detail of V46.

The decoration on V104 (Figure 109) is similar to that of V46. It is a thin sherd with deep, 1.5 mm, grooves with raised areas between, in a distinct design. On the upper part of the sherd the raised bands bend upwards, on the bottom half they bend downwards, with a long triangular shape on one side of the middle and a divided band on the other. Grooves are c. 2 mm wide and the raised bands c. 4 mm in width. The latter are also shallowly grooved along their length.

The decorated sherds of V121 (Figure 109) have laminated having lost their interior surfaces but are somewhat similar to V25. They are all decorated with a shallow incised line design. The line is 2-3 mm wide applied vertically or perhaps obliquely, in a radiating design, but with part of the design at right angles to the former. The design on SF 120 is only partial.

These vessels reflect the variety of pot shapes and sizes seen at other late Neolithic excavated sites that have produced copious examples, such as Balfarg in Fife and many of the recently excavated Orcadian sites. Copper (2024, 57-59) argues that Grooved Ware developed on Orkney before 3000 BC and that Grooved Ware vessels were found just before that date at Machrie Moor and just after that date at the Balfarg Riding School. This suggests that these vessels from Guardbridge were similar in date to those from Balfarg, i.e. of the c. 29th to 28th centuries BC.

Early Bronze Age Beakers

Sherds from only three identified vessels from the early Bronze Age were found across the excavated area (Table 25). Beaker vessels are usually easily recognisable because of their distinctive fine cord decoration or those produced by a toothed comb tool. Beakers were either funerary vessels or used in domestic contexts. At Guardbridge none of the vessels were found in funerary contexts or were associated with human remains, although they may have been removed from their original contexts of deposition. However, two were found in fairly close proximity in the southern part of the site between ST26 and ST22 (see below) but V80 was found much further to the north-west in the excavated area.

The best preserved of all the vessels found at Guardbridge and the most complete was V80 (Figure 111), a finely made Beaker vessel with a

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complete rim diameter of 150 mm and a base of 85 mm. Although a few body sherds had been lost c.70% of the vessel is present. It is a wide mouthed low carinated beaker that stands 128 mm high. Its rim is slightly everted, with a roughly rounded top and the neck is concave to a prominent carination. From the latter the vessel reduces to the base. The interior surface of the rim has three comb impressed but closely positioned horizontal lines located just below the rim top. Externally, the decoration starts on the rim edge with three horizontal comb-impressed lines. They are slightly erratically made and there is some overlapping of the lines of the design. Below this is a narrow blank field c. 5mm deep, followed by a decorated field c.35 mm in depth comprising four horizontal comb-impressed lines forming an upper and lower border between which are broad triangles, again the impressions are made with a comb. Three oblique lines form the triangle sides, and the interior of the triangle is infilled with five horizontal lines. Between each upright triangle is an inverted plain one. This complex decorative motif is repeated below a c. 15 mm blank horizontal field. The repeat ends at the acutely angled carination, where only two horizontal lines of the lower border survive the breakage of the vessel at the coil join. Between 5-7 mm below the carination a further repeat of the complex motif takes the decoration to the base of the vessel. The base of the vessel is slightly domed.

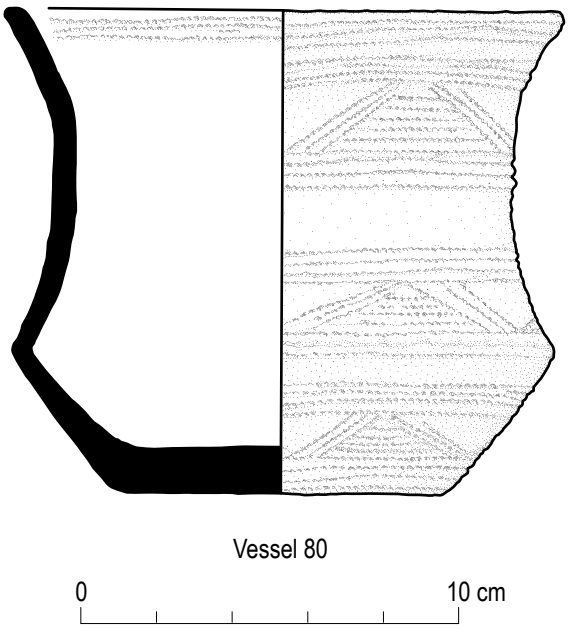


Figure 111: Early Bronze Age Beaker V80.

The composition of the pot included micaceous clay like most other vessels of this assemblage, together with fine quartz sand and other unidentified minerals. The surface of the vessel was deliberately smoothed before being decorated with a comb but there is some loss of the surface in places. The decoration is largely crisp with sharp edges indicating it was executed at the leather-hard stage. Some of it has been infilled with a substance that has been rubbed into the comb impressions to highlight them and produce a white design on a terracotta background (Figure 112). The white substance is probably powdered calcined bone. Loss of organic material from the fabric during firing has left small vesicles mainly on the interior of the pot.



Figure 112: Detail of V80 with white powder added to the design.

This type of Beaker (the European Bell Beaker) with a low carination is the earliest type to be found in Scotland, is closest to its continental equivalents, and it was predominantly used in burials as a grave good but its occurrence is rare (Needham *et al.* 2019, 174). A slightly smaller example was found at Carnoustie with an all over-corded (AOC) decoration (Ballin Smith 2025) and a similar, thicker-walled, plain but again slightly smaller example was found at Beechwood Park, Raigmore Inverness (Sheridan and Hammersmith 2006, 80-81). The earliest continental type Beaker found in Scotland from Newmill, Perth and Kinross was dated to around the 25th century BC (Sheridan 2007, 96-99). The pit in which V80 was found was not dated but its completeness suggests it might have been a burial pit.

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V39 to the east was recovered from a pit in ST20, and V43 was located in a pit in ST26 to the north. V39 is the base edge of an abraded and burnt Beaker base c.80 mm in diameter together with three abraded body sherds. The base edge is decorated by three parallel horizontal lines of probably impressed cord and there is an indication of incised decoration on one body sherd. This is probably the remains of AOC Beaker that was moved from its original place of burial. V43 is a finely made straight rim of a Beaker vessel, c. 120 mm in diameter, with a rounded top and slight interior bevel. It is heavily abraded with a gritty exterior and any decoration has been removed. The high level of abrasion indicates that this too was not in its original burial context. It is not inconceivable that V43 and V39 are both actually parts of the same vessel given their general proximity and the lack of other Beaker sherds on the excavated area.

Middle Bronze Age Urn

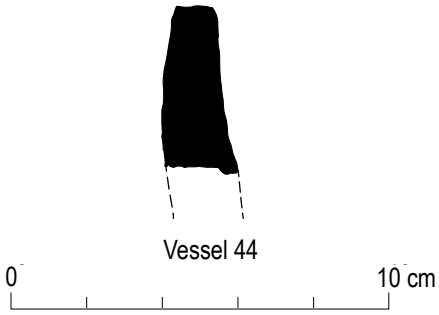


Figure 113: Middle Bronze Age urn V44.

Fragments of a single burial urn V44 (Figure 113) were found in the same area as V39 and V43, near ST20. The plain pottery is heavily gritted and between 17-20 mm in thickness. The rim, which could not be measured as it has virtually no curvature, has a distinctive flat top and is otherwise straight apart from a fingertip indentation on the rim top. Below the rim the walls of the vessel expand towards the missing base. Moulding marks are clearly visible but other sherds indicate that the exterior surface of the urn was smoothed before firing. The loss of organic temper from the firing process has left cavities in the fabric, and the vessel is either poorly finished on its interior or is very badly abraded. This is a flat-rimmed urn, and unlike other urns of its type such as those found at Dunragit (Ballin Smith 2021 b, 20-22) it does not appear to have been pierced below the rim to take a cover for its contents. No human remains were found with the sherds, suggesting they had been lost. The fragmentary nature of the urn also suggests it had been removed from its burial context.

Other Middle Bronze Age Vessels

There are 108 sherds representing 13 vessels, which are considered to be middle Bronze Age in date that derived from contexts across the excavated area (Table 25). These sherds were mixed with earlier and later dated sherds in the pit groups or structures in which they were found, so there is an element of uncertainty about their allocation to this period. All the sherds are plain but most give a good indication of the size and shape of the vessel to which they belonged. This description therefore concentrates on the diagnostic sherds of rims and gives an overview of the variety of vessel sizes and rim shapes produced at this time. Most of the vessels lie in the middle of the pot sizes (Table 23) with outliers to the bottom and top of the range. No base sherds were recorded from this period, but it is assumed that the bases of the vessels were flat.

In comparison with earlier described vessels the manufacture of these pots is more utilitarian, with fine finishing almost absent. Many of the sherds display finger moulding marks and rims can be poorly or unevenly shaped. This was often due to larger sized or coarser grits added to the clay, which often protruded through the clay surface, such as V33, for example (Figure 114).

The sherds from this period have been split to two types, dependent on their characteristics.

One category is characterised by thick-walled and heavy vessels that have mainly everted or slightly everted rims which generally are rounded (V68, V88 and V111, Figure 114) but some such as V33 (Figure 114) and V52 have a slight angularity to the rear of the rim. V20 is a somewhat straighter rim to a slightly bulbous vessel but with an acutely angled bevel to the interior perhaps to take a lid.

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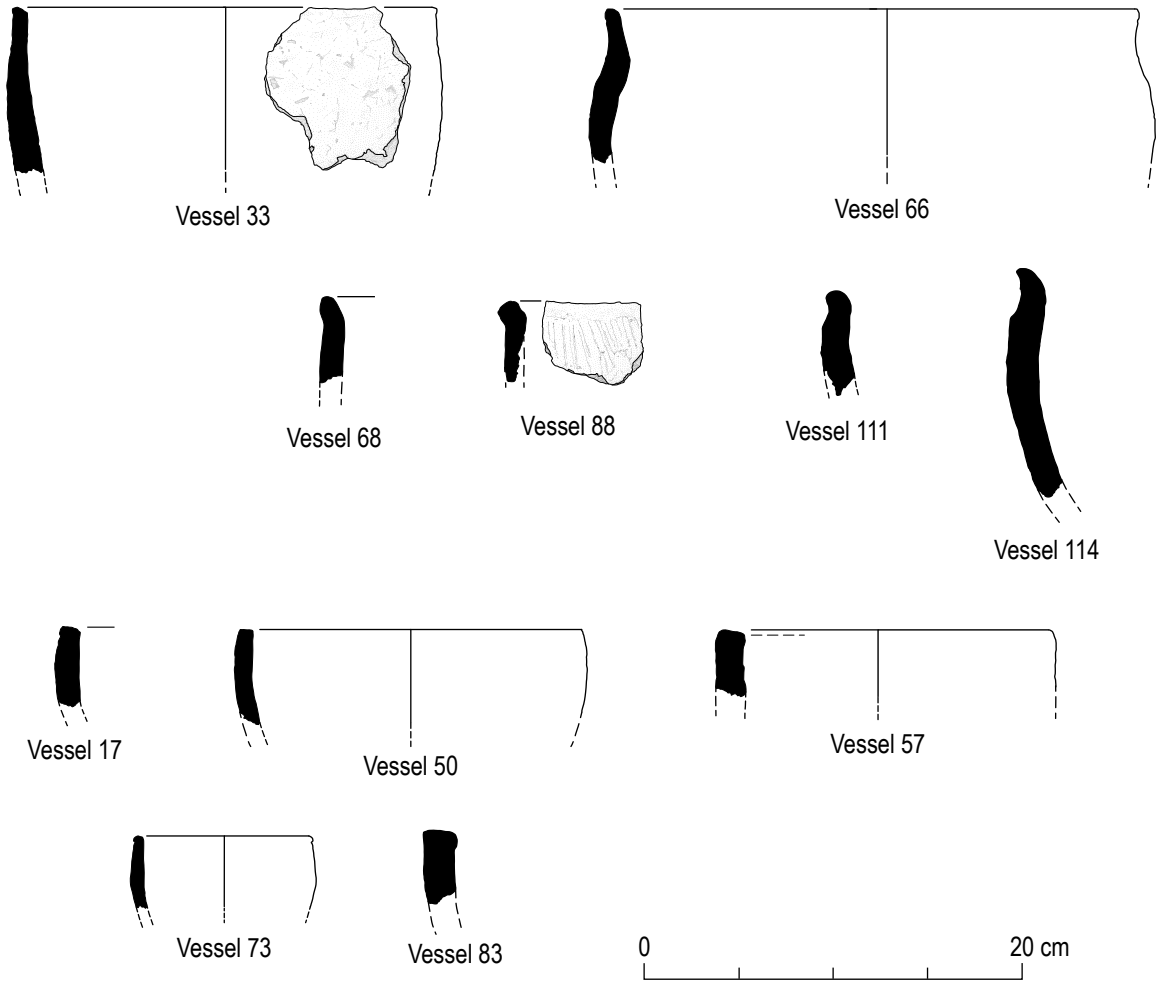


Figure 114: Other Bronze Age pottery.

Several examples have a concave neck and thereby emphasis a shoulder which may have been deliberate or a product of the shaping of the body with the attachment of the rim coil. Examples of this are V20, V52 with V66, V111 and V114 (Figure 114). A number of rim and body sherds conjoin to form V114, which measured c. 220 mm in diameter may be the best example of a middle Bronze Age vessel from Guardbridge. It is robust and heavy but its rim sherds are poorly moulded and show some loss of their interior surface. The rim is mainly rounded and everted to a short concave neck to an unevenly moulded and not entirely present rounded carination. Sooting on this vessel might imply it was a cooking pot. This vessel is also typical of the shapes of these pots which are mostly curved or irregularly straight.

V88 (Figure 114) is two conjoined rolled and everted rim sherds to a straight-ish sided vessel. Striations are present below the rim and down the vessel, but they are not decoration. They have most likely been made during the rough wiping of the vessel surface downwards from the rim creating deep and 2-3 mm wide thin marks, possibly from dried grass. The marks seem to have carried on down the pot.

The second category of vessels for this period is predominantly flat topped with generally a curved body. Three are thick-walled (V17, V57 and V83) and the other two (V50 and V73, all Figure 114) are thinner, slighter vessels. V83 has the largest rim diameter of all the vessels measured at Guardbridge, of 400 mm. The slight bulge of clay to the interior of this rim, and that of the exterior of V17, could suggest their vessels were partly dried upside down, with the weight of the pot forcing the rims slightly out of shape. V73 is the smallest recorded at Guardbridge, with a rim diameter of c. 90 mm, suggesting this was a cup or small drinking vessel.

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Later Bronze Age/Early Iron Age Vessels

In the Scottish Lowland areas where later Bronze Age pottery is found, it is usually in relatively small amounts such as that found at Hawkhill, Lunan Bay, Angus (McGill 2009, 50) or is missing from structures of that date (see The fort, Iron Age, section above), or their precise dating can be problematic. Unlike vessels of earlier periods the characteristics of later prehistoric domestic pottery with their variations with many different vessel styles are not necessarily easily attributed to specific dates. This is most likely due to research concentrating on more easily recognisable ritual and domestic vessel forms from earlier and later periods.

In this section vessels are characterised by their different rim shapes: bevelled, everted and flat-topped, and round-topped rims. As with other vessels, these examples were found across the excavated area (Table 25), but the roundhouse ST40 has a large number of them.

Many of these sherds/vessels are dark grey in colour, as opposed to the orangey colours of earlier periods, which indicates reduced conditions (lack of oxygen) during firing and possibly different methods of firing. Some sherds have noticeable cavities from the burning away of copious organic temper added to the clay, which may have allowed fine and lighter vessels to have been made.

Internal bevelled rims

A number of vessels have acute angled internal bevels. Some are predominantly straight (V26, V58, V59) or slightly everted (V87 and V95). The actual rim top is mostly rounded in these examples (see Figure 115).

One of the largest vessels, V59 has an open rim with a diameter of c. 290 mm and would have stood c. 200 m in height. It is a heavy bucket-shaped pot that tapers gently down to its c. 220 mm diameter base. Although the rim is round topped and straight the bevel ends in a ridge beneath which is a concavity where it joins the interior surface of the vessel. The base of the vessel was coil-built with finger moulding marks above the rounded base edge where there is a coil join. Some of the sherds indicate finger drag marks down the body from the moulding or finishing stage and grass marks are also visible on its surfaces. Like many pots of the later Bronze Age, the surfaces of this vessel were only roughly smoothed as mineral temper protrudes through them. This may have been deliberate to produce a 'non-slip' exterior to a heavy vessel. Sherds from near the base of the vessel carry thick carbon deposits from food residues indicating its use as a cooking pot.

V58 (Figure 115) is a smaller pot with a straight to slightly everted rim to a predominantly bucket-shaped vessel that would have been c. 145 mm high. The rim indicates a diameter of c. 175 mm and it has an acutely angled bevel. Although this is a fine-walled vessel it is copiously gritted. Its flat, coil-made base was c. 160 mm in diameter, but it is much abraded with loss of its surface. Its base edge protrudes and is rounded. Other sherds of this pot have been heavily vitrified (see *Vitrified Material*).

V117 (Figure 115) is a straight rim c. 120 mm in diameter with thin rounded top, an acute bevel to the interior and finger moulding below the rim externally. This flat-based vessel could have stood c. 95 mm high.

The rims of V49, V51, V64 and V70 (all Figure 115) are less acute and there is a tendency for the bevel to have a slightly rounded profile. These vessels may not be as well made as those described above and certainly V64, a c. 180 mm diameter vessel has coarse large grits and is poorly moulded. Vessels V51 and V70 have diameters of c. 200 mm. The latter, however, has a surviving partial perforation below the rim that was chipped through the pot from the exterior surface.

V38 (Figure 115) with a diameter of c.140 mm, has a straight rim with rounded top and slight bevel to the interior. This heavy and robust vessel has gently curving sides and a flat base with a rounded base edge and probably attained a height of c. 115 mm.

V127 is a 7.5 mm thin-walled vessel with a thick, slightly domed base that would have stood c. 130 mm high. The vessel has a gently curved profile and a rounded rim top indicating a diameter of c.140 mm. Slight finger dimples are noted at the base-edge from moulding. Its base measures c. 120 mm in diameter and is thick and slightly domed.

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The rims of V71 and V76 (both Figure 115) are slightly inturned indicating thin-walled bucket-shaped vessels.

Everted flat-topped rims

These vessels are predominantly characterised by a flat or slightly sloping rim top with a rounded, slightly exaggerated eversion to a predominantly straight or gently curving vessel. Examples include V31, V32, V47, V53 V84, V102, V103 and V107 (Figure 116). The rim of V85 (Figure116) may have been more prominent.

From the surviving sherds of V53 it has been possible to produce a reasonable profile of the vessel, which differs little in its manufacture from those described above. It has a flat topped c. 200 mm diameter rim and a flat base of 140 mm diameter with a slightly protruding base edge. The pot would have been in the region of 160 mm high, gently tapering to its base from its open mouth. In contrast V72 (Figure 116) is a flat-topped everted rim to a fairly thick-walled bowl.

Vessels V29 and V96 (both Figure 116) have slightly more rounded bellies than V53 and their rims are simpler, thinner and without any expansion to the exterior. V96 has a rim diameter of c. 140 mm and a base diameter of c. 100 mm. Its base is very fragmented, abraded and poorly moulded but it has a rounded uneven edge to it. The vessel would have been c. 126 mm high. The rim of V29 could not be measured.

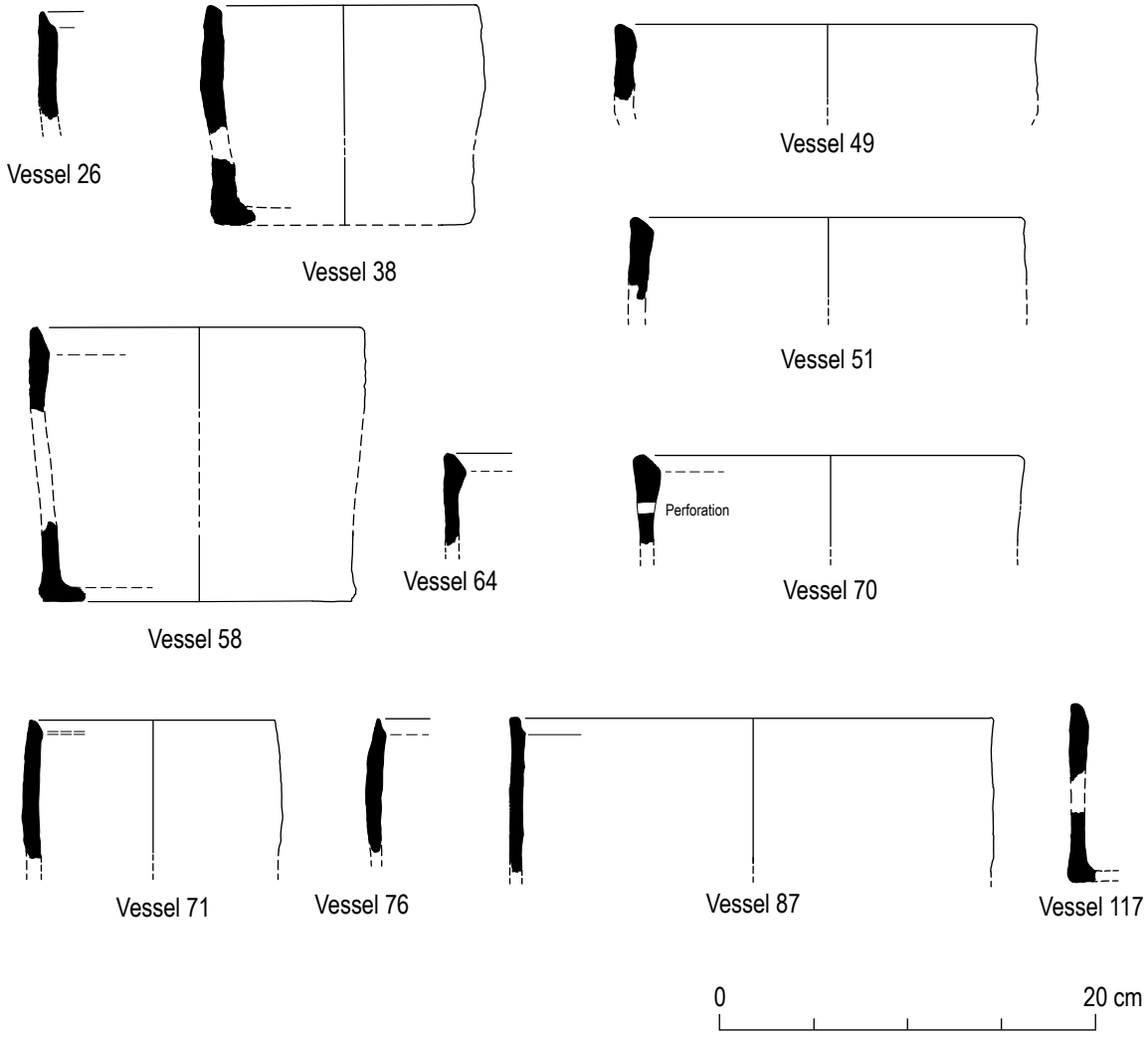


Figure 115: Later Bronze Age/Iron Age pottery with bevelled rims.

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V107 (Figure 116) are the remains of the greater part of one large plain vessel with several flat but burnt base sherds with a sharp clean base edge. The rim sherds are small and fragmented but indicate a diameter of c. 270 mm. The rim has a slightly bevelled flat top, and is everted with a narrow rounded edge to the rim with finger moulding below it. The base has a diameter of c. 160 mm but its interior is thoroughly burnt and loss of its surface had occurred possibly post-deposition. Some of the body sherds are large c. 80 by 80 mm but several with straight edges suggest breakage along coil joins. The surface of the vessel was finished by being roughly smoothed. It is estimated that the vessel could have been c. 300 mm or more in height.

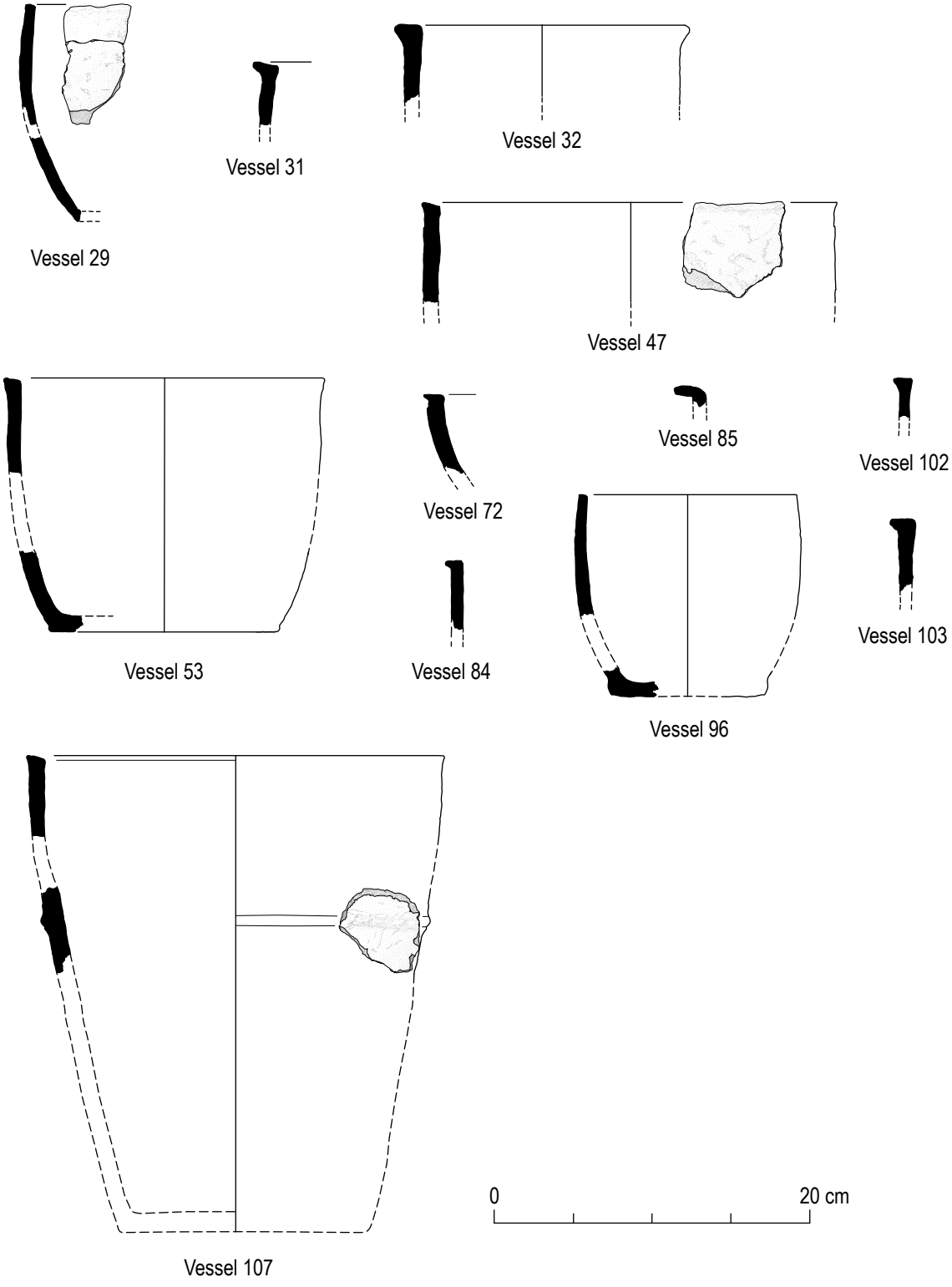


Figure 116: Later Bronze Age/Iron Age pottery everted flat-topped rims.

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Base sherds

Isolated base sherds, V54, V60, V91, V94 and V99 (Figure 117) indicate a variety of base edge shapes. All are round-edged but some have protruded more than others during manufacture possibly due to the weight of the vessel with heavy stone temper. In the example of V60 the base was extremely thick and heavy in spite of only a c.100 mm diameter.

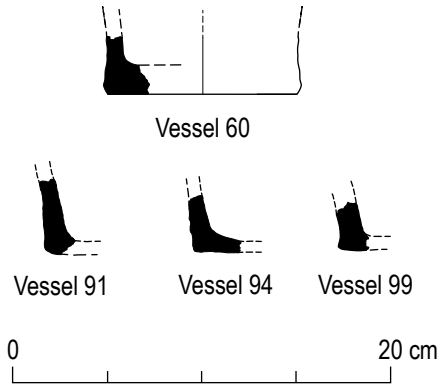


Figure 117: Later Bronze Age/Iron Age bases.

Iron Age Vessels (Table 25)

A small number of sherds are identified as definitely Iron Age, or more precisely middle Iron Age. These include decorated sherd V105 and a small number of base sherds. Again, these sherds were located across the excavated area, but V67 is from the ST40 roundhouse.



Figure 118: Detail of V015 with applied decoration.

A single Iron Age body sherd is decorated, V105 (Figure 118) with a design that is typical of the period especially from sites in the northern and western parts of the Scottish Mainland as well as the Western Isles and the Northern Isles. This cordon was applied to neck or shoulder of the vessel. It is c. 8 mm wide and the patterning of it is indistinct because of its grit content and loss of its surface through abrasion. Cordons were generally decoratively slashed or pinched (Ross 1994, Illus 144).

Two fragments of V22 are an example of a dimpled base (Figure 119), which is characteristic of some cooking vessels of the Iron Age period (Ross 1994, 250, Illus 150). One piece is from the edge of the vessel which has broken away from the wall but it has the remains of a finger runnel between the wall and base. The other, larger piece indicates the base was domed in the centre. It too has a finger runnel round its surviving edge, but has at least eight finger dimples that were impressed into the base's interior surface. This is not decoration but the dimples may have stopped the liquid inside the pot boiling over.

Other base sherds include V67 (Figure 119), which has as sharp right angle base edge to a straight thin vessel. Different angles to the juncture of the base and wall of the vessel can be noticed, for example in V116 (Figure 119) with a c. 160 mm diameter. The heavy base the angle is obtuse, but in the larger V120 (Figure 119) with a c. 180 mm diameter base, the join is a sharp right angle, and the wall above is slightly concave indicating different pot shapes. In both these latter examples the middle of the base is domed internally making it the thickest part of the vessel. This could have been formed during the moulding of the vessel wall to its base.

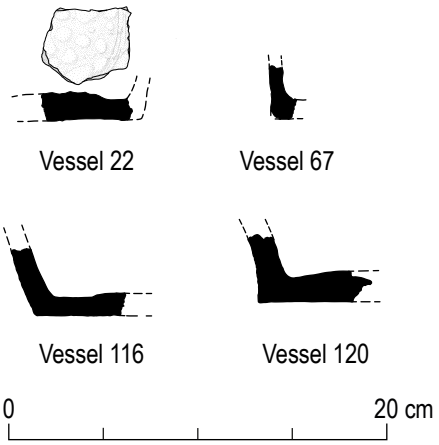


Figure 119: Iron Age pottery.

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Undated Vessels

There are unidentified 30 vessels (Table 25). They are most likely of middle to late Bronze Age date or of the early Iron Age. Many of them are small, malformed, distorted and fragmentary rims and thought there are some share some characteristics with the vessels described above identifying them more precisely has not been possible. The majority of these vessels are from ST40 the roundhouse.

Vessel distribution

The distribution of vessels across the excavated area is complex but certain trends are noted (Table 25). The majority of early Neolithic vessels came from ST11 on the western side of the excavated area and the vicinity around it, especially to the west. Other areas used in the early Neolithic were PG1 north of the waterlogged/pond and ST20 with associated contexts to the south of it. ST1 in the central area, north of PG1 also produced early Neolithic pottery.

The same areas also produced middle Neolithic vessels, indicating some degree of continuity of activities there. However, this pottery was also found in contexts relating to ST6 and ST30 in the west, but also ST31 on the eastern edge of the site north of the waterlogged/pond. Later disturbances probably account for the probable distribution of sherds of V5 between ST11 and ST 30, but more importantly, conjoining sherds of V2 were found in both PG1 and ST27 c. 110 m apart, suggesting in this case, a deliberate distribution of sherds.

During the early and middle parts of the Neolithic is appears that parts of the landscape were favoured, but with a gradual movement eastwards perhaps as the waterlogged/pond shrank in size. The small assemblage of later Neolithic vessels indicates a more widespread distribution which included west of ST6 and the area between ST12/15/16; PG1 and ST18 in the centre; and interestingly east of ST23 towards the south-western extent of the excavated area, where the majority of sherds of this pottery were found. Here a large bucket-shaped vessel (V45) and a much finer one (V46) were found together. There was also a single sherd of late Neolithic pottery located to the north of the fort.

The most important find in the early Bronze Age was V80 an early Beaker. It was located north of ST34 in the centre of the excavated area and near to ST18 with its late Neolithic activity. The Beaker may have come from a cist, but had been disturbed or removed from it in recent times. Other rare examples of early Bronze Age Beaker pottery were found between ST20 and ST26, towards the south-west, with the remains of a middle Bronze Age urn found to the west of ST20 and indicting a possible pit burial in the vicinity. This distribution might suggest the area lay outside settled areas.

From the distribution of what is considered middle Bronze Age domestic pottery, settlement areas somewhat overlapped with earlier activities, for example, PG1 and the nearby ST2 in the centre of the area and ST11 and its surroundings in the west. Perhaps newly settled areas included ST30 and ST12 towards the west and centre/west, and interestingly ST40 and the nearby ST31 in the east. ST22 in the south, noted above as having early Bronze Age activities, also had middle Bronze Age pottery.

It has not been possible with any certainly to separate later Bronze Age domestic pottery from that of the early Iron Age. However, in looking at their distribution there are three main concentrations – two north of the waterlogged pond and one to the south of it. The most important focus of activities is around the ST40 roundhouse with the nearby ST31, where together a total of 12 vessels were found. This accumulation of pottery there suggests that the roundhouse may have originated in the second half of the Bronze Age and been rebuilt over time.

A looser concentration of pottery is around the central area of PG1, ST1, ST2, ST6, ST17 and ST18, with a possible outlier in ST6, and where there is structural evidence of a several roundhouses and the remains of 12 vessels. Pottery from ST27 to the north-west of this concentration may be due to later activities. The last focus of seven vessels is around ST20, ST22 and PG2 to the south-west with a small number of sherds of two other vessels further south and west around ST23 and ST38.

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The five middle Iron Age vessels are restricted to the centre of the excavated area, from ST40 in the east through PG1, ST17 and ST18 to as far as between ST12/ST15/ST16. The undated vessels are predominantly from the structures already included in the distribution of pottery, with ten of them from ST40.

Chronology and comparison with other sites

The chronology of the site is difficult (see *Radiocarbon Dating* section) but there are some radiocarbon dates that are associated with the contexts in which pottery was found. Some of the dates are relevant but others are not (see Table 26). There are fourteen vessels linked directly to radiocarbon dates and another three where the vessels are from within the same structure that has been dated or are close by. Four vessels, plus one by association, are earlier than the radiocarbon dates; two vessels with another by association are later; and most of the rest could be contemporary with the dates. This latter group are of uncertain date and are likely to be from the late Bronze Age and the early Iron Age, as the dates suggest.

Guardbridge is a rare example in lowland Scotland of the survival on a raised beach area of occupation from the early Neolithic through to the middle Iron Age, and one with a corresponding range of pottery vessels. The complexity of structures over a long time scale and over a large area, combined with artefactual evidence, is not a pattern generally found in the surrounding region or further afield. In Angus, Carnoustie another raised beach site, provided copious structural and ceramic evidence of occupation from a slightly more limited date range, from the early Neolithic into the later Bronze Ages (Ballin Smith *et al.* 2025). The site of Newton Road also in Carnoustie is another but with a far more limited example of pottery recovered from a number of pit groups, with examples of early Neolithic carinated bowls, and sparse examples of middle Neolithic Impressed Wares and late Neolithic Grooved Ware (Johnson 2009, 5-12). Both these sites indicate the preference of well-drained soils, away from the coastline and with an elevation across the landscape.

Vessel No	UB No	Sample	Context	Radiocarbon Age BP	Calibrated 1-sigma (68.3% probability)	Calibrated 2-sigma (95.4% probability)	Structure	Remarks
V24	UBA-51749	806	1449 fill of enclosure ditch 1448	4299 ± 31	2919 – 2888 cal BC	3010 – 2880 cal BC	ST12	This vessel is later (LBA/EIA) than the date
V43	UBA-54738	1675	2772 fill of pit 2773	2902 ± 27	1125 – 1017 cal BC	1204 – 1008 cal BC	ST26	This is a small plain Beaker and earlier than the date
V2	UBA-53317	1086	1916 fill ofposthole 1915	2893 ± 26	1118 – 1017 cal BC	1202 – 1000 cal BC	ST27	This is a middle Neolithic vessel and much earlier than the date
V109	UBA-51743	240	316 fill of enclosure 315	4419 ± 30	3098 – 2934 cal BC	3320 – 2920 cal BC	ST9	This pottery is likely to be later than the Neolithic date
V35	UBA-53323	1795	2962 fill of pit 2961	2843 ± 26	1047 – 933 cal BC	1109 – 920 cal BC	ST20	The vessel could be contemporary with this date
V107	UBA-54722	SF 431	953 fill of ditch 952	2812 ± 24	1000 – 928 cal BC	1045 – 902 cal BC	ST12	It is possible that this heavily burnt pottery is contemporary with this date or earlier

Table 26: Vessels and radiocarbon dates comparison.

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Vessel No	UB No	Sample	Context	Radiocarbon Age BP	Calibrated 1-sigma (68.3% probability)	Calibrated 2-sigma (95.4% probability)	Structure	Remarks
V89	UBA-51742	112	035 fill of large pit 169	2732 ± 25	900 – 832 cal BC	923 – 817 cal BC	ST2	It is possible that this heavily burnt pottery is contemporary with this date or earlier
V58, V59, V76, V84, V85, V75	UBA-54730	1437	2015 deposit	2659 ± 33	887 – 795 cal BC	899 – 789 cal BC	ST40	Some of these vessels could be contemporary with this date, but it is likely that some are also earlier
V122	UBA-54717	176	240 lower fill of pit 242	2445 ± 25	738 – 421 cal BC	750 – 411 cal BC	PG1	This vessel is probably early Neolithic and much earlier than the date
V31/V32	UBA-53322	1772	2954 upper fill of pit 2953	2456 ± 26	749 – 479 cal BC	754 – 416 cal BC	PG12	Although these vessels are from context 2952 is is possible that they are contemporary with this LBA/ EIA date
V45/V46	UBA-54737	1615	2707 fill of pit 2706	2947 ± 27	1214 – 1119 cal BC	1258 – 1051 cal BC	E of ST23	These vessels are from context 2709 and are definitely late Neolithic and therefore earlier than the date
V106	UBA-54720	344	512 fill of pit 510	4643 ± 31	3497 – 3368 cal BC	3516 – 3362 cal BC	ST41/ PG1	This vessel is from context 511 and is most likely to be much later than the date

Table 26 (continued): Vessels and radiocarbon dates comparison.

Other Neolithic examples from slightly further afield and more inland include Powmyre Quarry at Strathmore, Angus and Dubton Farm, Brechin. The former produced a similar range of early to middle Neolithic vessels with a variety of rim shapes and vessel forms and sizes (Sheridan 2012, 49, Illus 8) as at Guardbridge but the occupation of the site did not continue into later periods. At Dubton Farm, there were a total of 230 early, middle and later Neolithic vessels (MacSween 2002, 34-42) that also provide good parallels to those of the same periods from Guardbridge but its later period, which included Iron Age souterrains produced no pottery.

While early and middle Neolithic pottery is fairly commonly found during excavations in the region, late Neolithic pottery is also present with three decorated Grooved Ware vessels found at Mains of Kelly near Arbroath (MacSween 2007a, 60-61, Illus 13), where its vessel 2 clearly resembles V30 from Guardbridge. The pottery was not dated, but falls into the centuries immediately prior to 2500 BC. Mention has already been made of

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the extensive Grooved Ware assemblages and their dating at places such as Balfarg/Balbirnie (see Copper 2024, above), and they are not repeated here. Over the last two decades there has developed a good consensus on the range of vessels and their dating throughout the Neolithic due largely to the work of Alison Sheridan and also Anne MacSween (see Brophy and Sheridan 2012).

Pottery wares largely associated with funerary activities that developed during the Neolithic/ Bronze Age transition (the Chalcolithic) and throughout the early Bronze Age have been well recorded and researched (Downes 2012). Again, Sheridan along with the *Dating of Human Remains for DNA Project* carried out by the National Museums Scotland in collaboration with other initiatives and institutions have contributed significantly to our understanding of the chronology of these various pottery types. However, the problems arise when looking at Bronze Age and early Iron Age domestic pottery that is often plain and relatively sparse in numbers compared to the funerary wares. Its diagnostic elements vary considerably, it is often undated, whole pots are rare, and on sites such as Guardbridge, which is a palimpsest, it may be difficult to determine if the pottery is contemporary with the feature or context in which it was found. There is a great deal of uncertainty surrounding this pottery and it is often considered together into a catch-all category, as in this report.

At Lunan Bay, Angus, again on the raised beach of that area, occupation was identified from the early and middle Bronze Age and into the early centuries AD. The illustrated pottery displays bevelled and straight rims of these periods similar to those at Guardbridge (McGill 2009, 50-51, Illus 25, SF64.1 and SF64.2), but they are not dated further.

Close to Guardbridge at Leuchars, Bronze Age roundhouses were excavated in 2004. Pottery was sparse, and came mainly from postholes, but it was undecorated and rims had mainly interior bevels (MacSween 2007b, 11, Illus 14). The structures were dated to between 1620 – 1410 and 1220 – 830 BC (Cook 2007, 19), spanning the end of the early Bronze Age to the end of the late Bronze Age and indicated, as at Guardbridge, the problems of differentiating in finer detail not only the dates of structures but also of the pottery assemblage.

Similar problems are noted throughout pottery assemblages in the coastal areas of Fife and Angus regarding domestic Bronze Age pottery, but the problems are not restricted to these areas. Excavations at Hatton Farm, Angus, as well as producing a large example of finely made early Neolithic pottery vessels (Johnson 2010a, 9-13) also had a wooden roundhouse and a small number of middle to late Bronze Age pottery vessels. Like at Guardbridge they had predominantly flat rims, one may have belonged to a bowl, and they were considered middle to late Bronze Age in date (ibid, 19-20), with the radiocarbon dates indicating a middle Bronze Age date for the structure.

In addition, a late Bronze Age barrel-shaped vessel of 12th to 9th century BC date from Powmyre Quarry, Strathmore had a flat bevelled inturned rim, and others of uncertain date from the same site indicated bucket-shaped pots with angled flat rims with perforations (possibly indicating repairs) and some decoration (Sheridan 2012, 49, 56, Illus 8 and 10), again not too dissimilar from the middle-late Bronze Age/early Iron Age pottery at Guardbridge. Sheridan characterised the undecorated pottery at Powmyre Quarry as having flat bases but with a variety of vessel forms from bucket-, barrel- or cylindrical-shaped, but in general more information is needed on the development of this pottery.

A near-complete late Bronze Age vessel was found at a multi-period site at Alloa, Clackmannanshire. Its form was globular but with a reduced diameter pointed rim and decorated bevel. It is one of the rare radiocarbon dated vessels that provided a date range of 1120 – 830 cal BC, the late Bronze Age. Other pottery from this same excavation included lugged early Neolithic vessels, middle Neolithic Impressed wares and also Beaker pottery (Johnson 2010b, 35-40).

The understanding of the development of domestic pottery of the Bronze Age into the Iron Age is again vague, with rim and vessel shapes changing in part to more globular forms with

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prominent everted rims and reduced diameter necks. The later domestic pottery from the Iron Age settlement at Dryburn Bridge, East Lothian, indicated a variety of rim forms - inturned, straight and bevelled, rounded and inturned and everted (Cool 2007, 73, Fig 58). The base edges of the pottery were also varied as those at Guardbridge and the author suggested that the assemblage was possibly mixed as earlier wares were present with those contemporary with the settlement.

A total of 17 sherds of Iron Age pottery from Shianzie Farm, Perthshire produced vessel forms typical of the period (McGill 2002, 90). The reduced neck globular vessel with a wide curved everted rim found there was not present at Guardbridge. The lack of this vessel form has implications for understanding the Iron Age at Guardbridge and it may imply that the very few vessels identified there may not be indicative of middle Iron Age occupation of the site, but perhaps of occupation somewhere else in the vicinity of the site. It is possible that by the middle Iron Age, settlement may have moved away from the raised beach and been established further inland, for example, near the present farm at Seggie, and that the rare sherd of Iron Age pottery may have come from manuring fields established over the previous settlement at Guardbridge.

The understanding of later prehistoric assemblages from complex palimpsest sites such that at Guardbridge are fraught with difficulties. There may be future excavations that produce well-stratified and good examples of various types of pottery from the middle and late Bronze Ages and into the Iron Age that pave the way to dating and understanding these vessels in more detail, and the structures they come from. Until then, we have approximately 1000 years of pottery making from c. 1550 BC to c. 500 BC that still requires further investigation and clarification.

Clay and daub

By Beverley Ballin Smith

Introduction

Fragments of daub or clay burnt accidentally (fired clay) were found during the processing of soil samples from across the project area. As its name suggests it is the burnt remains of clay usually used for construction, mixed with organic material such as animal dung and straw, and occasionally with small stones. It is generally a relatively soft material when found in archaeological contexts compared to sherds of pottery, and it is only hardened by exposure to heat or burning. Unfired clay is light weight and generally does not survive particularly well its burial conditions, taphonomic processes or the post-excavation processing of samples. However, the presence of fragments of burnt clay is important for site interpretation, as it can support or enhance the understanding of an abandoned or demolished structure. Fired clay fragments can derive from structures as small as a hearth or an oven, or as large as a wooden building.

Although pottery (see *Prehistoric Pottery*) and a fragment of clay loom weight was found in features across the project area, the amount of raw clay, prepared clay and daub varies from larger to generally small amounts. A total of 242 pieces and fragments weighing a total of 2758.1 g came from a number of pits, postholes and other deposits[6] (Appendix 3). The appendix also indicates the number of pieces from the site of raw clay, prepared clay and daub, together with their weights, and the contexts in which they were found.

Raw and prepared clay

Raw clay was possibly dug from subsoil deposits or a stream side and brought back to the site to be made ready for different uses. The material

6 The pieces were examined with a X6 hand lens and their attributes were compiled in an archivable table devised using Microsoft Excel. The material was analysed according to the revised guidelines of the Prehistoric Ceramics Research Group (2010), and the CIfA's Standards and guidance for the collection, documentation, conservation and research of archaeological materials (2014, revised 2020).

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described as prepared clay is raw clay which has been 'opened' with the addition of some organic material (filler or temper) that has been added to make the clay more usable. When found on archaeological sites samples of the latter are often cached or stored ready to use in hand-sized or small ball-sized pieces, which have been 'wedged', that is moulded, flattened, twisted and pulled to eliminate air and to mix the clay well (Hodges 1989, 20).

Sample 1433 (Figure 120) is an example of prepared clay where many of its fragments demonstrate the wedging process it had been subjected to. The fragments were clean and the clay of good quality when it was (accidentally) burnt and they retained evidence of this mixing and working process. S1433 was found in the fill of posthole 2435 within the interior of ST40. The largest two pieces measuring approximately 107 mm by 61.7 mm by 40 mm had split in half lengthways. It has been possible to reassemble them from the other pieces in the sample and this indicates that they were moulded in and ready to be made into other objects, such as loom weighs or to be mixed with stone temper for pottery making.

Daub

Daub is not pottery but it is similar to raw clay but has more organic material added to it. Often fine minerals such as gravel or the occasional small stones are also included to give 'strength' to the clay. They can be added deliberately or accidentally when daub was being prepared and mixed in a pit or on the ground. Daub was used in its raw state as a constructional material together with withies (willow/hazel/alder wands) in a hurdle-type wooden construction, where its main function was as an insulating and infilling material. This combination of wooden withies and clay is traditionally known as wattle work or 'stake and rice' in Scotland (Walker and McGregor 1996, 38). If protected from the weather it was both a windproof and somewhat of an impermeable barrier. In the archaeological record this relatively soft clay substance was used as a building material for light weight, non-load bearing structures such as the walls of prehistoric timber buildings and for smaller structures such as ovens, hearths and furnaces. Locally available clay was an easily exploitable resource, as was the organic binder or additive, usually straw or dung. Daub has a long history of use, not just in Britain but also worldwide, and the different base materials and additives produced different variants such as *adobe* and *cob* (Graham 2004, 27).



Figure 120: Sample 1433 prepared clay.

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The natural reddish colour of the clay at Guardbridge would have reflected that of the underlying bedrock, but when burnt or fired it often kept its orange/red hues. This would normally only occur through the burning down of a house or structure, or through the prolonged heat of a furnace or hearth. In Scotland, due to taphonomic processes (mainly water and root penetration, and mechanical abrasion) much of the fired clay material, and especially daub, is lost from the archaeological record if it was not sufficiently hardened through burning. Daub pebbles normally survive as irregular, abraded and soft clay lumps.

Results of the analysis

The weight of individual fired clay pieces varies from less than 1 g to over 250 g but the average is c. 12.7 g indicating the variability of survival of this material depending on its type, context and taphonomic processes. Often the small size of some of the daub pebbles is a hindrance to their firm identification. However, the tiny amounts maybe all that survive to indicate that wooden structures were present on the project area and that they are likely to have been accompanied by wattle and hurdle walls or partitions (carbonised fragments of alder, hazel and birch were commonly found on the site, see *Archaeobotany*, above). Very few pieces provided evidence of shaping or impressions of wood to indicate their connection with withies or wooden panelling. The best example is SF 936 from the fill of a linear feature (2102) north-west of the fort. It was a single piece that suggests it was associated with a withy. It also contained an impression of a cereal grain. None of the fragments from features in buildings survived with withy impressions.

The largest amount of daub SF 389 came from pit (700) in PG1 and weighed 708 g. Its shaped pieces and flat surfaces, including one with a raised edge suggest this derived perhaps from a wall, partition or an oven. A small amount of daub SF 1836 was found in an adjacent pit (464) that also produced a radiocarbon date of 751 – 412 cal BC (UBA-51746), the early Iron Age, and suggested the pit was either part of, or disturbed by, activity related to a later building ST41 to the south-west.

A shaped piece, SF 138 was located in the fill of pit (211) situated between PG1 and PG2 with two other smaller fragments of daub (together weighing 51.5 g). This thick and heavy piece has one flattened smooth surface, almost polished, and a right-angled corner where it has been deliberate shaped (Figure 121). The finding of daub pieces in pit, posthole and ditch fills is not unusual, as they probably became incorporated within the backfilling of these features from the sweeping of floors or during the burning down of a structure.



Figure 121: SF 138 shaped piece of daub.

As well as samples of daub, raw clay in significant amounts weighing between 251 g to 328 g were found both within a deposit (2435) in the Iron Age roundhouse ST40, SF 1141, and within a likely Neolithic pit group, SF 173. The latter was a cobble of clay that weighs 251 g and was included in the fill of pit (311) in PG3. The piece has been partly pierced, perhaps by a rounded and pointed stick (Figure 122) that was pushed through the clay obliquely at first and then straight into it. There is no obvious wear around the entry hole and it has been interpreted as a trial or play piece.

Prepared clay was also found in significant amounts. S1433, the largest amount (830 g) was burnt prepared clay found in the fill of posthole (2435) within stone-built roundhouse ST40. During the excavation of this structure and feature, this material was considered as fragments of clay-lining such as remnants of wall render, or part of a destroyed hearth.

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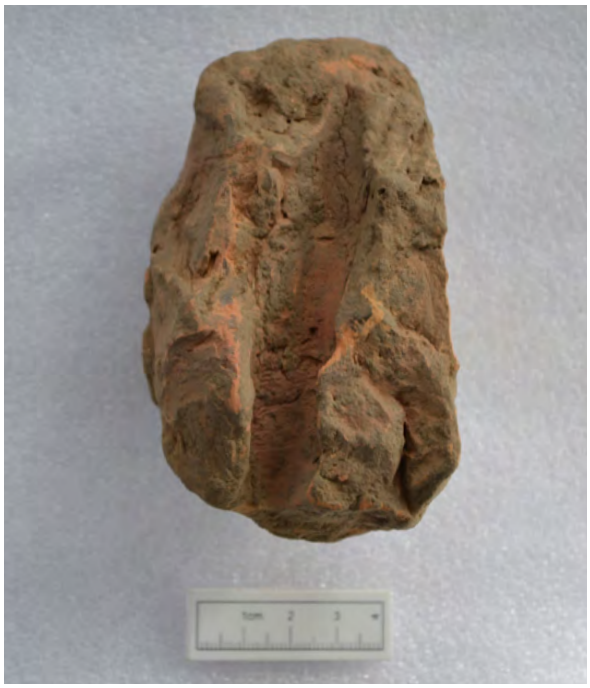


Figure 122: SF 173 pierced daub piece.

Other examples of prepared clay include SF 144 from the fill of pit (242) in PG1. They were rounded and irregular pieces, but SF 389 (708 g) from pit (700) was a fragment of a larger piece that contained some quartz filler, suggesting this was intended either to be structural or artefactual. Three other pieces of prepared clay, SF 543 (132.6 g), came from the fill of ditch (1448) of ST12. Interestingly, this context was radiocarbon dated to 3010 to 2880 cal BC (UBA-51749), the late Neolithic.

Artefacts of fired or burnt clay

Loom weight

Only one definite object, SF 905, was identified from the fired clay samples (Figure 123). It is an unstratified fragment of a loom weight, weighing 83.5 g. It is formed of prepared clay that has some organic temper present but has been hardened by fire. This small arc of a torus (doughnut)-shaped weight retains a portion of its surface and approximately half of its perforation. The surface is fire damage and other fragments of the piece have been lost through spalling. The perforation, 19 mm in diameter, has been made by a finger or thumb pressed all the way through the clay and depressing it at the centre of the artefact. Evidence suggests that this piece is probably the top of the weight as there is smoothed wear above the perforation on the surface of the piece. This would have been caused by a cord rubbing where it was fastened through the perforation to suspend the weight from an upright loom. There would have been many more weights below the loom to keep the warp threads under tension and in place on the frame, but this is the only surviving fragment to indicate weaving took place. A small number of fragments of similar torus-shaped fired clay loom weights were found at Northbar, Erskine, from roundhouses whose dated use spanned the middle to later Bronze Age (Ballin Smith forthcoming b). The similarities



Figure 123: SF 905 fragment of clay spindlewhorl.

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between the Guardbridge fragment and those from Northbar would suggest they were most likely of a similar date.

The prepared clay sample S1433 from posthole (2435) ST40 contains one piece that resembles part of a loom weight perforation. The fragment of burnt clay retains an outline of the edge of a thumb pressed into the rough clay fragment (Figure 120, bottom right). This may simply be fortuitously made by someone sticking their thumb into clay rather than an actual loom weight piece.

Discussion

Fired clay pieces of three different types (raw clay, prepared clay and daub) are not datable in themselves but the radiocarbon dates from the project area suggest periods of occupation from the Neolithic through to the early Medieval period.. Although some pieces are generally very small, the distribution of fired clay is indicates it was widespread. Its association with buildings as either raw clay brought in or as prepared clay to be used for pottery suggests it was an important resource in the domestic economy of the area. Even today the red clays around St. Andrews are still being exploited for pottery making (e.g. Butterwynd Pottery). However, one of the most important aspects of clay resources was that of its use as a building material - daub. Fragments of daub were commonly found in pits, postholes, deposits and burnt deposits associated with pit groups (PG1, PG3, PG10 and PG12) as well as structures (ST1, ST5, ST6, ST7B, ST9, ST18, ST20, ST25, ST31, ST34, ST40 and possibly ST41). Its presence in and around these features indicates that daub with wattle was a vital architectural component for wall panelling, partitions ovens and perhaps even for the bases of hearths.

However, given the complexity of the distribution of buildings across the excavated area, the reuse and rebuilding of structures and the effects of ploughing, there is some ambiguity about which structures and building(s) the fired clay evidence belongs. Daub being light in weight could be moved in general domestic debris to be deposited in the infilling of postholes and pits and as a component of midden material it would have been spread across areas under cultivation.

The fired clay material from Guardbridge has not included many shaped pieces such as those from later periods at Ayr Academy, for example (Ballin Smith 2019), but fragments of daub from as early as the early Bronze Age were present. It is also notable that from the later Bronze Age and Iron Age structures at Braehead, Glasgow (Ellis 2007) that daub pieces or pebbles were not present, indicating like at the nearby settlement site of Northbar, Erskine, subsequent uses of the site and taphonomic conditions present there had a significant bearing on the survival of this constructional material. Similar conditions of disturbance and ploughing have affected the survival of fired clay materials at Guardbridge but the rare example of a torus-shaped loom weight fragment is of considerable importance. Clay formed into similar loom weights, some slightly burnt, were found in pits and postholes related to middle to late Bronze Age roundhouses at Northbar, Erskine (Ballin Smith forthcoming a and b), and are considered an important comparative example.

The largest amount of prepared clay was S1433 that was and stored in a building that possibly caught fire. It was not burnt in the posthole in which it was found, but possibly deposited there during clearance of the building. The survival of this material is rare, especially as it is the largest example and from an Iron Age roundhouse. The prepared clay could have been used as an insulating or damp-proofing material within the roundhouse as has been noted at other Iron Age sites, e.g. a cell in the yard of the SW building at Howe Broch (Ballin Smith 1994, 60) but this is unlikely given its shaped appearance. It is more likely to have been prepared for the making of pottery or even loom weights.

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Medieval and later pottery

By Bob Will

Introduction

The assemblage of pottery recovered from the archaeological investigations at Guardbridge in Fife consisted of 77 sherds (963.9 g) and includes material from the medieval and post-medieval periods as well as a few modern factory-produced industrial wares (Table 27). All the sherds were examined, weighed and recorded according to guidelines and standards produced by the Medieval Pottery Research Group (MPRG 1998 and 2001). The sherds are mainly in a Scottish White Gritty Ware fabric and represent cooking pots and jugs and date to the late thirteenth or early fourteenth century.

Scottish white gritty ware

A total of 73 sherds (853g) in Scottish white gritty ware fabrics were recovered from the excavated area and is the main medieval fabric group in the assemblage. This fabric is found throughout Scotland particularly in Fife and in east coast towns and in the Central Belt but it is found in the west of the country too (Franklin and Hall 2012). White gritty wares first appear in the late twelfth century but the tradition lasts into the late fifteenth century. So far, the only published kiln site is at Colstoun in East Lothian (Brooks and Betts 1981). This fabric has been extensively studied and it is likely that a number of kilns were in production throughout Scotland (Jones *et al.* 2003). Large amounts of white gritty wares have been recovered from excavations in nearby St Andrews and from Tentsmuir where it is the dominant local fabric (Hall 2002).

The sherds from Guardbridge are in a number of similar but different fabrics from white to pale pink to buff in colour and with varying amounts of quartz inclusions. The fabrics display evidence of different kiln firings and manufacturing techniques as well as potting skill. Some vessels are very well made with thin walls with abundant quartz inclusions and a light green or yellow glaze.

The vessels represented in the assemblage are mainly cooking pots or storage jars with a few glazed sherds and grooved strap handles from jugs. The cooking pots were identified by soot or black fuming marks on the underside of the bases and exterior of the body sherds. The number of sherds from cooking pots and the use of light green and yellow glaze on the jugs would suggest a date in the late thirteenth to fourteenth century.

Low countries redware

One small thin body sherd in a well-made redware fabric with a clear glaze that gives a shiny brown appearance to the sherd was recovered and could be from Low Countries Redware vessel. A range of cooking pots was imported into Scotland from the Low Countries from the fourteenth century (Haggerty *et al.* 2007).

Tin-glazed white earthenware

One sherd of tin-glazed earthenware was recovered from the excavation. The sherd is the flat base from large plate or platter with a hand-painted scene of fishermen pulling in nets, painted in blue with a white background. Tin-glaze became common in Europe from the sixteenth century with potteries in the Netherlands and England before taking off in the seventeenth and eighteenth centuries (Jennings 1981). The sherd from Guardbridge is likely to date from the late eighteenth century and may have been made at the Delftfield factory in Glasgow which operated from 1748 to 1823 (Kinghorn and Quail 1986).

Fabric	Total	Rim	Base	Handle	Body sherd	Weight (g)
Scottish white gritty ware (SWGW)	73	12	5	2	54	853
Low Countries redware	1				1	1.1
Tin-glaze white earthenware	1		1			105
Modern white earthenware	1				1	0.7
Modern red earthenware	1				1	4.1
Total	77	12	6	2	57	963.9

Table 27: Types of pottery and their numbers.

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Modern

Only two sherds of modern factory produced industrial ceramics were recovered, these comprise one sherd of white earthenware with a blue transfer print and the other a sherd of red earthenware that is probably from a flower pot. These wares were manufactured at a number of factories throughout Scotland and the UK in the late nineteenth and early twentieth century, unfortunately there are no distinguishable designs or makers mark that could identify the pottery.

Discussion

This small assemblage is typical of material from excavations from St Andrews and Fife in general (Hall 1997) where the dominant local fabric is Scottish White Gritty Ware and it is likely that there were pottery kilns operating in Fife. The large number of sherds from cooking pots would suggest a date in the late thirteenth or fourteenth century. There were no post-medieval sherds that tend to come in the late fifteenth century and are found throughout Scotland. The Low Countries Redware sherd was unusual but Low Countries fabrics have been found in St Andrews and highlight trade with Continental Europe.

Bronze Age metalworking evidence

By Matthew G. Knight[7]

A crucible fragment (SF 99) and two mould fragments for casting a bladed object (possibly a sword) (SF 1468) and a socketed gouge (SF 1713) were recovered during excavations at Guardbridge. Radiocarbon dates confirm a late Bronze Age date for the fragments. This small assemblage is an important addition to the corpus of Bronze Age metalworking evidence from Scotland, particularly the socketed gouge mould, which is only the third known example from this country.

Catalogue (Figure 124)

SF 99 Thick fragment of fired ceramic, broken on all edges, with smooth oxidised orange exterior; coarse sandy fabric with few small (<1 mm) grit inclusions. There are small patches of copper-alloy deposits on the interior surface. It probably derives from the wall of a non-ferrous crucible. XRF: leaded tin-bronze. Dimensions: 22.6 by 17.8 mm; thickness: 14.2 mm; weight: 4.98 g. ST2, context 152: backfill of a crouched inhumation burial.



Figure 124: Moulds for Bronze Age metalwork.

7 National Museums Scotland

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SF 1468 Roughly trapezoidal fragment from a ceramic mould valve for a bladed object, broken at the top and bottom and worn along one interior edge. Micaceous sandy fabric, with very fine inclusions. It has a smooth rounded exterior, oxidised pale orange in colour, and reduced pale grey interior surface, particularly over the object matrix. Patches of burnt clay, sand or soot adhere to the interior. The matrix is uneven due to wear but is 27.1 mm wide at its widest and in section slopes from each edge to a flat base; it represents the negative of a blade, probably for a sword. XRF: no significant result. Length: 38.1 mm; width: 42.9 mm; thickness: 14.0 mm; weight: 17.81 g. ST20, context (2962) the fill of a pit (2961).

SF 1713 Fragment of the gate of one valve of a ceramic mould for a socketed gouge, broken down one side and across the bottom. Micaceous sandy fabric, with very fine inclusions. It has a smooth rounded exterior though flattens towards the lower half of the fragment, oxidised orange in colour and partially delaminated. Interior is reduced grey colour. The gate has a flattened top and is quite shallow, leading to a matrix for a rounded socketed tool. The negative of a slight collar moulding survives and upper part of the groove for a gouge, creating an undulating cross-section at the bottom of the matrix. This fragment comes from the upper right quarter of the front of a socketed gouge. Length: 45.5 mm; width: 27.2 mm; depth: 14.6 mm; weight: 13.48 g. ST20, context 1713 the fill of a pit (2961).

Chronology

The character of the mould fragments, and the objects they would have produced, is consistent with a late Bronze Age date (c.1150 – 800 BC). A sample of alder charcoal (Alnus cf glutinosa; sample 1795) from the same pit fill (context 2962) as the mould fragments returned a calibrated radiocarbon date of 1109 – 920 cal BC (95.4%; UBA-53323, 2732 ± 25 BP). This confirms the expected date and would place the moulds within the Wilburton or early Ewart Park metalworking traditions (Needham *et al.* 1997).

The crucible fragment (SF 99) is also consistent with a late Bronze Age date, though is sufficiently undiagnostic that it could also date to the early Iron Age. Qualitative X-ray fluorescence analysis (XRF) of the crucible showed they were casting a leaded tin-bronze, which is also consistent with such a date range. A sample of human tibia from the crouched inhumation burial SF 99 was recovered from returned a calibrated radiocarbon date of 813 – 772 cal BC (UBA-53328,1851 ± 31 BP), confirming a late Bronze Age/early Iron Age date.

These associated dates do not overlap significantly and raise the possibility that the mould and crucible fragments may derive from two separate events.

The wider context

The non-ferrous metalworking debris recovered from Guardbridge represent singular fragments of one crucible and two moulds, one a matrix for a probable sword blade, and one for a socketed gouge. These can all be dated to the late Bronze Age, confirmed by the radiocarbon dates. These fragments suggest non-ferrous metalworking was taking place on site during the late Bronze Age, though give limited indication of the scale of this activity; indeed, most late Bronze Age assemblages of metalworking refractories tend to be small (Webley *et al.* 2020, 111). On the basis of the radiocarbon dates, it is possible that the moulds derive from an earlier metalworking event, while the crucible could be later, but this theory remains circumstantial.

The Guardbridge evidence is a significant addition to a growing number of sites from Scotland that have produced late Bronze Age metalworking evidence at different scales (Cowie 2002, fig.8). Like Guardbridge, some sites have produced only a few mould fragments, probably for one or two objects, such as 18 abraded fragments from Cill Donnain III, South Uist, only one of which was diagnostic enough to identify as a sword fragment (Parker Pearson and Zvelebil 2014, 133-134). At Galmisdale, Eigg, crucible fragments and around 100 fragments of clay moulds for producing at least one socketed axehead and a possible knife, were recovered from a small, isolated area with no significant prehistoric features (Cowie 2002). This probably represents a small metalworking event. By contrast, metalworking assemblages from Jarlshof, Shetland, and Cladh Hallan, South Uist, comprise several hundred mould fragments representing multiple objects including swords,

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spearheads, axeheads, pins and razors, associated with structures and settlement activity (Hamilton 1956, 28-29; Parker Pearson *et al.* 2001, 103; Webley *et al.* 2020, 103, 111).

During the late Bronze Age to earliest Iron Age (1150 – 600 BC), much metalworking evidence derives from settlement contexts, in or around structures and pits, and where object matrices for moulds can be identified, these are overwhelmingly swords, spearheads and axeheads (Webley *et al.* 2020, 91, 102-105). The Guardbridge blade mould fragment is thus in keeping with what one might expect in terms of context and form.

By contrast, the mould fragment for a socketed gouge matrix is much rarer with only two other certain examples currently known from Britain and Ireland, notably both from Scotland. Fragments of moulds for four socketed gouge moulds were amongst the 309 clay mould fragments for a range of tools recovered from two late Bronze Age/earliest Iron Age pits associated with a structure at Bellfield Farm, North Kessock, Highland (Murray 2012, 24; Clark *et al.* 2017, 60–61); and at Jarlshof, more than 200 moulds for a minimum of 20 objects were recovered, one of which was for a socketed gouge (Hamilton 1956, 28, Fig. 14.2). The socketed gouge mould from Guardbridge is an important addition to the known corpus.

Similarly, the (probably) late Bronze Age crucible fragment is a useful addition to those known elsewhere in greater numbers at, for instance, Cladh Hallan and Jarlshof, but is unusual in deriving from a mortuary-related context. Metalworking evidence directly associated with prehistoric human burials is very rare in Britain and Ireland, though human remains and metalworking refractories may often derive from the same sites. In Scotland, there was previously thought to be one direct association of metalworking moulds and late Bronze Age human remains in a short cist at Golspie, Highland (Sheridan *et al.* 2006, 201; Parker Pearson *et al.* 2019, 45, 501), but subsequent analysis and radiocarbon dating has revealed that the moulds represent a secondary deposit into the earlier cist during the early medieval period (Knight and Maldonado 2022; Knight *et al.* 2022, 205). Where human remains and metalworking material derive from the same sites, these tend to be in fills or midden deposits, rather than individual burials (Webley *et al.* 2020, 110–111). Webley *et al.* (ibid.) note only one direct association between metalworking evidence and human remains from Britain and Ireland at the settlement site of Huntsman Quarry, Worcestershire, where the upper fill of a waterhole contained human bone, a shale bangle fragment and clay mould fragments, though this might also be considered to represent a more coincidental accumulation of midden-esque material. The Guardbridge crucible fragment derives from backfill into the crouched inhumation, rather than being a direct association, and as such it is hard to interpret significance in its inclusion; it is more likely residual, in keeping with other evidence from late Bronze Age Britain.

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Vitrified material

By Gemma Cruickshanks[8]

Group	Material	Total (g)
Non-ferrous metalworking	Mould	31.3
	Crucible	54.8
Ironworking	Smelting slag	797.8
	Plano-convex base	348
	Slag spheres	0.2
	Undiagnostic iron slag	120
	Bog ore?	590.2
Undiagnostic	Fuel ash slag	430.3
	Fue ash slag ('Iron Age grey')	31257.5
	Fired clay	8.1
	Vitrified ceramic	800.4
	Vitrified ceramic (burnt pot?)	481.8
	Magnetic residues	78.2
	Burnt stone	1075.7
Total (g)		36074.3

Table 28: Summary of metalworking debris and other vitrified material.

Summary

A little over 36 kg of vitrified and other heat-affected material was retrieved during excavations at Guardbridge (Table 28). Vitrified material can be produced during a wide range of high temperature processes, from specialist metalworking to domestic hearths. This assemblage is dominated by a distinct but currently undiagnostic type of fuel ash slag and a small, but significant, number of fragments derived from non-ferrous metalworking and ironworking. The non-ferrous metalworking fragments comprise two late Bronze Age mould fragments and a possible crucible sherd (see *Bronze Age Metalworking evidence*). The few fragments of ironworking debris indicate both iron smelting and blacksmithing took place in the vicinity, probably in the Iron Age, though the dating for this activity remains uncertain. A large quantity of fuel ash slag was also recovered, possibly relating to the combustion of a wooden structure.

The assemblage

The material was visually examined and classified using common terminology (e.g. Crew and Rehren 2002; Lucas and Paynter 2010; McDonnell and Milns 2015) based upon characteristics such as size, morphology and density. The assemblage is summarised below and a full catalogue is in the archive.

Ironworking debris

Around 1.8 kg of material derived from ironworking. Two fragments of probable bog iron ore (SF 948 and SF 627) weighing 500.3 g hint at this being the type of ore used. Bog iron ore was the most common ore type used for ironworking in Scotland from the Iron Age and into the medieval period. Smelting slag fragments (SF 1134, SF 1158 and SF 1195) were retrieved from features in ST12, ST34 and ST33 respectively. The pieces are typically large and amorphous (weighing 887 g in total).

Fragments of small, plano-convex bases (SF 1108, SF 1132 and SF 1266) consistent in size with those produced during blacksmithing. While SF 1108 and SF 1132 were retrieved from overburden, SF 1266 was recovered from the fill (2751) of ST26. Further evidence of blacksmithing is provided by two slag spheres identified in soil samples (S.1624 and S.1671) from pit fills in ST22 and ST26 respectively. A further 14 g of iron slag fragments are undiagnostic (SF 1236, SF 1597, SF 2560 and SF 2686) and were found within feature fills in ST1, PG4, ST33 and the fort ditch, respectively.

The quantity of ironworking is therefore small but diverse and scattered in time and space (Table 29). No ironworking features such as smelting furnaces or blacksmith's hearths were identified, leaving the exact location of the ironworking activity uncertain. That most of these fragments are in secondary contexts also makes it difficult to determine their age, as such debris did not change in form from the development of iron production technology in the early Iron Age until after the medieval period. None of the contexts producing ironworking debris were directly dated, but dates from other features within the relevant structures or feature groups can tentatively be used to provide a date. For example, 1st century BC to 3rd century AD dates (UBA-51758 and UBA-51759) were returned from ST26 (though a late Bronze Age date was too: UBA-54738), which produced one of the smithing hearth base fragments, suggests this activity

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Group	Material	Structure									
		1	2	6 ex	11	12	17	20	22	26	33
Non-ferrous metalworking	Mould							31.3			
	Crucible		54.8								
Ironworking	Smelting slag										294.4
	Plano-convex base									131.8	
	Slag spheres								0.1	0.1	
	Undiagnostic iron slag	14.6					4.6				44.4
	Bog ore?				350.1	89.9					
Undiagnostic	Fuel ash slag	0.2	1.5			0.5		65.6	0.3		
	Fue ash slag (IAG)		1.2	14967.1				3.7			
	Fired clay										
	Vitrified ceramic										
	Vitrified ceramic/ ?BP							124.9			
	Magnetic residues		0.4	0.8	1.6	0.1	0.1		0.4	0.5	
	Burnt stone										225.4
Total		14.8	57.9	14967.9	351.7	90.5	4.7	225.5	0.8	132.4	564.2

Group	Material	Structure					Pit group			Fort ditch	Pit align.
		34	40	41	42	43	4	7	11		
Non-ferrous metalworking	Mould										
	Crucible										
Ironworking	Smelting slag	503.4									
	Plano-convex base										
	Slag spheres										
	Undiagnostic iron slag		2.9		3.1	1	44.7			4.7	
	Bog ore?										
Undiagnostic	Fuel ash slag		166.7	39.1	50.4			55.7			
	Fue ash slag (IAG)	1206.3	6801.9	9.2	22.8			180.8	1021.4	96.3	1938.1
	Fired clay		8.1								
	Vitrified ceramic			428.6							
	Vitrified ceramic/ ?BP		356.9								
	Magnetic residues	0.7	20.5	0.1		0.3		0.4	3	9.9	0.1
	Burnt stone		294.8								
Total		1710.4	7651.8	477	76.3	1.3	44.7	236.9	1024.4	110.9	1938.2

Showing all diagnostic material and other material over 150g
IAG = 'Iron Age Grey' see report
BP = ?burnt pot

Table 29: Distribution of vitrified material. Includes all diagnostic material and areas with over 150g of other material.

could be Iron Age - a time when ironworking is closely associated with roundhouse settlements. However, dates from other structures vary widely, for example two of the smelting slag fragments were recovered from feature fills in ST33 and ST34, which produced 10th century AD and late Neolithic/Bronze Age radiocarbon dates respectively (from other features in those structures). This illustrates the highly complex and long-lived nature of this site, which has led to the ironworking debris being widely redistributed over time.

Fuel ash slag

Most of this assemblage comprises types of fuel ash slag. Fuel ash slag forms during the high-temperature reaction between alkaline fuel ash, e.g. from wood charcoal, and silicates such as sand or clay. As such, this type of slag tends not to be diagnostic of a particular industrial process and could form, for example, as a result of a timber structure burning down and the burnt wood reacting with underlying soil.

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Over 31.6 kg of fuel ash slag was recovered, comprising over 650 fragments. Only around 400 g of this material consists of the typical, variable porous material usually classed as fuel ash slag. The remaining 31.2 kg is all very similar, consisting of highly porous, lightweight fragments in brown-orange-pink colours, with a smaller number of fragments which are pale grey in colour. Most are fractured showing the porous interior, but where the exterior surface survives it tends to be smooth, sometimes flowed and occasionally glassy. A few of the larger fragments preserve hints of contact with a regular surface, for example SF 1064 and SF 1142 have some convex faces, while fragments amongst SF 525 and SF 892 are plate-like, suggesting they formed on a flat surface. Occasional heat-affected stones are included, (e.g. SF 891) but no charcoal inclusions were noted.

Two dominant concentrations of this material are evident (Table 29). One particularly large lump (SF 616B) weighing 13.7 kg, along with a further 680 g of small fragments, was discovered in the lower fill (1550) of a pit (1548) external to ST6. Fill (1550) is dated from the mid-8th to the early 5th century BC (UBA-53313), the earliest Iron Age while the upper fill (1549) produced a radiocarbon date spanning the late-9th to early 11th centuries AD (UBA-51754), placing it in the latter half of the early medieval period.

A large concentration of over 450 small pieces weighing a total of 6.8 kg was retrieved from various deposits associated with ST40; a poorly preserved large stone-based roundhouse. Some 2.2 kg (212 fragments) were found within internal ?floor deposits (2015), radiocarbon dated to the very late 8th and 9th centuries BC, placing it in the latest Bronze Age/earliest Iron Age. The degraded nature of this structure makes it challenging to interpret why so much fuel ash slag is present but it seems unlikely to have formed *in situ* and is more likely to have been redeposited there from elsewhere. Vitrified material was often reused in flooring and paths in more recent times and would have been just as effective in the past, particularly if a surface was prone to waterlogging or becoming slippy.

Other fragments were more sparsely distributed throughout PG7, PG8 and PG11, the fort ditch and ST2, ST16, ST20, ST34, ST35, ST37, ST41 and ST42.

Similar material has been discussed under the description ‘Iron Age grey’ on other sites, such as at Broxmouth hillfort, where over 60 kg was recovered from redeposited midden dating to between the 4th and 3rd centuries BC (McDonnell 2013, 397). The exact origins of this material remains uncertain but chemistry and mineralogy have ruled out a metalworking origin (Gerry McDonnell pers. comm). Comparable material has also been identified from two other Scottish hillforts studied by the author; 47 kg Castle Law, Forgandenny and 19 kg from Ben Effray, both part of Glasgow University’s SERF Project (Cruickshanks 2019 a and b). Like the Guardbridge material, very large single pieces (10 kg and 18 kg) were retrieved from both sites, along with a range of smaller, but very similar fragments. Two pieces from Castle Law, Forgandenny had cylindrical perforations interpreted as stake holes, suggesting it may have formed during combustion of a wooden structure.

Other vitrified material

Around 850g of vitrified ceramic fragments was also recovered (see V58 from ST40 in *Prehistoric Vessels*).

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Metalwork

By Gemma Cruickshanks

A relatively small assemblage of metalwork was retrieved, comprising nine copper alloy and thirty iron objects. Seven of the copper alloy objects are small bar mounts (SF 931, SF 932, SF 933, SF 934 and SF 935). Such mounts are well-attested in the medieval period and would have adorned straps or belts in sets (e.g. Egan and Pritchard 2002, fig 113). Traces of mineralised textile on the back of one (SF 933) indicates this was likely to have been fabric rather than leather (Figure 125). While all the mounts are superficially very similar in size and construction, with two fine rivets at each end for attachment, they show subtle differences in shape. For example, SF 931 has a plano-convex section, while SF 934 has a more rectangular section; small differences which suggest they may not have been made as a set but collected together from different sources. All seven mounts were unstratified, but their discovery together suggests they were deposited while still attached to the belt and had not been disturbed to any great extent after deposition.



Figure 125: Copper alloy mounts SF 933.

The two other copper alloy objects comprise a modern screw fitting (SF 1136) from overburden (147) and a small undiagnostic folded sheet fragment (SF 1202) from a fill within ST33 (2560).

Of the thirty iron objects, 22 are small fragments of wire, some of which are twisted together. Their gauge and form suggests they are from relatively recent wire mesh (e.g. 'rabbit fencing'). The fragments have fuel ash slag adhering in places, consistent with their discovery in the fill of a lime kiln (2127). Two other fragments of wire (SF 927) found in the same feature are more likely to be from modern barbed wire fencing. The presence of fencing wire fragments implies fence posts with remnants of wire may have been burnt there.

A small iron knife (SF 1133) found in overburden (147) in four fragments, some of which are fused together, indicating it was already broken when deposited (or last disturbed), though traces of mineralised organic material on the tang indicate it still had a wooden handle. Its simple form is not chronologically distinct but its size is consistent with use as a general-purpose, everyday tool.

Two bars (SF 1138 and SF 1162), a rod fragment (SF 1190) and a tapering shank (SF 498b) are also chronologically undiagnostic. SF 1162 has both original ends present, indicating it is not a broken fragment from another object and could therefore have been stock iron intended for use by a blacksmith. The others have at least one broken end, leaving their original form unclear. A tiny unidentifiable fragment (SF 586) was also recovered from a deposit above pit (1596) by ST6.

Catalogue

Abbreviations: L length, W width, T thickness (L by W by T where unspecified).

Copper Alloy

SF 931 Slightly tapering copper alloy bar with convex upper, flat base and straight ends. There are two small perforations, one with a fine rivet still in place, at either end. L 16.5 mm, W 5-4 mm, T 2 mm; rivet head D 2 mm; perf D 1 mm.

SF 932 Two small copper alloy bars with rounded-rectangular section and straight ends. Both have rivets through perforations at the ends. 18 mm by 5 mm by 5-4.5 mm; 16.5 mm by 4 mm by 3 mm (dimensions of rivets and perforations is unclear).

SF 933 Two small copper alloy bars with shallow convex uppers and flat bases. Both have rivets though both ends (though perforations which seem to widen to the base). One has textile

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still attached to the base around one of the rivets, indicating this group of bar mounts were probably attached to a fabric item. 17 mm by 5 mm by 2 mm; 18 mm by 14.5 mm by 2 mm.

SF 934 Small copper alloy bar with rectangular section, rounded off on edges, and straight ends. There are two small perforations, both with a fine rivet still in place, at either end. L 17.5 mm, W 4 mm, T 3 mm (rivet dimensions obscured).

SF 935 Small copper alloy bar with convex upper, flat base and straight ends. Two conical rivet holes were drilled from the underside. L 17 mm, W 4-5 mm, T 2 mm; perforation 1 mm D on upper surface, expanding to 3 mm on base.

SF 1136 Modern copper alloy ring with threads on the interior to enable it to be screwed into another component. D 32 mm, W 5 mm, T 2 mm.

SF 1202 Small, corroded fragment of sheet copper alloy, roughly triangular, now folded once to create a rectangle. Some edges look broken, indicating it was once larger. 11 mm by 16.5 mm by 3 mm.

Iron

SF 586 Tiny iron fragment. Unidentifiable. 4 mm by 3 mm by 1 mm.

SF 927 Portion of iron wire, comprising two strands twisted together. Most likely from modern barbed wire fencing. L 72 mm, W 9 mm, wire T 5 mm.

SF 957 Fragments of fine iron wire, some twisted together and other fragments with pale grey porous fuel ash slag adhering. The wire is likely to be recent in date, possibly from something like 'chicken wire' fencing. The adhering slag suggests it was burnt, probably as fragments still attached to a wooden post used as firewood. Longest fragment 23 mm long, 2 mm in diameter.

SF 1133 Four very corroded fragments comprising the tang and fragmentary triangular-sectioned blade of a knife. The tang is rectangular sectioned and preserves mineralised wood from the handle. The blade appears to have partly broken in antiquity, as the broken tip adheres to another fragment of the same blade. Too fragmentary to establish exact form but was a fairly small, general-purpose knife, probably with a straight back curving down to tip. Blade seems quite long compared to tang. Total length c.120 mm; tang L 33 mm, H 8 mm, T 4 mm; blade max H 16 mm.

SF 1138 Two refitting fragments of curved, rectangular-sectioned iron bar. Section is sub-triangular. L 69.5 mm, W 13.5 mm, T 6 mm.

SF 1162 Iron bar with slightly rounded ends, parallel sides and square or rectangular section (now in 10 fragments). That ends are not broken suggests it could have been stock iron, rather than e.g. part of another object, such as a tool or nail shank. L 80-90 mm, W c. 10 mm, T c. 8 mm.

SF 1190 Small corroded iron fragment showing circular section on opposing broken edges, indicating is was part of a rod c. 5.5 mm in diameter.

SF 498B Small, straight, tapering iron bar. L 28 mm, W 5 mm by 5 mm.

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General discussion

The natural and man-made landscape

By Beverley Ballin Smith

The picture of the past landscape environment at Guardbridge and the changes noted to it over time have largely come from the archaeobotanical analyses and radiocarbon dating of organic carbonised material found in pits, postholes and deposits. Clarification of that picture is difficult because of the layering of buildings and other activities over earlier ones, and inevitably the mixing of organic materials.

The Upper Palaeolithic and the Mesolithic

From the evidence collected from the site a series of images can be gathered and the first begins with the earliest dated evidence (UBA-51753 and UBA-54727) of woodland cover on the escarpment during the middle to later eighth millennium BC and also the middle of the seventh millennium. It suggests that birch trees and hazel shrubs, from the presence of nutshells, grew there. Birch is a pioneer species and hazel traditionally grows along forest or woodland margins where there was more light for it. The presence of both species could suggest there was woodland in the area prior to the Storegga tsunami.

Towards the end of the seventh millennium BC the Storegga Slide and the subsequent tsunami (for details see Bondevik *et al.* 2003, 289-300) directly affected the Guardbridge area during the Mesolithic period. The inundation of water from the tsunami possibly removed any post-glacial tree cover for several kilometres in land, including that at Guardbridge. The evidence from the excavated area on the elevated sandstone escarpment demonstrated it was not immune from the effects of this event (see Lithic Artefacts) and it may have lost all its vegetation leaving open views to the Eden Mouth and the sea beyond.

During the excavation there was a waterlogged pond in the centre of the investigated area and towards its eastern boundary probably lying between the 23-24 m contours. This may have originated post-glacially or from the effects of the tsunami, but was probably considerably larger during the Mesolithic and Neolithic than during later periods. At the very end of the Mesolithic and beginning of the early Neolithic in the fifth millennium BC birch and alder trees were present. Both birch and alder like damp/wet environments (i.e. alder carr) and they may have been growing around the margins of the waterlogged (possible lake) area forming a belt of wet woodland.

The Neolithic

Indications of human activity on the escarpment were dated to the early to middle Neolithic (from the end of the fourth to the middle of the third millennium BC) where some pits of that date were situated towards the western boundary of the excavated area between the 24 m and 25 m contours and away from the wetter areas on the escarpment. Species used for firewood or construction included birch and hazel, but willow (another damp loving tree) was also present as was oak and heather-type charcoal. Heather and its related species can indicate poor soils and their presence suggests that there were damp or wet areas of heathland, perhaps more generally across the escarpment. Alternatively heather-types could have been brought in from outside the excavated area for use as bedding, roof covering materials as well as firewood. However, the picture is made more complex by the identification of hazel nuts, and for the first time evidence of the cultivation of barley. In spite of the damp conditions there were also more favoured areas, perhaps on higher ground above the 25 m contour to the north, west and south-west where small plots of land had been cleared for the growing of crops.

In the central part of the excavated area to the north and west of waterlogged area, several pit groups indicated activity during the middle Neolithic c. 3500 to 3000 BC and provided additional evidence for the environment during that time. Oak appears in the archaeological record as well as mixed cereal crops of barley and emmer wheat, and willow was also noticed in a pit alignment in the north-west of the area. The middle to later Neolithic, to as late as c. 2500 BC, saw activity in some of these same areas, but the locations of the pits suggested there was a slight shift in the use of the landscape towards the edges of the wet/pond area, and towards the eastern boundary of the excavated area (Figure 126), with more evidence of the gathering of

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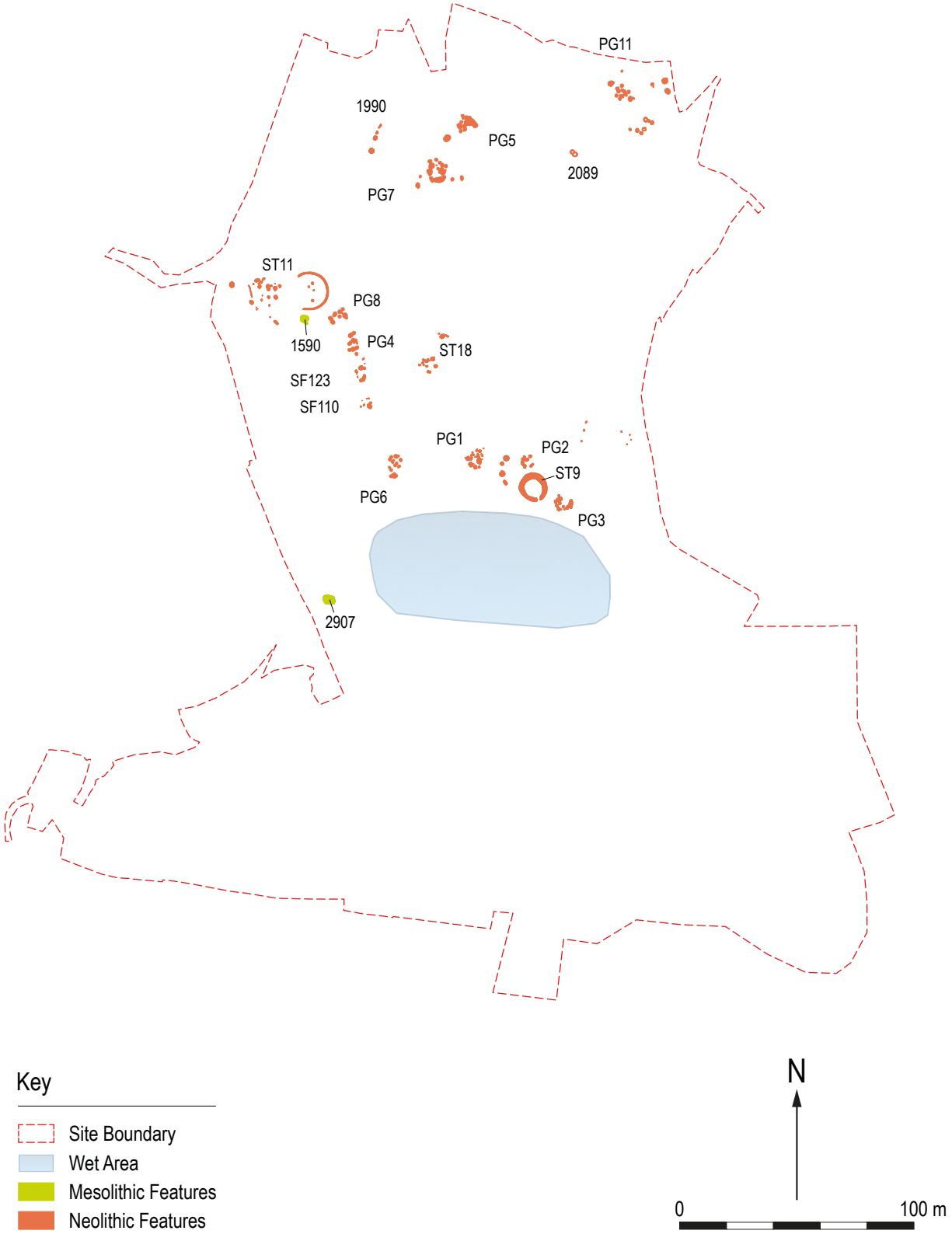


Figure 126: Location of features during the Late Upper Palaeolithic, Mesolithic and Neolithic.

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hazel nuts, the use of alder wood, and of emmer wheat and barley probably grown in small clearances or fields. Heather-type charcoal was also found in middle and late Neolithic features on the higher ground towards the north-east suggesting heathland was present towards the edges of the escarpment there.

The pattern of human activities is not entirely clear, but Neolithic peoples used a variety of resources, from drier woodland, alder carr near the waterlogged area, most likely woodland clearances for the growing of crops, and possibly heathland areas for the gathering of heather-type vegetation. Not all these environments may have been present on the escarpment but most likely in its near vicinity, and the resources including the river and estuarine area were sufficient to attract repeated visits by people moving through the landscape, to eventually settling there on a more permanent basis.

The Bronze Age

Most of the native species resources noted in the Neolithic period continued to be utilised throughout the Bronze Age from c. 2500 to c. 800 BC (Downes 2012) – willow, alder, hazel, birch, heather-types and oak - and hazel nutshells were still gathered and eaten. There is a suggestion from the archaeobotanical analysis that oak was commonly used both structurally and for firewood. Blackthorn and ash, suggesting mixed woodland, also made an appearance during the early Bronze Age in the central part of the excavated area where two roundhouses were located (Figure 127).

Permanent roundhouses were erected in the middle of the excavated area and north and west of the wetland area (ST2, ST13, ST17 and ST18), with other buildings to the west (ST27), to the south-west (ST22 and ST25) and to the south (ST20) of it. The majority were in use during the middle and later Bronze Ages but residual environmental evidence from the Neolithic has probably affected the sequence of events in these areas. However, although the evidence is sparse, there is sufficient to suggest that hazel wattle was used in ST22. It is highly likely that willow, alder as well as hazel were used in most of the roundhouses for light-weight walls with daub as an insulating material, and oak and possibly alder used for the load-bearing structural elements of the buildings. This is not entirely borne out by the evidence, due to the lack of it, but these species were commonly used in roundhouse construction elsewhere in Scotland (see Alldritt forthcoming). As previously mentioned, charcoal from heather-type species could have been used for roofing the buildings and there was widespread evidence of its exploitation.

Cultivated food crops during the Bronze consisted of oats, barley and wheat, with evidence surviving from buildings ST17, ST18 and ST27, although the only evidence for cereal processing (see *Archaeobotany*) took place during the late Bronze Age in building ST17. Two other pieces of evidence suggest the economy was mixed. Sparse evidence of cattle during the early Bronze Age was noted in ST2 and field boundaries or enclosures (for crops or cattle) were identified in the western part of the excavated area dating to the end of the Bronze Age and beginning of the early Iron Age.

The overall picture appears to be one of continuity of the use of local resources and habitats from the Neolithic for the construction of permanent buildings. Cereal crops were cultivated with oats identified as weeds in barley fields, and also, but with very sparse evidence - the keeping of cattle. The landscape probably continued to change throughout the Bronze Age but the detail of that change is missing from the archaeological record. The wetland/pond area survived but probably shrunk in size and woodland resources were still important, but trees providing structural timbers may have been felled outside the excavated area. Territory and land ownership may also have been marked with the establishment of field boundaries and the erection of buildings. How many roundhouses and other buildings were in use at the one time across the area is not known but it is likely that there was a generational replacement of them, where buildings were rebuilt in different places across the landscape. The population on the escarpment may not have been large.

A more open landscape than during the Neolithic is indicated by established buildings, boundaries for cultivated fields or enclosures, with the possibility of established grazing land. With a landscape becoming more agricultural it is likely that trees and woodland were pushed back to less favourable areas of the landscape due to agricultural practices.

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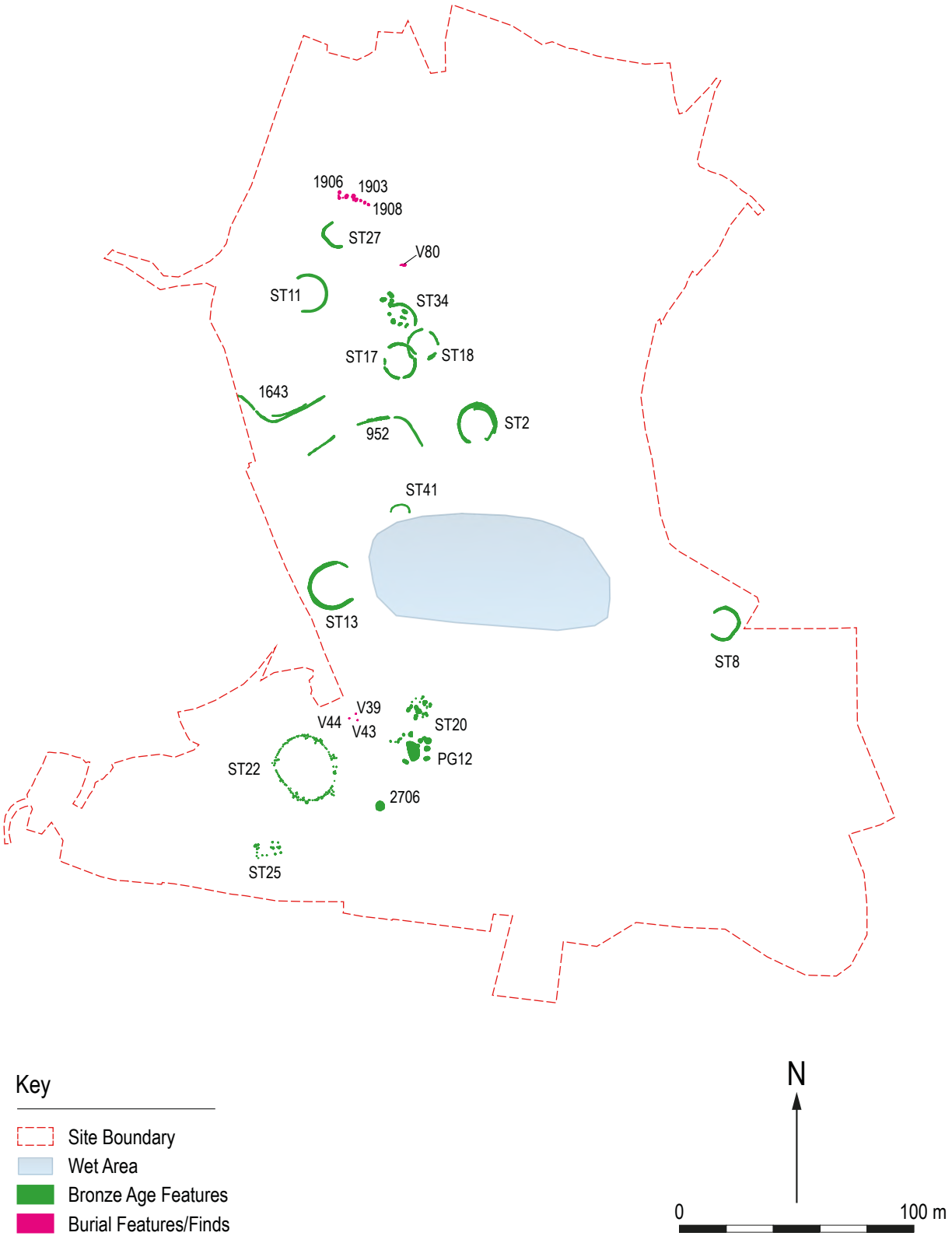


Figure 127: Location of structures and features during the Bronze Age.

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Iron Age

The opening of the landscape begun in earlier periods continued during the Iron Age. This period is represented by a fort, a stone-built roundhouse, wooden structures and enclosures (Figure 128). Alder, hazel, oak, some willow and copious heather-type charcoal typify the main species found within features of structures across the excavated area from the early Iron Age c. 800 to 600 BC through the middle Iron Age and into the early centuries AD. Evidence of the use of birch seems to have almost disappeared during this period from the archaeological record.

In the inner ditch 1 of the fort in the north-east corner of the excavated area grassland seeds were identified. A later structure (ST7) built above the fort ditches in the middle Iron Age produced evidence of cultivated flax. Elsewhere barley (ST40 and ST26), significant amounts of wheat and barley (ST15), oats (ST5) and unidentified cereal (ST3, ST4, ST12 and ST16) indicate that cereal crops were important to the economy of the settlement. Hazel nutshells were still gathered in the autumn and their remains were found in the roundhouse ST40, and in ST26 and ST35.

Wooden structures like ST26 would have used copious amounts of wood in its construction but no other species were identified apart from hazel. However, the presence of gorse/broom and of the burnt remains of heathy turves adds to the picture of a landscape possibly largely devoid of trees, but where heathland and grassland dominated. Ramsay (see *Archaeobotany*) suggests that muir-burn may have taken place on the heathland and that would account for the widespread occurrence of heather-type charcoal in feature fills across the excavation.

Although alder and willow were present it seems likely that there was little of either species remaining close by to the settlement at this time – the wet/pond area may have continued to shrink in size providing a less suitable environment for them. Even before the end of the Iron Age the reduction of tree cover may have been almost total.

Medieval

By the late thirteenth century AD the landscape was probably devoted to arable cultivation with the growing of cereal crops of emmer wheat with some barley and oats. Weed seeds also indicated arable cultivation. With the turning of the landscape into a productive agricultural economy, the only structures found on the excavated area during this period were kilns for the drying of cereal harvests (Figure 129), with a large amount of cereal grain coming from the corn drying kiln (2113). Other kilns, and the evidence for one or two structures for the burning of lime, and the construction of drains into the wetland area, indicate an agricultural landscape that was managed for productivity. By this time, the main farm buildings had probably moved to where the present day farm house of Seggie is located, and people no longer lived on the escarpment. The picture of the medieval landscape was probably little different from the present, except for the enclosure of fields and the establishment of tree lines as shelter belts.

The Late Upper Palaeolithic and Mesolithic

By Jordan Barbour

The earliest sign of human activity at Guardbridge was a chance find of a Late Upper Palaeolithic knapping floor, from c. 10,800 to 9,800 cal BC. A small lithic scatter was preserved along with a fire-pit or hearth and to date it is Fife's only evidence of late Upper Palaeolithic activity in the region. In Scotland, published Late Upper Palaeolithic sites are rare but include Lunanhead in Angus, Milltimber Aberdeenshire, Howeburn in South Lanarkshire and South Cuidrach on the Isle of Skye. These nomadic peoples would have followed migrating herds of reindeer across the Arctic and sub-Arctic landscapes of Scotland (Ballin et al. 2018a).

Activity at the very end of the late Mesolithic at Guardbridge was identified by a fire-pit overlying the Late Upper Palaeolithic scatter, dated to between 4320 – 4051 BC. This fire-pit was associated with a cluster of burnt lithics arranged in a distinctive star-shaped pattern, indicative of a tent-like structure in which the knapper operated.

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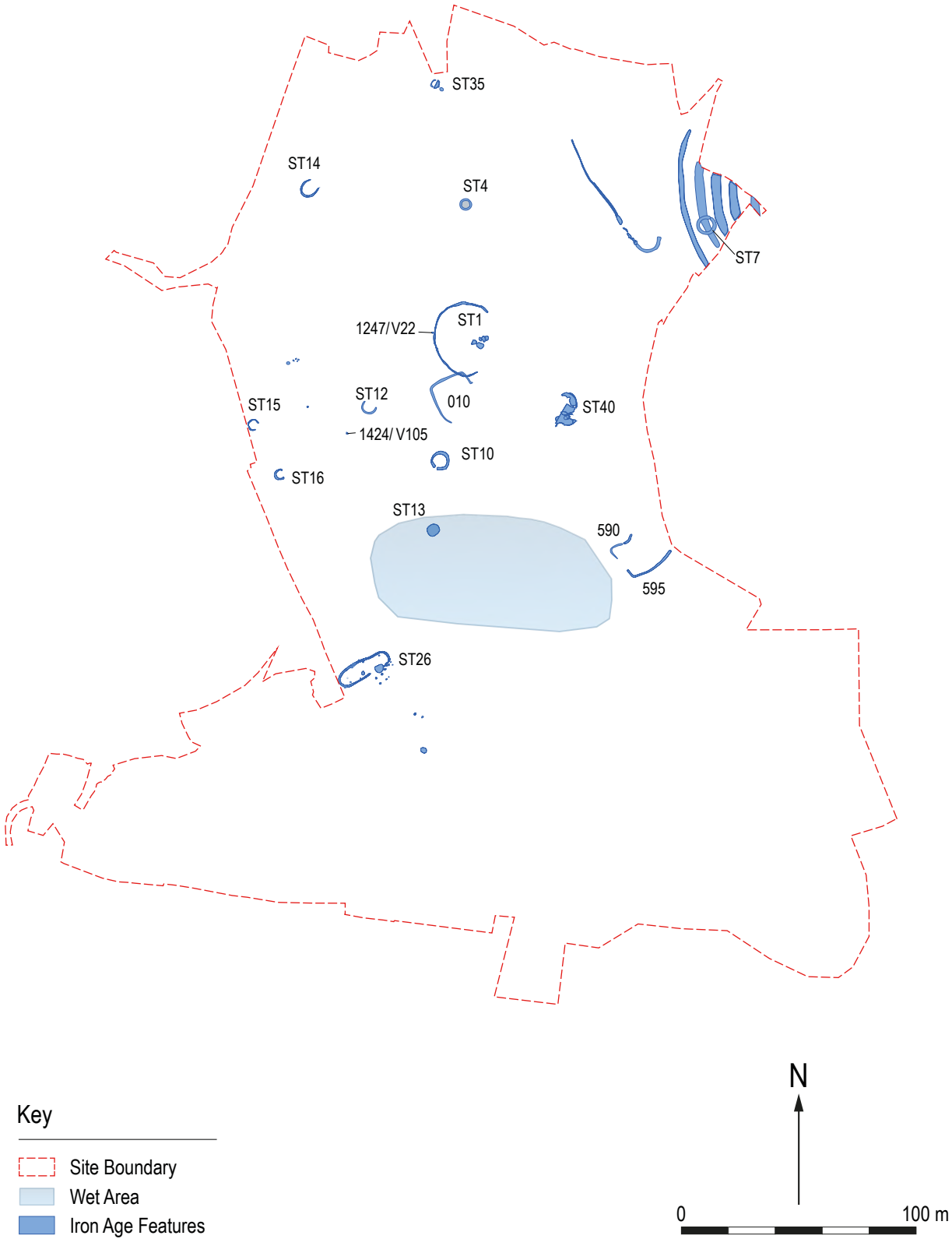


Figure 128: Location of structures and features during the Iron Age.

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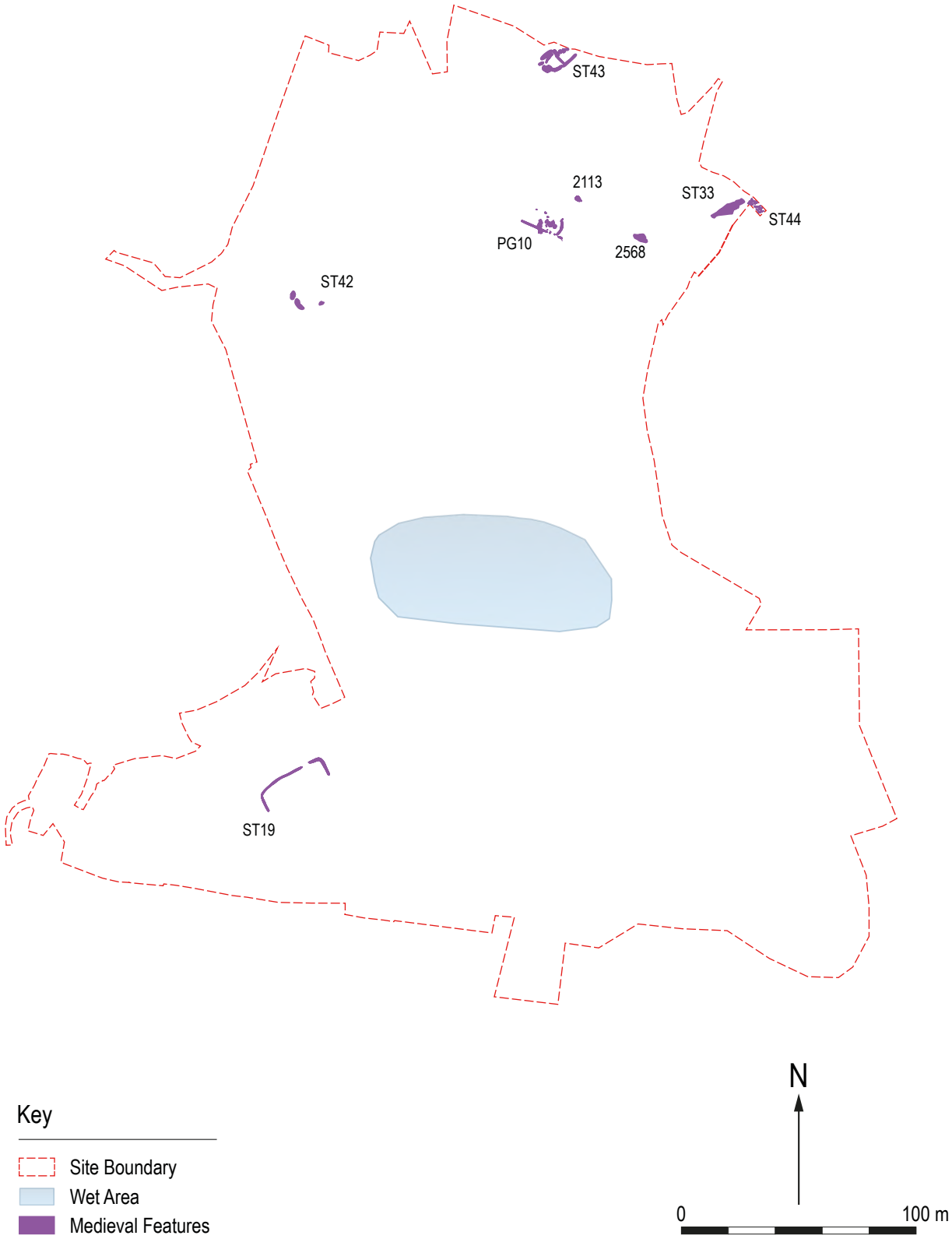


Figure 129: Location of medieval and later structures and features.

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Evidence for late Mesolithic occupation in Fife is also relatively limited in comparison to, for example, the west of Scotland, although two previously excavated Mesolithic sites lie within close proximity to Guardbridge, and share its coastal environmental setting (Figure 130). At Morton, Fife, c. 6 km to the north of Guardbridge, Coles (1971) recorded a series of stakeholes arranged in arcs and occupation deposits which together appear to represent at least five separate structures. Radiocarbon dating conducted across the site indicated that Morton was likely to have been the subject of repeated returns by people over several centuries, from c. 6,000 years BC. A second late Mesolithic site was recorded at Craighead, Fife Ness, c. 21 km to the south-east of Guardbridge. Wickham-Jones and Dalland (1998) recorded an occupation deposit in association with an arc of shallow pits, tentatively interpreted as the remains of a temporary structure. Within this arc was a roughly oval patch of reddened soil, which may have represented the position of a small surface hearth. Radiocarbon dating indicated that occupation, likely of short duration, occurred between c. 7600 – 7400 cal BC.



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Figure 130: Late Upper Palaeolithic, Mesolthic and Neolithic Age sites mentioned in the text.

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Evidence of structures was recorded at both of these sites, and further structural evidence has been recorded at around twenty sites across Scotland (Wickham-Jones 2004). What evidence there is typically indicates ephemeral stake-built and tent-like structures, usually circular or star-shaped plan, used by a society thought to have been largely nomadic (*ibid*., 238; Figure 131). More substantial evidence for structural remains than that seen at Guardbridge was recorded at the above two Fife sites, though the inference of structural elements from artefact dispersal patterns is not without precedent. Ephemeral Mesolithic structures have been similarly inferred through lithic dispersal patterns elsewhere in Scotland. For example, the excavations at Caochanan Ruadha, Cairngorms, by Warren *et al.* (2017) recorded a lithic deposit centred on a likely hearth, with an abrupt fall-off in lithic density demarcating a roughly oval area c. 3 m by 2.2 m.

Small sites such as that identified at Guardbridge are often interpreted as specialised encampments, which may have been occupied for only a few days at most. Their limited lithic assemblages would also suggest a short occupation period. Clues as to what specific activities were conducted at the site, aside from the knapping of flint, were largely absent, though the wider landscape of the site may give an indication. The Guardbridge site lies in close proximity to the estuary of the River Eden, and the estuary of the River Tay is only c. 10 km to the north. An estuary habitat would have provided a wide range of resources, allowing for the exploitation of the river (fish), the adjacent land (deer, timber etc.), and the intertidal zone (shellfish, seaweed etc.). The Fife Ness today is seasonally abundant in migratory birds, the hunting of which may also have formed part of the Mesolithic subsistence strategy.



Figure 131: Artist's reconstruction of a typical Mesolithic dwelling.

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Sergant *et al.* (2006) have noted that 'invisible' hearths such as that recorded within the centre of the lithic scatter are characteristic of the Mesolithic period across north-western Europe, and suggest that surface hearths without a defined pit or stone settings predominate throughout the period. However, evidence of a more defined fire-pit was also located within the excavated area. Pit (1590) was the earliest dated feature at Guardbridge (excluding the presumably residual late Mesolithic material recovered from the outer fort ditch), preceding the stone knapping activity by c. 2,500 years and extending occupation of the site into the first half of the seventh century BC. Unfortunately, this early occupation was limited to the hearth pit and an adjacent pit of uncertain association.

It is clear that pit (1590) was a substantial hearth, though its specific purpose remains uncertain. Trace amount of hazelnut shell recovered from pit (1604) to the immediate south may indicate the preparation of hazelnuts, though this material was absent from within the hearth itself. The recovery of several lithics from the upper fill, noted to have lain at the interface between the upper and the lower (burning layer) fills, may indicate that they were deposited or dropped into the hearth prior to the feature silting up or being backfilled, though this adds little interpretation of the hearth's purpose, other than for warmth and light.

The Neolithic

By Jordan Barbour

Early to middle Neolithic occupation

Earlier Neolithic occupation from the end of the fourth millennium BC was represented across the excavated area by a series of pits, which occurred in several clusters across the centre part of it, and a rectilinear ditch enclosure in the south.

Three clusters of shallow early to middle Neolithic pits were identified on the basis of artefactual material: a cluster to the west of ST11; a cluster to the south-east of ST11, and one to the north-west of ST9 (PG1). Earlier Neolithic pit digging activities were also in evidence within the interior and immediate environs of ST18, and it appears likely that Bronze Age structures were constructed within an earlier Neolithic pit cluster. The pit cluster to the west of ST11 can be dated to the early Neolithic due to the recovery of a large collection of early to middle Neolithic artefacts. PG1 can be tentatively dated to the early to middle Neolithic due to the inclusion of a Neolithic polished stone axehead and PG4 to the middle to late Neolithic from the inclusion of a scale-flaked knife. Those pits within and around ST18 presented a more confusing picture, with radiocarbon dating and artefactual material suggesting a date range from the early Neolithic into the later Neolithic.

No clear evidence of early to middle Neolithic domestic structures was recorded. Lacking coherence, it appears unlikely that the pit clusters are representative of foundation elements of upstanding structures, and can be interpreted as evidence of episodic pit digging. Clusters of shallow pits, frequently containing broken pottery, are a near ubiquitous element of earlier Neolithic inhabitation in lowland Scotland (Brophy 2006, 22). Interpretations as to their function generally fall into two broad camps: either as pits for the disposal of domestic refuse (e.g. Smith 1964), or as the remains of ritualised deposition of objects (e.g. Garrow *et al.* 2005).

The general lack of intercutting between the pits suggests a short time-frame of activity within each pit cluster. However, those pits to the west of ST11 that contained pottery tended to contain fragments of several vessels, with each fragmentary vessel generally confined to a single pit. This could suggest that the pits were not open at the same time, but rather resulted from several episodes of pit digging. Garrow's (2005, 154-155) excavations of an extensive series of pit clusters at Kilverstone (Figure 130) have indicated that they were likely to be the focus of repeated visits over several generations, and excavations at Chapeldonan (Barbour forthcoming) have suggested that this might be the case at more modest pit cluster sites. This pattern of activity was in evidence at Guardbridge, with pits within and around ST18 providing two non-overlapping date ranges. Artefactual evidence from the pit cluster corroborated this, with pits containing early Neolithic pottery alongside one pit containing later Neolithic Grooved Ware.

Pits (1772 and 1817) were different with of sherds of a single early Neolithic vessel (Vessel 3) apparently dispersed between the two adjacent pits. Pit (1772) was unique amongst this cluster

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in that it also contained an intact flint scale-flaked knife, and perhaps presents the clearest suggestion of deliberate deposition of favoured artefacts within the pits to the west of ST11. The polished stone axe head within PG1 alongside several pottery fragments is also suggestive of the structured deposition of a particularly 'special' object.

Interpretation was also complicated by the variability in function of pits. The majority of the them contained very little carbonised material, although pits (1786 and 1817) contained evidence of their use as fire-pits, with the circular arrangement of burnt stones within (1786) providing the strongest evidence of this. Pit (1786) was also notable in that it contained the highest number of fragmentary vessels within the cluster, with five separate vessels represented. Excavations at Meadowend Farm, Clackmannanshire, recorded a similar pattern within some of the pit clusters excavated there, with a small number of hearth pits also containing assemblages of broken vessels, amidst a much larger number of pits without evidence of *in-situ* burning (Jones *et al.* 2018 22-31). This suggests that the structured deposition of objects may have been conducted in a varied manner, with some being simply buried and other being burned prior to burial. The inclusion of substantial quantities of hazel nuts alongside an assemblage of broken pottery vessels within pit (247) of PG1 provided further variation. This quantity of carbonised material could indicate that one of the functions of the pit was to prepare hazelnuts for consumption, although its association with several fragmentary vessels is similar in character to assemblages interpreted as the likely product of deliberate deposition.

Material culture and the economy

The recovery of a scale-flaked knife of Yorkshire flint from PG4 and a polished stone axehead likely to derive from Great Langdale (Type VI) from the pit alignment to the west of ST9 suggests that the inhabitants of the site had some level of interaction with groups from far afield. The production and distribution of Great Langdale axes appears to have mainly been a feature of the early and middle Neolithic periods (Bradley and Watson 2021, 10) with Bradley (2016) suggesting exploitation of Langdale sources from c. 3800 to c. 3500 BC. The exact nature of the long-distance interactions that led to the distribution of Great Langdale axes across the country are still a matter of debate, though it is apparent that axes of the Type VI variety are a particularly widely dispersed variety (Schauer *et al.* 2020, 855). Interestingly, the other axe heads recovered from within pits suggest more local sources, with a polished stone axe head of calc-silicate hornfels derived from Craig Na Caillich, Perthshire, c. 85 km to the north-west. This was recovered from one of two isolated pits within the north-east of the site, and an axehead of Old Red Sandstone, whose raw material was probably available locally, was recovered from PG4. This combination of imported material and more freely available local materials, each deposited in similar contexts, indicates that axes were perhaps valued not simply as 'exotic' objects, but that they were treated similarly no matter their origin.

The evidence for plant subsistence recovered from within the pit clusters and rectilinear enclosure indicates the cultivation of barley, with smaller amounts of wheat. Limited evidence for the gathering of hazel nuts was also recorded, with a large amount of carbonised hazel nutshell recovered from a single pit within PG1. These findings conform to the identified edible plant material found in Neolithic sites in Scotland (Bishop *et al.* 2010, 89).

It would appear that early to middle Neolithic occupation was concentrated within the centre and north of the excavated area but with a substantially lower level of Neolithic material culture evident in the south. However, the rectilinear enclosure ditch (ST19) with its associated internal features was radiocarbon dated to the middle Neolithic period, but no corroborating diagnostic material culture was recovered from it. The ditch possibly represents the remains of an enclosure or field boundary, although its specific function was not determined and is thought to be later in date due to it truncating several postholes from ST22 which has been dated to the Bronze Age.

Later Neolithic occupation

The most substantial evidence for middle to late Neolithic occupation from around 3000 to 2500 BC was found in one structure (ST9; Figure 126). The lack of interior features, the homogenous nature of the ditch fill and the lack of associated

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diagnostic material culture made interpretation of this structure difficult. Initial thoughts prior to excavation were that the ring-ditch may have represented the foundation trench of a roundhouse but it also bore some resemblance to a proposed later Neolithic ring-ditch structure excavated at Beckton Farm, Lockerbie (Pollard 1997, structure F111). The Beckton structure had a shallow penannular ditch, the interior edges of which were lined by a series of stakeholes, and from which was recovered fragments of Grooved Ware pottery. During excavation, however, it was shown that the structure ST9 lacked any clear evidence of postholes or post packing material such as that observed at Beckton Farm. Further, the depth of the ring-ditch proved to be significantly greater than that expected of a foundation trench, and reappraisal of the evidence suggests ST9 represents the remains of a post-built structure.

A possible mini-henge

Alternatively, ST9 could be the remains of an earthwork that was truncated so that only its negative elements remain. The closest parallels in form lie within a class of feature termed 'mini-henges', defined by Harding and Lee (1987, 37) as annular or penannular ditches of less than 14 m diameter. These features appear to be most common along the east coast of Scotland, and there is a particular concentration within Fife and Perthshire (Barclay 2005, 84; Figure 130). Within that area, similar examples have been fully or partly excavated at Millhaugh (Wright 2017, 16) and Forteviot (Brophy and Noble 2020, 151-156), c. 45 km to the west of Guardbridge. The Millhaugh example was of similar dimensions, with a penannular, round-terminal ditch c. 1.75 m in width, 0.55 m in depth, and with a total diameter of c. 8 m. As with the Guardbridge example, it featured a single narrow entranceway, and the interior of the ring-ditch contained no evident features. The Forteviot example was only partially excavated, although it clearly had a penannular ditch with rounded terminals, 2.3 m in width and 0.9 m in depth, and with a total diameter of c. 9 m. Again, no discernible features were encountered within the interior. The ditches of these examples contained well-defined stratigraphy that allowed the excavators to plausibly discern the existence of (no longer extant) surrounding earthen banks which had slumped into the ditches. No such slumping was evident in the Guardbridge example, although these comparisons suggest that it is certainly possible that it, too, could have featured a similar surrounding earthen bank formed of material dug out during the creation of the ring-ditch.

Dated examples have shown that these features occupy a broad chronological range, spanning the late Neolithic into the early Bronze Age (see Barclay 2005, 90-91), and radiocarbon dating indicates that the Guardbridge example fits within this range at c. 3,000 BC. Interpretations as to the potential function of hengiform monuments have often been frustrated by their variability in size and the presence or absence of associated features. Some such as that at Guardbridge, Forteviot and Millhaugh had no internal features, whilst others appeared to have contained pits into which cremation material was deposited (e.g. Balneaves, Russel-White *et al.* 1992), or rings of postholes indicative of timber circles (e.g. Moncrieffe, Stewart 1987). Traditional interpretations of henges have often argued for the role as gathering places, though the existence of much smaller examples or 'mini-henges' such as this example would seem to argue against it (Barclay 2005, 89). The Guardbridge mini-henge would have had a far more private space than that envisaged for the larger henges. At the very least, the Guardbridge mini-henge contributes to a growing corpus of henge-sites which have increasingly highlighted a likely variability in function.

It is apparent that henges frequently form a component of larger monument complexes, many of which appear to have had long developmental histories. Excavations of the significantly more substantial henge at Balfarg (Mercer 1981) have demonstrated that the monument was pre-dated by a concentration of early Neolithic pits located outside the western entrance of it (Barclay 1993, 43-210). Earlier Neolithic activity within the vicinity of the Guardbridge henge was definitely in evidence, with PG1 and a linear arrangement of four substantial pits to the west containing polished stone axeheads and fragments of several middle Neolithic Impressed Ware Bowls. The subsequent development of henges into the Bronze Age is also often evidenced, for example, by the inclusion of cremation remains or burials within the interior of the enclosure, such as at Cairnapple Hill (Barclay 1999). Subsequent development of the Guardbridge henge was

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only scantily proven, although two pits were dug into its ditch fill after the ditch had been backfilled or had silted up. Pit (339) dug into the eastern terminus of the ditch, contained a small assemblage of burnt and fragmentary bone and a sherd of undiagnostic prehistoric pottery, which is potentially indicative of the inclusion of cremation remains. The degraded state of the bone assemblage, however, makes this interpretation very tentative.

The latest Neolithic features within the site are represented by a half-circle of severely truncated postholes (ST36), which are potentially indicative of a small circular post-built structure of late Neolithic date. No material culture of the Neolithic was recovered from within it, and there was a notable paucity of late Neolithic pottery recovered across the excavate area in comparison to the more substantial assemblages of early and middle Neolithic pottery. The recovery of a small amount of late Neolithic Grooved Ware from the pit cluster within and around ST18 would suggest that activity continued into the later Neolithic period, and perhaps lends credence to Garrow *et al.'s* (2005) argument that pit clusters are likely to be the product of a long span of activity. Given the relative paucity of material, however, it would appear that the most intensive occupation of the site occurred during the early to middle Neolithic period, with something of a lapse in occupation during the late Neolithic.

The Bronze Age

By Thomas Muir

Distribution and structures

At an initial glance, the Bronze Age remains at Guardbridge could almost form a coherent settlement, with a small group of relatively evenly spaced roundhouses distributed along the higher ridge (Figure 132), which was first occupied during the Neolithic period (Figure 126). This settlement could be comparable with Bronze Age settlements such as Allt na Fearna, Lairg, where the settlement showed an average of one hut circle per hectare (Ashmore 2001, 5). Similar structures were also found at West Acres (Toolis 2005) and Pitlochie Road (Cook 2007) (Figure 130). However, several structures including ST17 and ST18 overlap one another suggesting that this is not the case at this site, and a more complex chronology of settlement begins to emerge.

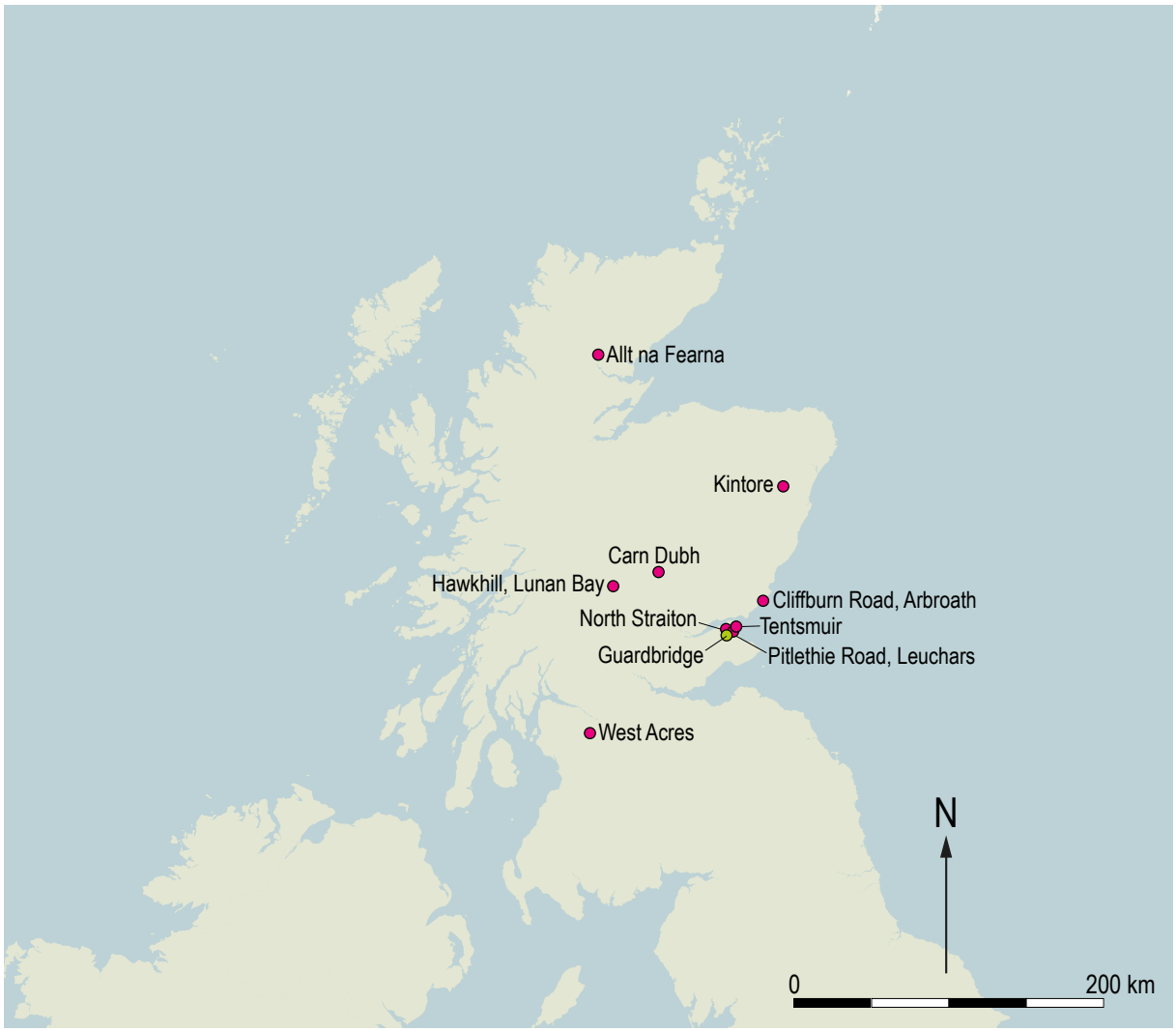
In term of coherent structures of contemporary activity, there is very little evidence to say whether any of the roundhouses were occupied at the same time. The relatively close radiocarbon dates from ST22 and the double pit alignment to the south may suggest contemporary use around 1208 and 1049 cal BC, but the margins of error are too great to confidently promote this idea. It could even be speculated that Guardbridge is in the 'Group 1' of Cowley's Bronze Age settlement classifications, in which hut circles are isolated from other monument types, with no sign of cultivation in the vicinity (Cowley 1998, 166), rather than a cluster of two to six (Group 2) or four to thirteen (Group 3) structures. In this case there would be few contemporary structures, but this seems unlikely, particularly by the late Bronze Age with the abundance of dating evidence collected.

Only a relatively small collection of artefacts was recovered from Bronze Age deposits across the excavated area. The handful of pottery, lithic chips, likely hearth waste and modest botanical evidence from the structures give us the faintest clues to the structures' being used for domestic habitation, but little else. The mould fragments found in PG12 and the crucible fragment from ST2 indicate that at least a small amount of non-ferrous metal working was taking place within the settlement but they do not really tell us where or when this took place.

Due to the heavily truncated nature of the site, there are few stratigraphic relationships that can be discerned from the structural remains as most of the structures are well distributed across the site. It could be argued that the very similar architecture of ST17 and ST18 shows a certain degree of continuity within the settlement, but the radiocarbon dating challenges this.

Studies on architectural traditions have identified three main types of Bronze Age house (Pope 2015, 176). The Guardbridge structures (Figures 127 and 133) fit into the ring-bank and post-built structural categories. However, their truncated nature and their mixed dating indicate that internal features are often difficult to understand. Timber circles of the size of ST22 at Guardbridge are rare in the archaeological record, with most

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Figure 132: Bronze Age sites mentioned in the texts.



Figure 133: Reconstruction of Bronze Age buildings at Guardbridge.

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being far smaller in size. Structures tended to become smaller during the late Bronze Age, and averaged c. 8 in diameter (Pope 2015, 178), so the 27.4 m by 22.5 m at Guardbridge is very large in comparison. The presence of a possible small posthole structure in the south-east end of ST1 could suggest that the enclosure contained built structures such as roundhouses, although the present structure at only 4 m in diameter is small. The latter could, however, represent an internal post ring rather than the external walling.

ST41, a curvilinear, crescent shaped structure with revetment wall on one side was different from the other built structures on the excavated area, although a similar crescent structure (2673) was found to the south-west next to PG12. Structure (2673) had no revetment wall but was dug deeper into the subsoil on its southern arc presumably to provide a level building surface (Figure 36). ST41 is probably the remains of a possible circular structure although no structural remains were located except for several large pits on its south side. A similar revetted structure was excavated at Hawkhill, Lunan Bay, Angus (Rees 2009; Figure 132). The author suggested that the roof may have rested on the revetment wall side although no structural remains, such as postholes, were evident to suggest its configuration. This latter structure was dated to the late Iron Age, later than ST41, although an Iron Age shale bracelet was recovered from one of its pits, suggesting activity during that period.

Dating issues

The radiocarbon dates from charcoal samples provides the best dating evidence and help us to better understand how the site was occupied during the Bronze Age. The dates indicate a near continual use of the site throughout the period with a break between the middle of the sixteenth century BC and the middle of the fifteenth century BC. Only a small number of dates confirm settlement use in the early and middle Bronze Age, and they were largely found near the centre of the area excavated. However, after the break in activity, the site appears to become more intensively inhabited by around 1260 BC. This noticeable increase in activity, and possibly continuous occupation, continues until around 1000 BC, when there appears to be another decline. Unfortunately, the lack of a robust artefactual assemblage means this pattern is not supported by the finds record.

The dates recovered are mixed but some trends have emerged. The earliest dates come from the centre of the area from ST2 and ST17 (Figure 127), which at least indicates an early Bronze Age presence in this area. Dates from ST17 suggest an early Bronze Age date for its northern gully (446) of 1735 – 1531 cal BC (UBA-51745), which is much earlier than the late Bronze Age dates of pit (169) within ST2 of 998 – 833 cal BC, and of posthole (712), within ST17 of 913 – 809 cal BC. This early date may be an intrusion from earlier material disturbed during construction of ST17. With its dates of 1262 – 1054 cal BC (UBA-53306) from pit (067), and 1256 – 1022 BC (UBA-53308) from pit (865), it is most likely that ST18 preceded ST17, with a slight gap in occupation between the constructions. Without the radiocarbon dating, this would have been impossible to interpret from the features and artefacts alone. Late Bronze Age dates are found across the excavated area, and indicate if not settlement expansion, then localised movement. This has been speculated on other sites, such as Kintore and Cliffburn Road, where one or two houses may have been maintained at any one time and gradually moved across the landscape during rebuilding (Dunbar 2012, 23), and Carn Dubh, where the settlement moved slowly in an east/west alignment over time (Rideout 1995).

While there is a slight gap in the dating record during the middle Bronze Age, the evidence seems to point to relatively consistent occupation at the site, at least from around 1200 BC when the dating evidence increases dramatically. It was after this period that the impressive timber circular structure or enclosure was constructed, possibly indicating more complex needs of a society developing and settling.

Funerary wares and burials

Unfortunately, a relatively small assemblage of Bronze Age pottery was collected from Guardbridge, and poor preservation means precise dating is difficult for most of it. For those vessel fragments that can be confirmed, however, they tend to lean towards late Bronze Age in date. The pottery assemblage shows no obvious concentration of activities or uses, with no specific areas containing more than others.

Funeral wares were also recovered from the excavated area but not from their primary

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contexts. These include the Bronze Age Beaker sherds (V33, V43 and V80) and urn fragments (V44) found in the north-west and south-west of the site. The most significant of the pottery collected was the decorated early Bronze Age Beaker, Vessel 80. Bronze Age Beakers are not uncommon in the area, with examples found as close as at Tentsmuir to the north-east of the site (Canmore ID 22194) near Leuchers, where sherds from a number of Beakers were identified with cord-impressed decoration (Longworth 1968, 60-67). Beakers are often found within funerary settings and this may hint at a more varied use of the local landscape over the course of the Bronze Age.

No obvious Bronze Age funerary setting was identified at Guardbridge, but it was speculated that the line of pits to the north, which included stone-lined examples, and the small ring ditches may have been a robbed out cemetery, which may explain the Beaker remains recovered nearby. There were a wide range of funerary practices in the Bronze Age but the use of pits with pottery containing the cremated remains is evident in the region, which the cemetery of North Straiton to the north-west of the site demonstrates. Similar to Guardbridge, this was on a prominent hill in the landscape, with a settlement nearby (Canmore ID 33250), although no excavation has confirmed its date. The five cremation pits were all similar in style, with small amounts of broken pottery, and it was speculated that the similarities and small number may suggest a short-lived use or a small community (Stronach *et al.* 2006, 11). A variation of this type of cemetery at Guardbridge cannot be ruled out.

Material culture and the economy

As with the pottery, a relatively small assemblage of lithic artefacts recovered were related to the Bronze Age, and of these, most were small chips and flakes with little information. There were no spectacular pieces but the most interesting concentration comes from the possible porch at ST17, which contained an irregular flint core, indicating that knapping had taken place in the immediate area. This paucity of lithic artefacts is not unusual in excavated Bronze Age settlements, with only ten lithics recovered from West Acres (Engl 2005, 483), 21 from Cliffburn Road (Engl 2012, 18) and 15 from the nearby site of Pitlethie Road, Leuchard, Fife (Engl 2007, 13), some of which may be date to the Neolithic period (Figure 132). The Guardbridge lithics assemblage is typically of the Bronze Age in this area.

Of the coarse stone assemblage recovered from Guardbridge, only spindle-whorl SF 1463 can be said to be likely Bronze Age in date (see *Stone Artefacts*). This was recovered from pit (2953) in PG12, which also contained Bronze Age pottery, and the late Bronze Age date recovered from ST20 nearby may indicate a late Bronze Age use for the area. Pit (2961), also in ST20 was dated to the late Bronze Age and may suggest a similar date for pit (2953). The used spindle-whorl and tentatively dated stone agricultural tools suggests farming and animal husbandry took place as well during the Bronze Age in this area.

The evidence of recovered metalworking gives us a more varied idea as to the activities taking place around the late Bronze Age periods of settlement, as the crucible fragment from ST2, and the two mould fragments from PG12 can all be attributed to a period around 950 – 800 cal BC, (see *Metalwork, above*). It is suggested that non-ferrous metalworking took place in a number of areas across the excavated area, with a probably sword blade and a socketed gouge being produced somewhere near PG12. The limited amount of metalworking evidence recovered suggests small scale metalworking for local consumption. No metalworking evidence was recovered from either West Acres (Toolis 2005) or nearby at Pitlethie Road (Cook 2007), perhaps indicating a more developed or stratified society at Guardbridge.

The macro-botanical evidence was similar across all Bronze Age features on the excavated area, with charcoal dominated by heather-types, alder, hazel and oak. These species are characteristic of the local environment at the time, and were generally very similar to the charcoal recovered from the roundhouses at Pitlethie Road (Cook 2007, 5-17). Among this assemblage, occasional small traces of burnt hazelnuts, cereal grains and other seeds provide information on the diet of the occupants at Guardbridge. Again, this assemblage is similar to Pitlethie Road, although the remains of the weed common cockle were also found there (ibid. 19), which likely reflects its closer proximity to the coast than Guardbridge. The types of charcoal found suggest the waste material from hearths was scattered or blown

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around becoming incorporated into surviving features. The only evidence of in situ burnt wood was found hearths and not from any of the excavated postholes.

In summary, the evidence gathered at Guardbridge is very fragmentary but it is clear that there was a human presence on the site for almost all of the Bronze Age period, with a higher density around 1260 – 1000 BC. The structural remains are characterised by a small scattering of roundhouses of differing construction types, although it is impossible to judge the size of the settlement at any one time due to the heavily truncated remains. The structures show evidence of occupants using the local environment for fuel for fires in hearths and wood for construction. Crops were cultivated and processed, hazel nuts and other seeds were gathered, pottery was made and stone tools were crafted. In the later Bronze Age, more intricate non-ferrous metalworking working took place, and there was slight evidence of the processing of wool into yarn from local sheep.

The Iron Age

By Maureen Kilpatrick

The Iron Age settlement at Guardbridge appears atypical compared to other known sites in Scotland, in part due to the wide variety of structural types found within a relatively small area, a trend continued from earlier periods on site. It is also one of the few instances in Scotland where the area surrounding a fort has been investigated, and as such provides a unique opportunity for research. The structural types on the excavated area included a stone roundhouse (ST40), post-built rectilinear-shaped structure (ST26) and field boundaries (010 and 590/596). Several small enclosures were also found whose dates were located within the early Iron Age (ST3, ST4 and ST7). These features are all located adjacent to the multi-vallate fort located in the north-east corner of the field (Figure 128) and did not appear to be located within a surrounding boundary, as many settlements were during the Iron Age.

The fort

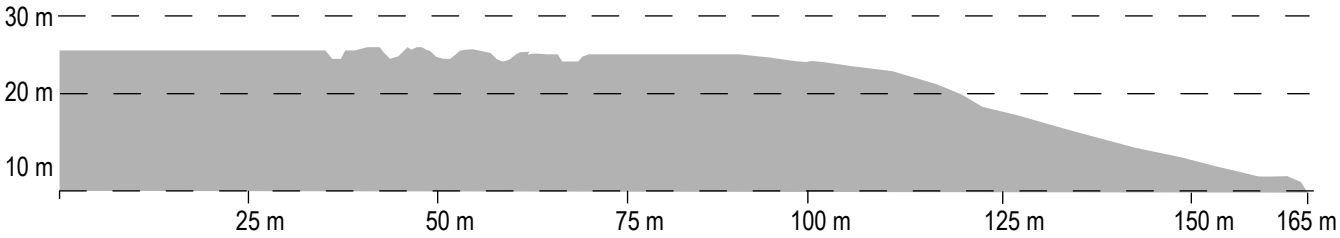
The fort with its five concentric ditches was located at the highest point in the field around the 25 m contour line, with the field gently sloping downwards in all directions except the east which comprised a steep, vertical drop of c. 4 m (Figure 134). The escarpment slightly broadened out, although it remained steep until it flattened out around the 7 – 8 m contour line within the village of Guardbridge itself. The fort's position at the edge of the escarpment provided commanding views of the River Eden and 'Edens Mouth', now known since 2000 as the Eden Estuary, which gave access to the North Sea and the east coastline of Scotland. No evidence of ramparts remained. Presumably the ditches were backfilled following the forts abandonment and the remaining soil ploughed away.

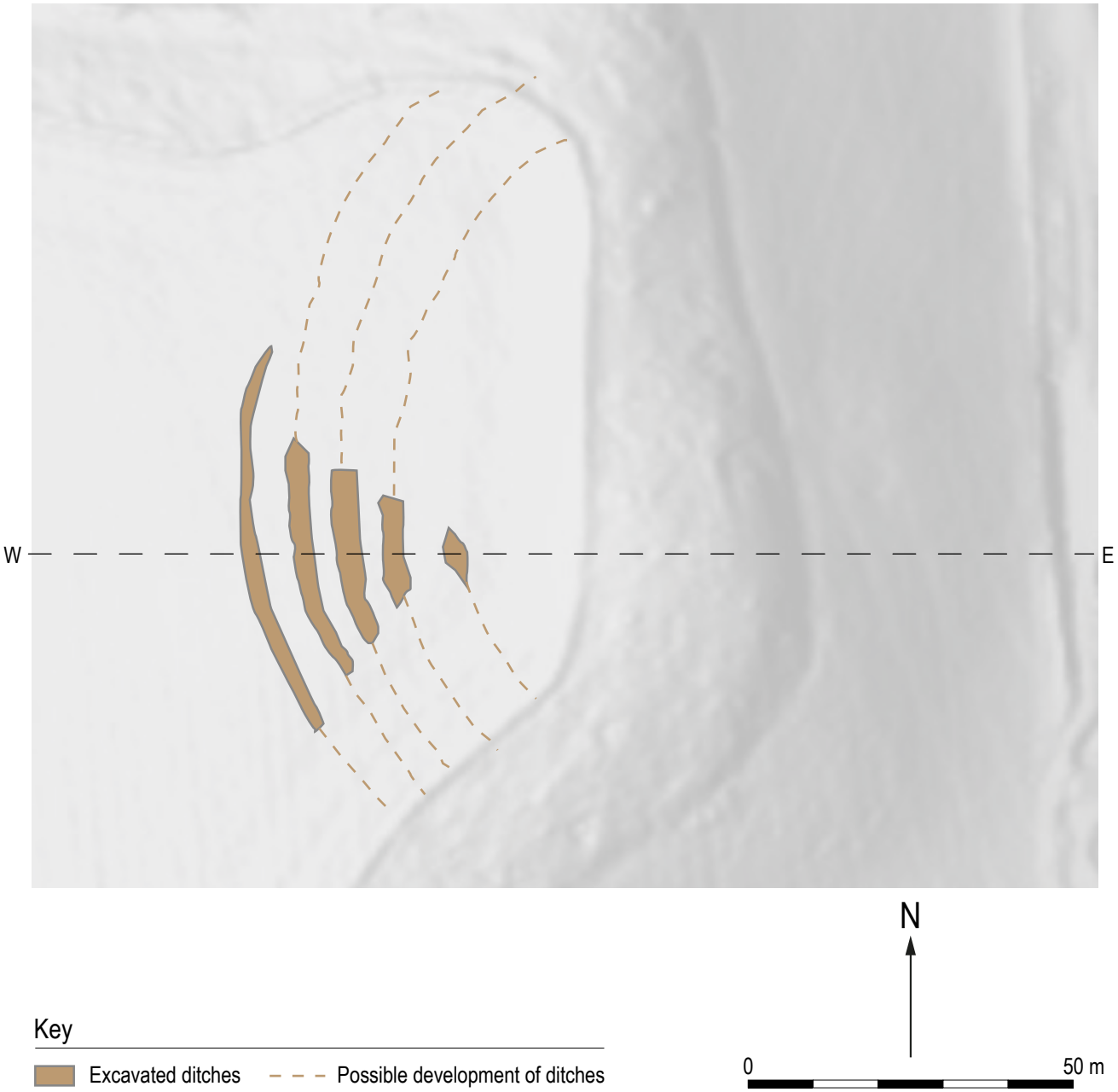
The actual classification of the fort is slightly more problematic. This is due to the possibility that part of the escarpment collapsed over time and by doing so was considered to have removed the eastern extent of the fort and its ditches. However, LiDAR imagery suggests otherwise, and the escarpment at the eastern side remains intact (compare Figures 42 and 134), and its eastern edge is undamaged. The Roy Military Survey of Scotland map of 1747-55 shows the field under agriculture, but with a steep slope on the eastern side, presumably the same slope that exists today (Figure 135). If this is correct, then the fort would be, classified as a hillfort Class V – Cliff-edge and plateau end fort. Forde-Johnstone describes these forts as:

> *'Group V covers all those sites in which there is a level, or at least an easy, approach on three sides with natural defences only on the fourth side. These natural defences range from sheer cliffs, in true cliff-edge sites, to slopes which provide only supplementary support for man-made defences in plateau-edge sites (Forde-Johnstone, 1976, 80)'.*

Lock and Ralston describes the Guardbridge fort as a 'level terrain fort' positioned on a 'Cliff/ Plateau-edge/Scarp' in their *Atlas of Hillforts of Britain and Ireland* (2014).

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Figure 134: Fort ditches and profile.

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Figure 135: Excerpt from the Roy Military Survey of Scotland 1747-55. (© British Library Board. All Rights Reserved).

A further consideration that might have impacted the fort's eastern edge is the North British Railway branch line of Leuchars-St Andrews-Crail which was located along the base of the slope as it passed through Guardbridge village. It was constructed in the mid-nineteenth century and finally closed in 1969. However, cartographic sources suggest that the impact to the slope containing the fort was negligible, the tree belt surrounding and containing part of the fort's ditches remained intact (Figure 136). The tree belt was first depicted on these map sources in 1828 (Figure 137).

Only a small part of the fort was excavated (30 %) with the remainder preserved *in situ*, either within the development boundary or beyond it, and below the surrounding tree belt. During the fieldwork a further inner ditch was uncovered (Ditch 0) below the remains of a later building (ST44). Unfortunately, radiocarbon dating of the ditch fills did not clarify the sequence of their primary excavation and usage. Charcoal retrieved from the ditch fills provided dates from the late Mesolithic 7765 – 7586 cal BC (UBA-51753) - outer ditch 4, to the early Bronze Age 2468 – 2295 cal BC (UBA-54733) - inner ditch 3, to the late Bronze Age 1884 – 1515 cal BC (UBA-54735) – inner ditch 2, and the early Iron Age 770 BC – 489 cal BC (UBA-51757) - inner ditch 1. Artefacts were minimal but those that were recovered included pottery, lithics and bone fragments, probably residual finds incorporated into the ditch fills during their infilling.

The only ditch sampled where it can be said with some certainty that the context was 'secure' was the basal fill of the recently discovered inner ditch (inner ditch 0) which provided a date of use sometime between cal BC 49 – cal AD 71 (UBA-54736). This layer was sealed with a further four ditch fills which had no evidence of disturbance. The radiocarbon date from the upper fill which was overlain by the remains of the later stone structure ST44 provided a radiocarbon date earlier than the lower ditch fill (UBA-51752) 990 – 832 cal BC, which again highlights the re-use and disturbance to many of the features and deposits across the site.

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Figure 136: OS 25 inch 2nd edition 1894 Fifeshire Viii.7 map of Guardbridge. Reproduced with the permission of the National Library of Scotland, https://maps.nls.uk/



Figure 137: C. Greenwood, W Fowler, and T Sharp 1828 Map of the counties of Fife and Kinross. North East section. Reproduced with the permission of the National Library of Scotland, https://maps.nls.uk/

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Inner ditches 2 and 3 were also truncated by the small double ring ditch enclosure (ST7), its inner ditch provided a radiocarbon date within the middle Iron Age, similar to that from the newly discovered basal ditch of ditch 0 of 170 cal BC – cal AD 3 (UBA-51755). However, this date could again be a residual piece of carbon that was accidently incorporated into the ditch during its excavation and/or backfill.

Despite the radiocarbon dates providing a contradictory picture regarding the use and lifespan of the ditches and the fort itself, fieldwork and *Radiocarbon Dating and Chronological Modelling* (see above) suggested the origin of the fort was within the late Bronze Age with the excavation of the outer ditches. It then continued in use into the Iron Age, with Ditch 0 excavated in the middle Iron Age. When the ditches fell out of use a small double ring ditch (ST7) occupied the site. This sequence is based on the fact that all the ditches respect each other and that they were in use, or visible, to each other when being excavated. Sometime in the first millennium AD, the fort had fallen out of use and kiln ST33 was constructed over it in the ninth century AD.

The excavation of the Broxmouth Hillfort in East Lothian (Armit and McKenzie 2013, 93), revealed at least seven phases of use. One of these, phase 4, revealed a series of ring ditch houses built across the obsolete and backfilled ditches of the fort in the middle Iron Age, the third century BC and thereby indicating the ditches had been filled in earlier than that date.

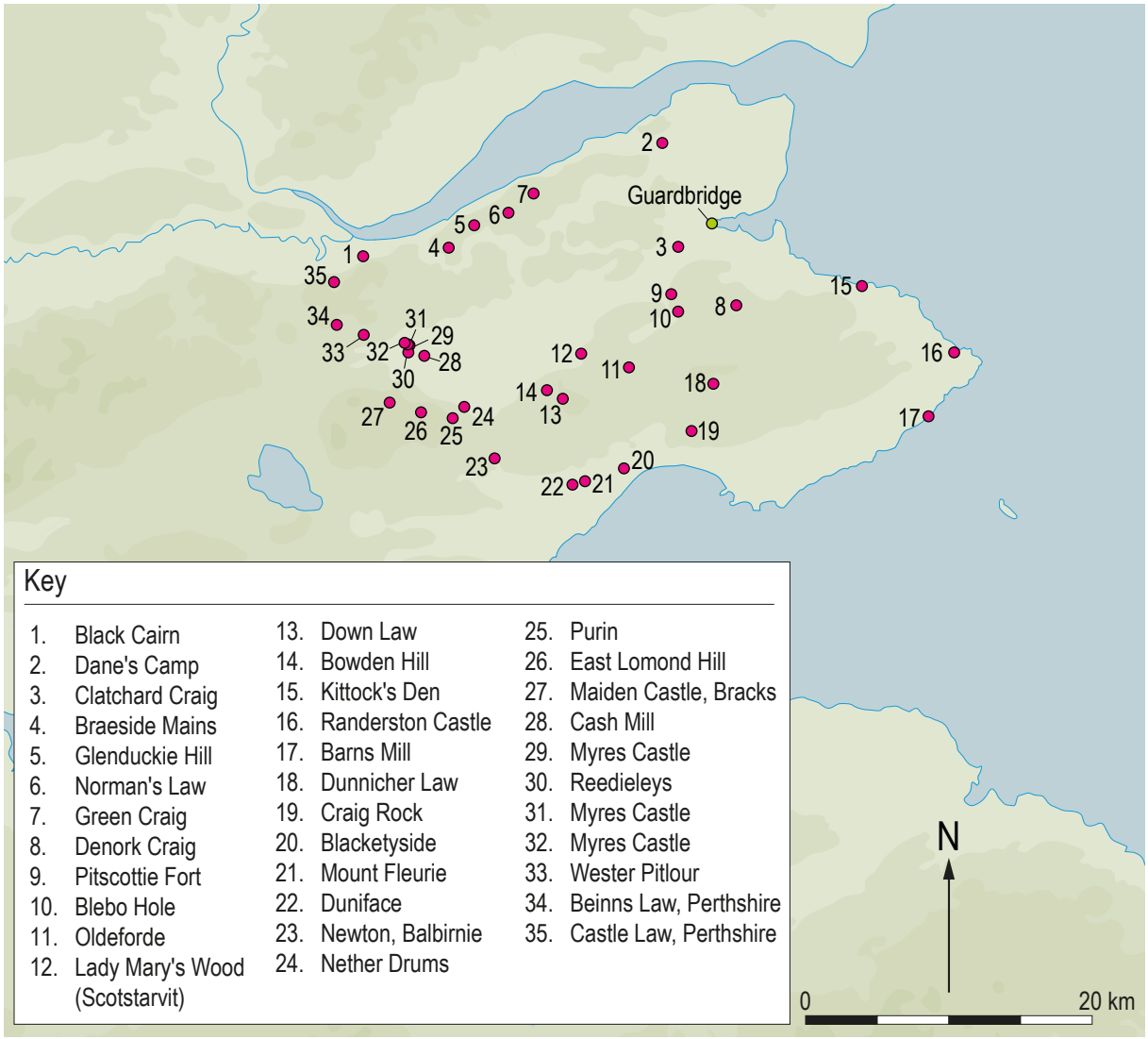
There are presently 34 forts recorded in Fife (Lock and Ralston 2024; Figure 138) with 14 characterised as 'contour forts' on top of hill tops, while 12 are positioned on knoll/ hillock or outcrops, the latter category includes Guardbridge fort (*ibid*.). Within Fife there appears to be several linear fort groups. These include a group of six forts overlooking the Firth of Tay situated on a higher ridge of ground and a further group in the western area. A further group, slightly more disparate are located on higher ground within central to southern Fife, while there is a small number of forts, situated along the coast that generally comprise promontory forts. The vast majority of these structures remain undated as they have not been investigated archaeologically by excavation. One that has is Clachard Craig fort (Close-Brooks 1986). It is part of the Firth of Tay group and was excavated in the 1950s, prior to its destruction during quarrying, but it was dated to the early medieval period. East Lomond fort located in the west of Fife linear group was also investigated by excavation in 2017 and 2022 and material from both the Bronze and Iron Ages were recovered. This included the partial remains of late Iron Age buildings, hearths and evidence of metalworking. Ceramic crucible fragments, a stone ingot mould and a ring-headed copper-alloy pin were recovered with a rotary quern fragment and fragments of shale armlets and a corded-shale/ jet ring fragment (O'Grady and Fitzpatrick 2017). In 2022 further work was undertaken at the fort to investigate the large outer enclosure and two small trenches were excavated across the stone ramparts to expose them. Midden, occupation deposits, a hearth with a stone weight and a crucible fragment were uncovered during the works (O'Driscoll, *et al. 2023).*

Most of the investigations of forts within Scotland have been small in scale and generally focused on small keyhole trenches across ditches, ramparts and internal areas (Figure 138). Moncrieffe Fort located on the north side of the River Tay in Perth and Kinross was subject to limited excavations across its enclosing ramparts between 2014 and 2015 (Strachan *et al.* 2023). These interventions revealed a multivallate fort comprising four concentric ramparts of earth and stone enclosing a small hill, the southern side remained open, utilizing the natural cliff face. Unlike Guardbridge there were no associated ditches. Radiocarbon dating revealed two phases of construction with a period of use spanning the early Iron Age between 600 – 200 cal BC. Although no structures were found within the central area, artefacts including bone, a shale bracelet, a spindle whorl similar to the unfinished whorl from Guardbridge (SF 278) and a possible stone lamp would suggest that there was at least a domestic function to the site. Several Neolithic radiocarbon dates and the finding of a jet bead would suggest that earlier prehistoric activity was also present within the locale. Moredun Fort is located adjacent to Monifieth Fort and comprises several phases of occupation including a pre-fort monumental stone roundhouse. Stone lamps, similar to that found at Guardbridge, (SF 559 from pit 1454), spindle whorls, stone discs, numerous

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shale objects including roughouts of bangles and pendants were also recovered. Again, there were no ditches but earth and stone ramparts. Human cremated bone was also found within the stone roundhouse, which dated to the middle Iron Age, and was a later insertion. Castle Law in Abernethy (Strachan *et al.* 2023) has also been investigated. Excavation was limited to opening up trenches across the internal and external walls previously dug during the Victorian period. Unfortunately, no datable material was recovered. However, nearby, are the remains of a possible Iron Age occupation including a rectilinear and curvilinear enclosures and unenclosed settlement.

Broxy Kennels Fort in Perth and Kinross, classed as a Contour fort (Lock and Ralston 2024) was almost wholly excavated in 2022 except for a small section to the west which remains intact below ground. This fort had four ditches which encircled a low hill adjacent to the River Tay with one (Ditch 2 North) truncated by a stone-lined souterrain. Unlike the ditches at Guardbridge, there were multiple fills within the Broxy Kennels ditches several with charcoal lenses. However, as with Guardbridge finds within the ditches were few but included lithic fragments, occasional pottery sherds, daub, and several stone tools including whetstones. Samples from several of the basal layers of these ditches provided dates between 800 and 400 cal BC for its primary construction at the very end of the late Bronze Age and within the early Iron Age period (Green and Atkinson forthcoming). Earlier prehistoric features were also noted at the base of Broxy fort that provided evidence, similar to Guardbridge, of settlement within the wider landscape of the fort prior to its construction.



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Figure 138: Location of hillforts in Fife.

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The earliest Iron Age radiocarbon dates on site within the first half of the first millennium BC appear to be from two circular structures with ditches (ST3 and ST15). They are similar in date to the stone roundhouse ST40, suggesting they were contemporary structures. Although most of the small enclosures remain undated due to the absence of any datable features or botanical material, the similarity of ST5 and ST6 to ST4 could suggest that they are of similar date, the latter enclosure dating from the early to middle Iron Age. ST12 could be included here as it contained an Iron Age pottery sherd, but the date of its enclosure is Neolithic, and therefore its origin is uncertain.

The roundhouse

The stone roundhouse (ST40; Figure 56 and 57) was presumably robbed of much of its stone for use in the later structures built on site, such as those above the ditches (ST33 and ST44) and those of possible medieval date to the north-west (ST42) and north-east (ST43). The radiocarbon dates from several deposits and features within the roundhouse suggests it was in use during the latter part of the late Bronze Age and the early Iron Age between 1000 BC and 700 BC (Figure 128). This dating was also supported by the numerous sherds of pottery from these periods, which included the remains of at least 12 vessels from ST40 and ST31 nearby (See *Prehistoric Vessels,* above). There were in addition several fragments of earlier Bronze Age and Neolithic pottery found among them as residual finds. Numerous fragments of fuel-ash slag were also found across its surface during the excavation (see *Vitrified Material*, above). It is presumed that this material was deposited when the building was mostly reduced in height to ground level, although its actual origin is unknown.

Stone-built roundhouses have been found across 21 locations in Fife but very few have been dated or archaeologically investigated. However, many have been found in other areas in Scotland including Caithness, Sutherland and Argyll. At Drumcarrow Craig 6.25 km to the south of the site and occupying the crest of a ridge were the remains of three stone roundhouses, the best-preserved measuring 7 m by 8 m internally with stone walls 1.8 m wide. The latter also contained an entrance passageway to the east, a central hearth and rough floor cobbling in the northern internal part only, with the remains of a stone rectilinear building nearby. Artefacts included pottery, stone and lithic tools, although none were diagnostic to period. Maxwell (1953) suggested a date of use of this roundhouse from the late first millennium BC or the early first millennium AD based on its morphology and artefacts. Three stone roundhouses measuring between 12 m and 14 m in diameter were found at Drummond Wood (Figure 139), again located on the crest of a low hill. Although not formally dated, a suggested date range of between the second and sixth centuries AD has been postulated for these buildings (Maxwell 1953). The Guardbridge roundhouse (Figure 140) was of similar size to these roundhouses, although due to its degraded state, an entranceway was not discernible. However, as with the Drumcarrow Craig fort round house, the internal stone flooring was only found in one area abutting the internal wall.

In research at Balbithan Wood, Kintore, Aberdeenshire (Cook 2021) 27 hut circles were recorded during survey, with most represented by an outer ring bank comprising either earthen material or stone. Their size ranged from approximately 9 m to 18 m in diameter, with most averaging 15 m to 16 m. Their sizes were similar to ST40 at Guardbridge although only eight had invasive investigations. Of those, five probably had a domestic use and three were non-domestic in function. At Guardbridge, the finding of domestic pottery in a structure would suggest that it was domestic in function. However, the radiocarbon dates of these structures placed them within the middle Bronze Age, earlier than that postulated for ST40 and indicated a relatively wide ‘age span’ for these buildings.

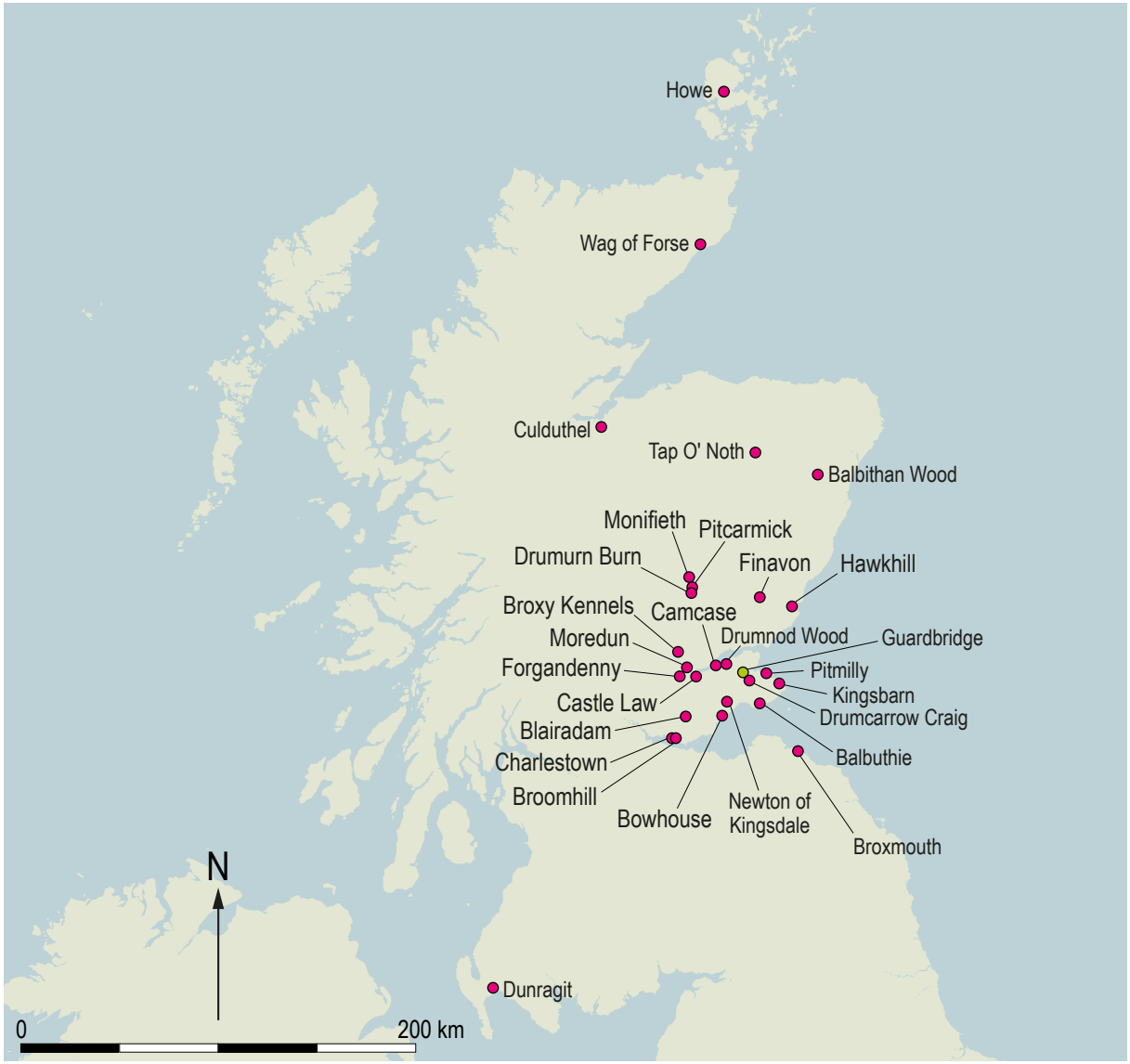
Enclosures

The large palisade enclosure ST1, which dominated the north-east part of the excavated area, could not be dated by radiocarbon dating due to an absence of suitable material (Figure 128). However, it contained pottery sherds from both the Neolithic and Iron Age periods, although the Neolithic material could be residual in origin. A large palisade enclosure with an entrance was

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found at Culduthel, Inverness (Hatherley and Murray 2021, 26-29) probably dating to the early Iron Age and is a good comparison with the ST1 enclosure that could also date to that period. The lack of evidence for a dwelling within the internal area of ST1 could suggest that it might have functioned as an animal stockade.

The small ring ditch enclosures found at Guardbridge were generally devoid of artefacts although they consistently returned dates within the early to middle Iron Age. During excavations at Dunragit (Arabaolaza in Bailie 2021) in south-west Scotland three ring ditches, similar to those at Guardbridge, were excavated at the Upper Boreland Cottage site (Figure 139). They were all relatively small in size, ranging between 3.7 m and 6.9 m in diameter and were grouped next to a small cremation cemetery. Unlike most of those at Guardbridge they contained internal features including burial material of an inverted urn and a cremation deposit within the smallest, while the largest contained only pits with no datable artefacts. Their contents and location at Dunragit were clearly related to burials. Unfortunately, at Guardbridge most of the enclosures had only a few undated small pits and no datable artefacts that could suggest a function or period of use. Most of the Iron Age dates recovered from Guardbridge came from the north-west and central areas of the site and close to the fort area (Figure 141). Those dates, although consistent could be from residual material which became incorporated into their ditches during later activities across the area, such as manuring fields with 'night soil', followed by ploughing.



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Figure 139: Other Iron Age sites mentioned in the text.

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Figure 140: Roundhouse reconstruction in its landscape.

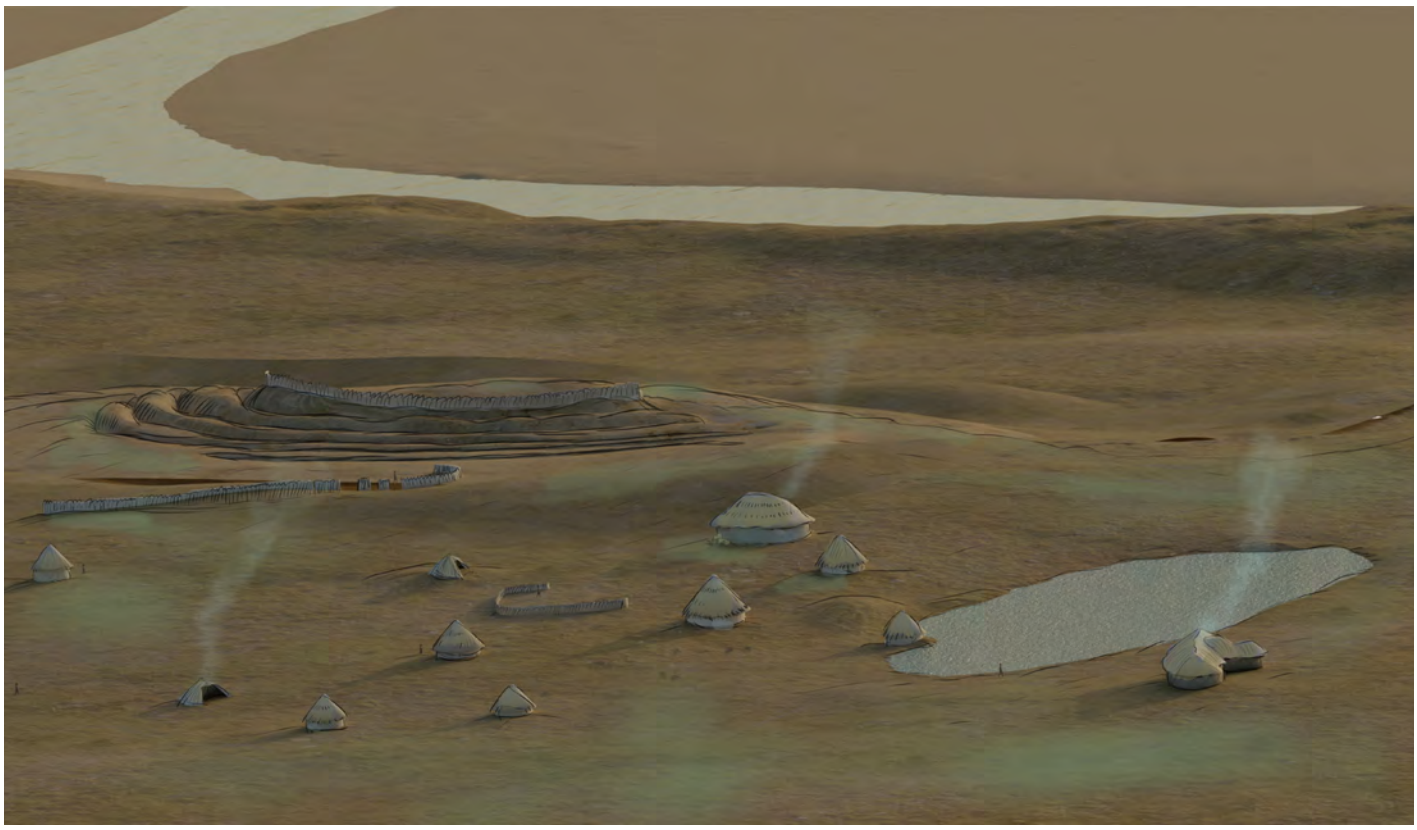


Figure 141: General view of the Iron Age at Guardbridge.

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The burial

The only known burial from the early Iron Age was skeletal remains (SK1) found inserted into the earlier ST2 enclosure. The insertion of burial remains into earlier structures and non-funerary contexts is not unknown activity during this period and has been found on other sites. These burial contexts are more common than formal burials sites during this period (Armit and McKenzie 2013, 411). During the Broxmouth Hillfort excavations (ibid.) two crouched inhumations similarly located within shallow scoops with no evidence of burial structures were inserted into earlier structures. Both burials of young female adults with evidence of peri-mortem trauma, provided dates within the early Iron Age Phase 1 occupation, albeit slightly later than the Guardbridge burial SK1. Although sex and age could not be ascertained during Sk1 skeletal analysis, the relative size of the bones would suggest that the individual had probably reached adulthood, or near adulthood, at time of death.

The aisled building or wag

The rectilinear post-built structure (ST26) in the south-west of the site comprised a building form not often recorded in Iron Age contexts, circular forms being the most common (Figure 128). However, according to Cowley (1999) from about the mid-first millennium BC onwards, circular forms were replaced by cellular and sub-rectangular buildings and by the end of the millennium rectangular buildings had become the standard. Two radiocarbon dates from two separate postholes within this building provided dates within the early first millennium AD, cal AD 87 – 306 (UBA-51758) and 43 cal BC – cal AD 116 (UBA-51759) one of the latest Iron Age buildings on site and within this period of change that Cowley (1999) refers to. Across Scotland, sites have been recorded that not only contained circular structures but also rectilinear. These include a group of structures locally known in the north of Scotland as 'wags' or 'aisled buildings' (Baines 1999). The Wag of Forse in Caithness is an example and also that at Howe in Orkney (Ballin Smith 1994). They generally comprised sub-rectangular stone-built structures with thick, earth fast stone walls often conjoined to a stone roundhouse at one end (Curle 1941, 1948 and 1950). However, this rectilinear shape has also been found in fort contexts, for example oblong enclosures have been recorded at Finavon in Angus (Alexander 2002), Castle Law at Forgandenny in Perthshire (Christison 1900) and Tap O' Noth in Aberdeenshire, where more recent excavation has suggested a date within the first millennium AD (Pictish) (Noble *et al.* 2023). Where recorded, these buildings have also contained circular structures. However, we do know that in later centuries, similarly shaped structures to ST26, appear in the region, such as the Pictish building at Pitcarmick in Perth and Kinross dated to AD 700 – 850, with later re-use in the early second millennium AD (Carver *et al.* 2012).

Celtic ditches'

Around the same time that ST26 was in use a small square enclosure known as a 'celtic ditch' appeared in the north of the site (010) along the main ridge of settlement which was dated to 93 cal BC – cal AD 64 (UBA-51741). It could have been a small field but no grain was recovered to suggest what crops were grown although the recovery of traces of oats and barley from postholes within it might suggest these crops were grown locally. There was no evidence of grain processing during this period. A further undated rectangular ditch was also found in the south-east of the site (590/596) and is presumed to be of similar date and function.

Celtic ditches are an indication of land divisions generally dated to the Iron Age although they can be earlier and have been widely investigated in the Netherlands due to LiDAR survey revealing their widespread survival (Arnoldussen 2018). They have also been found in parts of England including the chalkdowns of Berwick in southern England where aerial photography revealed a patchwork/ grid system of fields (Rhodes 1950). In England these individual plots were generally square in shape and could measure as little as 20 m by 20 m with the largest at over 2.8 ha (McOmish 2018). However, those at Guardbridge were smaller in size and did not have the surrounding lynchet, a raised bank of soil surrounding its edges, nor was there evidence of a gridded system, a series of fields adjacent to each other forming a chess

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board pattern. However, the site's continual use as agricultural ground suggests that the 'lynchet' may have been ploughed away over time. Within Scotland numerous field boundaries have been identified on aerial photography, mostly on higher ground where there has been a lack of intensive farming, with many thought to date from the early Bronze Age. According to Halliday (1999) these field boundaries comprising banks of stone are often very haphazard unlike the regular square enclosures identified in England (Rhodes 1950) and the Netherlands (Arnoldussen 2018). However, at Drumturn Burn in Alyth, Perth (Halliday 1999) several of these regular enclosures were identified. Two, large, linear field boundaries were also located in the north-west of the site and were initially presumed to be Iron Age in date. However, the remains of a pottery vessel from within one of the field boundaries, was dated using its carbonised residues as being late Bronze Age 1045 – 902 cal BC (UBA-54722) and were most likely associated with that period of activity on the site.

Iron Age economy

Iron Age occupation and activity at Guardbridge was not continuous with a significant break in occupation during the middle Iron Age period. Only two pottery vessels, V22 and V105, could be firmly dated to the middle Iron Age on site, although one radiocarbon date was also obtained from the ST4 enclosure. The lack of evidence for middle Iron Age settlement may be due to the possibility it had move elsewhere and the land adjacent to the fort, and the rest of the excavated area may have been used principally for agriculture. However, in the wider locale there are several Iron Age sites and finds spots, including Romano-British brooches at Pitmilly, Charlestown, Broomhill and Blairadam (Hunter 2014), all dating to the middle Iron Age, suggesting what happened at Guardbridge, did not necessarily happen elsewhere. However, many of these Fife sites (Figure 139) remain formally undated including possible square barrows such as Balbuthie and Camcase and also souterrains at Bowhouse and Newton of Kingsdale, all identified on aerial photographs. A short cist at Kingsbarns in Fife was dated to the Iron Age (James 2001).

Several shale fragments including bangles and pendants were also identified and dated by Hunter (*Cannel coal and oil shale*, above) as Iron Age and one spindle whorl was recovered from a pit which also provided an Iron Age date. A loom weight and other spindle whorls were also found on site, although their period of use was much less certain. One of the most interesting absences on site was rotary querns. These are a common find on Iron Age sites but none were found at Guardbridge. This could indicate that either saddle querns continued to be used on site or that grain processing was not undertaken at this location, suggesting that habitation had moved outside the excavated area. A similar situation was also found at Culduthel, Inverness, where during the early Iron Age, at House 3 only saddle querns were found, often re-used within walling. The re-use of quern stones also took place at Guardbridge in a small linear wall in PG5. Certainly, metalworking, wool and textile production were practised but all appeared limited in scale. To the north-west of PG6 and within pit (1454) was the remains of a stone lamp, another common find within Iron Age sites including Broxmouth Fort (Armit and McKenzie 2013).

Much of the research in Scotland has focussed on enclosed settlement sites rather than the unenclosed sites (Bailie 2021; Banks and Ballin Smith 2002), and this site has added to those unenclosed sites which includes the Iron Age site at Myrtle Cottage in Dunragit (Bailie 2021) and at Hawkhill, Lunan Bay, Angus (Rees 2009) (Figure 139), where a structure with a revetment wall was excavated and dated to the late Iron Age with similarities to the revetment structure ST41 at Guardbridge (see *Bronze Age* discussion).

Medieval and post-medieval

by Charlotte Hunter

From the examples of medieval structures and features revealed across the Guardbridge site, it is evident that the medieval use of this land was predominantly agricultural. Its value and fertility was demonstrated through the progression and succession of corn drying kilns in the north-eastern part of the site (Figure 129).

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The development of corn drying kilns for drying cereal harvests during poor weather and using different constructional techniques provides insight as to how these processes changed over time and developed in to the funnel-shaped kilns attached to barns during the eighteenth or nineteenth centuries throughout Scotland. Similar kilns have been recorded across Scotland, for example a keyhole-shaped kiln found at Glens of Foudland in Aberdeenshire which included a flat slate flooring throughout the heating chamber and single flue dating between the sixteenth and eighteenth centuries (Wallace *et al.* 2024). Alongside, an earlier corn-drying kiln found in Perth and Kinross, dating between the eleventh and thirteenth centuries which also shared likeness in its shape and botanical remains (Robertson *et al.* 2024).

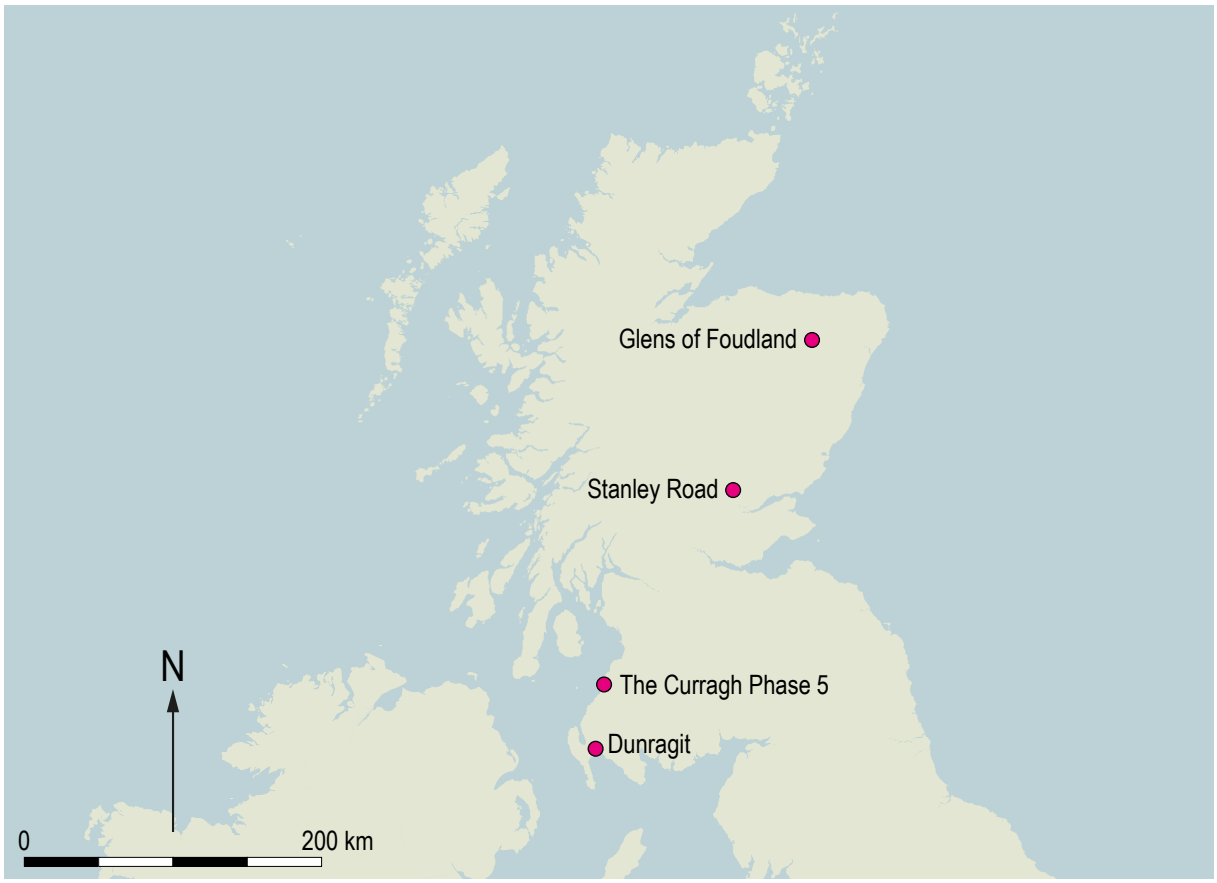
The type of kiln construction found at Guardbridge was also recorded to the south-west of Scotland in Dunragit (Bailie 2021) and at Girvan (Barbour and McNicol 2025) (Figure 142). There are several similarities between these examples, not only in their construction at Stanley Road (Figure 142), but abandonment and collapse. It could be suggested that there was a close connection between kiln (2568), ending about cal AD 1222, and the construction and use of the corn-drying kiln (2113) between (cal AD 1223 and 1275). This may be due to improvements in design and the demand for a larger sized kiln.

Not only were there developments in the construction of kilns at Guardbridge, but the reuse of stone also took place within the area. Stone was brought to the site and that used for lining the kilns may have been robbed or robbed from existing structures such as roundhouse ST40 which lay to the south-west and was reduced to its foundation courses. The Roy Military map portrayed the site as mostly grassland with what seems to be four buildings (kilns?) in the north-east corner of the development site (Figure 135).

Kiln structure ST33, which had two phases dating within the latter part of the first century BC and the early first millennium AD was located above the fort ditches but was earlier than the corn drying kilns being located within the overburden above the fortifications in the north-east corner of the site. Adjacent to it was paving and walling of further stone structures (ST44) but unfortunately no datable material was recovered from them. Its position level with the upper kiln phase of ST33 suggests they are of similar date. Numerous animal bone was also recovered from the deposits surrounding ST33 including cattle, sheep/goat and pig. In the north-west of the site was a further larger stone structure ST42 comprising of stone walling and a cobbled surface from which Medieval White Gritty Ware pottery was recovered.

The additional developments of stone-lined drains and remnants of pre-enclosure rig and furrow cultivation are evidence of drainage, land management and improvement of the land. The farm located directly to the west of site, Seggie Farm, is recorded as ‘Segy’ on a 1636 map (Figure 143). The present day field boundaries are been depicted on a pre-Ordnance Survey map (Figure 137), which probably represents the original enclosure farm plan.

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Figure 142: Medieval and later sites mentioned in the text.



Figure 143: c.1636-52 Robert Gordon/Timothy Pont. map Fife imperfect.Part of the parish of Abernethy. Reproduced with the permission of the National Library of Scotland, https://maps.nls.uk/

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Conclusion

By Maureen Kilpatrick

The Guardbridge excavation has significantly added to the corpus of sites already known within Fife and in the wider east coast area and has enhanced our understanding of the Late Upper Palaeolithic, Mesolithic, Neolithic and Bronze Age settlements and ritual activities, Iron Age settlement and medieval agricultural and industrial activity. It also offered the opportunity to explore the immediate hinterland of a fort complex, which is a rare occurrence in Scottish archaeology. Most research pertaining to forts is generally focused on the fort structure itself rather than the land adjacent to it.

A range of detailed post-excavation analyses of material recovered during the excavation included archaeobotanical and pollen analyses, analysis of all artefacts, osteological analysis of human and animal bones, micromorphological analysis of the fort ditch fills, radiocarbon dating and Bayesian analysis from selected features across the site and lipid analysis of a greasy deposit recovered from site (see *Lipid Analysis* above).

Despite this, the results have been difficult to interpret due to the impact of at least 9000 years of occupation and activities across the excavated area. The focus of this occupation has been on a relatively small area of raised ground surrounded by lower lying ground with what is now a small wet area, which was once probably much larger and influenced the areas available for habitation. This focus has resulted in the inter-mingling of remains, including both artefact and botanical material, either as residual or intrusive elements within archaeological features that were not their primary depositional context. A further consideration is the sandy soil in which the archaeological remains were buried, which has probably led to the loss of much archaeological information through its acidity and soil leeching. The poor pollen analysis results and animal bone results are two such casualties. However, radiocarbon dating provided evidence of a long period of occupation on the site commencing in the fifth millennium BC when hunter gatherer groups camped and ending in the first half of the second millennium AD with the cessation of agricultural processing of harvests during the medieval period. Following this, agriculture became the primary concern on site and continued up until the present day.

The archaeological work has also provided evidence of a multi-phase site along the coastline of Scotland with both domestic settlement and ritual activity. During the late Mesolithic period the occupation of the area was temporary in nature with a small hearth and later a small shelter providing a focus for activities such as lithic tool making. This type of temporary settlement is reflected elsewhere in Scotland (see *Mesolithic discussion*, above) with flint scatters a relatively common find although structural evidence such as that encountered at Guardbridge is sparse.

The Neolithic period at Guardbridge although prolonged was also slightly less tangible than later periods with no early Neolithic long houses that characterise this period in other places such Carnoustie in Angus (Ballin Smith *et al. 2025*). Instead, activity was dominated by a series of pits, both in groups and singular, filled with material including cooking pots and prestigious stone tools. The deposition of both signifies that both the dumping of domestic waste and ritual deposition were carried out during this period. The presence of a possible mini-henge monument also alludes to ritual activity, although what this amounted to is difficult to interpret with any certainty. However, pits are one of the most common finds on archaeological sites particularly during the early prehistoric period and their survival at this site is not unusual. Evidence of exchange networks was also present with the presence of a polished stone axe from Cumbria and pitchstone from the Isle of Arran. These early exchange networks can be found in the material cultural evidence from excavations across the Neolithic in Scotland.

The Bronze Age at Guardbridge saw the first definitive evidence of settled occupation on site with the construction of several roundhouses, although it is unknown if these were inhabited concurrently or they replaced each other over time, the latter suggesting that the site was less populated than first supposed. Land ownership and territorial marking was also taking place during this period and the appearance of field boundaries at Guardbridge might hint at this.

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Ritual activity was also represented by the construction of a large timber enclosure in the south-west of the site, built away from the main area of settlement on lower lying ground. Burials were also hinted at with the presence of several stone-lined pits indicative of cists located within a small pit alignment in the north-west of the site. Their human remains did not survive but an early Bronze Age decorated Beaker did.

Settlement continued into the Iron Age with the establishment of a multivallate fort in the north-west corner of the site. However, it is difficult to suggest what form occupation took within the fort itself as little of this was included within the excavation area. The circular form of building architecture continued, but included stone as well as wood, until it changed to more rectilinear shapes later in the Iron Age. Many stone roundhouses have been found but few are reliably dated beyond areas such as Orkney and Shetland, and the information from Guardbridge adds to the relatively scant evidence for this building form. There was also further evidence that the Iron Age settlement was unenclosed suggesting that this undefended type of homestead may have been more widespread during this period than previously envisaged or located.

Following the abandonment of the rectilinear house, the area appears to have had little occupation until the medieval period, where a series of kilns were constructed at the location of the fort presumably worked by farm labourers belonging to the farm of 'Segy', which appears on cartographic sources from the sixteenth century AD onwards but is now understood to have had much earlier origins stretching back in some form or another to some of the earliest occupation of Scotland.

Acknowledgements

GUARD Archaeology would like to thank Persimmon Homes North Scotland for commissioning the work, and in particular to Robert Patrick, Derek Gardiner, Euan Mclaughlin and Gordon Souter for their invaluable support throughout the project. Craig Laferty and staff from Tough Construction are also to be thanked for their assistance on site throughout the project. Plant and drivers were supplied by Tough Construction. Thank you to Douglas Speirs and Steve Liscoe, Fife Council's Archaeologists for their advice throughout the works. Technical support was from Aileen Maule, Clark Innes and Jen Cochrane. The project was directed by Maureen Kilpatrick with assistance from Eduardo Pérez-Fernández, Thomas Muir, Nieves Ruiz Nieto, Karolina Saxerbo Sjoberg and Charlotte Hunter. Excavations were undertaken by, John-James Atkinson, Jordan Barbour, Rachel Buckley, Ilia Barbukov, Anthony Byledbal, Hannah Collins, Orla Craig, Tom Davies, Tom Dooley, Evelin Eros, Hannah Everett, Mike Ferguson, John Gillen, Amanda Gilmore, Jaime Grant, Kenneth Green, Alan Hunter Blair, Juan Ignacio de Vicente Ojeda, Eleanor James, Emily Johnson, Ewan Kennaway, Nicole Kennedy, Luis Manual Martin Villasanta, Claire McCabe, Dave McNicol, Grace Murray, Laura Muser, Juan F Palomeque Gonzalez, Edward Rayner, Lauren Reid, Clare Shelley, Joshua Sherwood, Jacob Spriggs, Fraser Stewart, Heidi Stewart, Katharine Warden, Duncan Watson, Alan Woodward and Erica Villis.

Jennifer Simonson, Gillian Sneddon, Jordan Barbour and Eduardo Pérez-Fernández produced the report illustrations and Eduardo Pérez-Fernández produced the reconstruction drawings. The report was desktop published by Gillian Sneddon.

The project was managed for GUARD Archaeology Limited by Warren Bailie.

Torben Ballin would like to thank Alistair Dawson for help with literature relating to the Mesolithic period Storegga Tsunami.

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Appendices

Appendix 1: Botanical tables 1-37

Table 1: Structure 1

	Structure	ST1							
	Context	797	856	934	986	1015	1224	882	1236
	Sample	715	528	556	578	593	713	531	505
	Description	Fill of palisade enclosure (796)	Fill of pit (855)	Fill of pit (933)	Fill of pit (985)	Fill of pit (1016)	Fill of pit (1222)	Fill of possible posthole (881)	Fill of pit (1235)
Volume of charcoal >4 mm		2.5ml	<2.5ml	5ml	<<2.5ml	2.5ml	2.5ml	2.5ml	2.5ml
Charcoal									
Alnus cf glutinosa	alder	-	-	-	-	-	-	1 (0.03g)	1 (0.05g)
Betula spp	birch	-	-	-	-	1 (0.02g)	-	-	-
Corylus cf avellana	hazel	-	-	-	-	-	1 (0.03g)	-	-
Ericales	heather type	25 (0.14g)	13 (0.07g)	22 (0.19g)	10 (0.02g)	14 (0.11g)	7 (0.02g)	27 (0.09g)	-
Quercus spp	oak	-	-	4 (0.09g)	-	4 (0.07g)	-	1 (0.03g)	12 (0.28g)
Salix spp	willow	-	-	-	-	-	-	1 (0.01g)	-
Indet rhizome	indet rhizome	-	-	-	-	1 (0.04g)	-	-	-
Cereals (carbonised)									
Avena spp	oat	-	-	1	-	-	-	-	-
Hordeum vulgare sl	barley	2	-	2	-	-	2	-	-
cf Hordeum vulgare sl	cf barley	-	-	-	-	-	-	2	-
Indet cereal	indet cereal	3	-	-	-	-	1	18	-
Seeds etc (carbonised)									
Corylus avellana nutshell frags	hazel nutshell	-	-	-	-	-	-	14 (0.02g)	-
Fallopia convolvulus	black bindweed	1	-	-	-	-	-	-	-

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Table 2: Structure 2

	Structure	ST2					
	Context	035	037	055	064	152	152
	Sample	112	023	052	048	114	118
	Description	Filled of large pit (169)	Fill of curvilinear (049)	Fill of ditch (054)	Fill of curvilinear (063)	Fill of inhumation pit (153)	Fill of inhumation pit (153)
Volume of charcoal >4 mm		2.5ml	<2.5ml	<2.5ml	<2.5ml	5ml	<2.5ml
Charcoal							
Alnus cf glutinosa	alder	1 (0.03g)	-	-	-	-	1 (0.02g)
Betula spp	birch	-	-	-	1 (0.03g)	-	-
Corylus cf avellana	hazel	-	-	-	-	7 (0.10g)	1 (0.05g)
Ericales	heather type	9 (0.09g)	5 (0.06g)	2 (0.01g)	-	8 (0.07g)	-
Quercus spp	oak	1 (0.02g)	1 (0.02g)	2 (0.05g)	-	18 (0.44g)	-
Salix spp	willow	-	-	-	-	-	-
Indet charcoal	indet charcoal	-	-	-	8 (0.15g)	-	-
Cereals (carbonised)							
Avena spp	oat	-	-	1	-	-	-
Hordeum vulgare sl	barley	3	-	-	-	-	1
Indet cereal	indet cereal	3	-	1	-	5	-
Misc							
Bone	bone	-	-	-	-	-	-

	Structure	ST2				
	Context	157	162	176	198	202
	Sample	133	129	139	146	153
	Description	Fill of possible posthole (160)	Post pipe fill of posthole (161)	Fill of posthole (175)	Fill of stone lined pit (197)	Lower fill of pit (197)
Volume of charcoal >4 mm		<<2.5ml	<2.5ml	<2.5ml	10ml	2.5ml
Charcoal						
Alnus cf glutinosa	alder	-	1 (0.04g)	-	-	-
Betula spp	birch	-	-	-	-	-
Corylus cf avellana	hazel	-	-	3 (0.06g)	-	-
Ericales	heather type	2 (<0.01g)	4 (0.03g)	3 (0.02g)	58 (0.98g)	30 (0.55g)
Quercus spp	oak	-	-	1 (0.05g)	6 (0.10g)	2 (0.02g)
Salix spp	willow	-	-	-	-	1 (0.02g)
Indet charcoal	indet charcoal	-	-	-	-	-
Cereals (carbonised)						
Avena spp	oat	-	-	-	-	-
Hordeum vulgare sl	barley	-	-	-	-	-
Indet cereal	indet cereal	-	-	-	-	-
Misc						
Bone	bone	-	-	-	2	-

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Table 3: Structures 3-6

	Structure	ST3			
	Context	409	411	424	425
	Sample	284	280	277	278
	Description	Fill of ditch (408)	Fill of small enclosure re-cut by (412)	Upper fill of pit (423)	Lower fill of pit (423)
Volume of charcoal >4 mm		2.5ml	<2.5ml	5ml	10ml
Charcoal					
Alnus cf glutinosa	alder	-	-	-	-
Corylus cf avellana	hazel	1 (0.04g)	-	-	-
Ericales	heather type	23 (0.21g)	12 (0.28g)	64 (1.22g)	230 (4.11g)
Quercus spp	oak	-	-	-	-
Salix spp	willow	-	-	-	-
Indet rhizome	indet rhizome	-	-	-	-
Cereals (carbonised)					
Hordeum vulgare sl	barley	-	1	-	2
Indet cereal	indet cereal	-	-	-	6
Seeds etc (carbonised)					
Calluna vulgaris capsule	heather seed capsule	-	-	-	-
Chenopodium album	fathen	-	-	-	-
Danthonia decumbens	heath-grass	-	-	-	-
Galium aparine	cleavers	-	-	-	-
Persicaria maculosa	redshank	-	-	-	-

	Structure	ST4	ST5	ST6	
	Context	1284	1688	1717	1731
	Sample	691	952	974	977
	Description	Fill of ring ditch (1283)	Fill of curvilinear feature (1689)	Fill of curvilinear feature (1716)	Fill of pit (1730)
Volume of charcoal >4 mm		5ml	<<2.5ml	<2.5ml	-
Charcoal					
Alnus cf glutinosa	alder	5 (0.05g)	-	-	-
Corylus cf avellana	hazel	-	-	-	-
Ericales	heather type	20 (0.18g)	14 (0.08g)	8 (0.06g)	-
Quercus spp	oak	-	2 (0.01g)	-	-
Salix spp	willow	2 (0.10g)	-	-	-
Indet rhizome	indet rhizome	-	-	3 (0.12g)	-
Cereals (carbonised)					
Hordeum vulgare sl	barley	-	-	-	-
Indet cereal	indet cereal	1	-	-	2
Seeds etc (carbonised)					
Calluna vulgaris capsule	heather seed capsule	-	-	1	-
Chenopodium album	fathen	1	-	-	-
Danthonia decumbens	heath-grass	1	-	-	-
Galium aparine	cleavers	-	-	1	-
Persicaria maculosa	redshank	-	-	1	1

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Table 4: Structure 7

	Structure	ST7			
	Context	2615	2628	2629	2636
	Sample	1595	1596	1597	1562
	Description	Upper fill of double ring ditch (2619)	Fill of double ring ditch (2619)	Fill of double ring ditch (2619)	Fill of ditch (2635)
Volume of charcoal >4 mm		<<2.5ml	<<2.5ml	<<2.5ml	<2.5ml
Charcoal					
Betula spp	birch	-	-	-	1 (0.05g)
Ericales	heather type	6 (0.06g)	2 (0.01g)	6 (0.02g)	32 (0.19g)
Quercus spp	oak	-	-	-	2 (0.02g)
Indet rhizome	indet rhizome	-	1 (0.01g)	-	-
Cereals (carbonised)					
Indet cereal	indet cereal	-	-	-	2
Seeds etc (carbonised)					
Linum usitatissimum	cultivated flax	-	-	1	-

Table 5: Structures 8-10

	Structure	ST8			ST9			ST10
	Context	553	561	571	286	316	353	324
	Sample	383	354	362	191, 193	240	235	220
	Description	Fill of enclosure (552)	Fill of pit (560)	Fill of pit (570)	Fill of curvilinear (285)	Fill of enclosure (315)	Fill of pit (352)	Fill of pit (323)
Volume of charcoal >4 mm		<2.5ml	5ml	<2.5ml	2.5ml	<2.5ml	<2.5ml	-
Charcoal								
Alnus cf glutinosa	alder	-	-	-	-	1 (0.02g)	-	-
Corylus cf avellana	hazel	-	1 (0.15g)	-	-	-	1 (0.03g)	-
Ericales	heather type	32 (0.15g)	90 (0.81g)	30 (0.14g)	12 (0.12g)	-	21 (0.15g)	-
Quercus spp	oak	-	1 (0.03g)	-	-	-	5 (0.11g)	-
Salix spp	willow	-	-	-	1 (0.01g)	-	-	-
Cereals (carbonised)								
Avena spp	oat	-	2	-	-	-	-	-
Hordeum vulgare var vulgare	hulled barley	-	-	-	-	1	-	-
Hordeum vulgare sl	barley	-	2	-	3	-	3	1
Triticum dicoccum	emmer wheat	-	-	-	1	-	-	-
Triticum cf dicoccum	cf emmer wheat	-	1	-	-	-	-	-
cf Triticum spp	cf wheat	1	-	-	-	-	-	-
Indet cereal	indet cereal	-	3	-	-	-	2	-

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Table 6: Structure 11

	Structure	ST11									
	Context	1591	1592	1593	1605	1613	1660	1666	1826	1828	1830
	Sample	887	888	889	890	895	929	1041	1065	1035	1038
	Description	Lens of black material within fill (1593) of pit (1590)	Lower fill of pit (1590)	Main fill of pit (1590), above fill (1592)	Fill of pit (1604)	Fill of pit (1590)	Fill of pit (1659)	Fill of curvilinear ditch (1665)	Lower fill of fire pit (1824)	Fill of pit (1827)	Fill of pit (1829)
Volume of charcoal >4 mm		2.5ml	5ml	10ml	5ml	30ml	<2.5ml	5ml	10ml	<2.5ml	2.5ml
Charcoal											
Alnus cf glutinosa	alder	-	-	-	-	-	-	-	1 (0.02g)	-	-
Betula spp	birch	-	1 (0.03g)	-	-	-	-	1 (0.01g)	-	-	-
Corylus cf avellana	hazel	-	-	-	1 (0.01g)	-	-	5 (0.09g)	-	-	1 (0.07g)
Ericales	heather type	5 (<0.01g)	4 (0.05g)	-	35 (0.39g)	-	20 (0.17g)	88 (0.64g)	112 (1.27g)	4 (0.02g)	84 (0.69g)
Quercus spp	oak	-	7 (0.09g)	24 (3.12g)	-	150 (10.02g)	-	-	4 (0.03g)	-	-
Salix spp	willow	-	-	-	-	-	-	1 (0.07g)	-	1 (0.02g)	-
Cereals (carbonised)											
Avena spp	oat	-	-	-	-	-	-	-	35	-	-
Hordeum vulgare sl	barley	-	-	-	-	-	-	2	43	-	-
cf Hordeum vulgare sl	cf barley	-	-	-	-	-	-	-	19	-	-
Indet cereal	indet cereal	-	-	-	-	-	1	-	53	-	-
Seeds etc (carbonised)											
Carex spp biconvex	sedge biconvex	-	-	-	-	-	-	-	1	-	-
Carex spp trigonous	sedge trigonous	-	-	-	-	-	-	-	8	-	-
Chenopodiaceae	goosefoot family	-	-	-	-	-	-	-	37	-	-
Corylus avellana nutshell frags	hazel nutshell	-	3 (0.08g)	-	-	-	-	-	-	17 (0.15g)	4 (0.06g)
Danthonia decumbens	heath-grass	-	-	-	-	-	-	-	5	-	-
Fabaceae	pea family	-	-	-	-	-	-	1	-	-	-
Fallopia convolvulus	black bindweed	-	-	-	-	-	-	-	6	-	-
Raphanus raphanistrum pod frag	wild radish pod frag	-	-	-	-	-	-	-	4	-	-
Rumex spp	docks	-	-	-	-	-	-	-	1	-	-

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Table 7: Structure 12 and 13

	Structure	ST12			ST13						
	Context	1449	1465	1487	2907	2909	2913	2917	2919	2922	2945
	Sample	806	811	821	1782	1754	1755	1743	1744	1746	1783
	Description	Fill of enclosure ditch (1448)	Fill of posthole (1464)	Fill of pit (1486)	Deposit. Large lithic scatter	Fill of curvilinear (2908)	Fill of gully (2912)	Fill of pit (2916)	Fill of pit (2918)	Upper fill of pit (2921)	Deposit
Volume of charcoal >4 mm		5ml	2.5ml	2.5ml	5ml	<2.5ml	5ml	<<2.5ml	10ml	150ml	5ml
Charcoal											
Alnus cf glutinosa	alder	1 (0.14g)	-	3 (0.19g)	-	1 (0.06g)	-	-	4 (0.89g)	19 (36.09g)	2 (0.11g)
Betula spp	birch	-	-	-	-	-	-	-	-	4 (0.31g)	25 (0.67g)
Corylus cf avellana	hazel	-	-	-	-	1 (0.08g)	1 (0.09g)	-	-	2 (0.08g)	-
Ericales	heather type	115 (0.67g)	38 (0.20g)	9 (0.06g)	-	4 (0.04g)	38 (0.40g)	10 (0.08g)	14 (0.14g)	-	-
Quercus spp	oak	-	1 (0.04g)	2 (0.04g)	31 (0.66g)	-	6 (0.13g)	-	13 (1.96g)	2 (0.12g)	-
Salix spp	willow	-	-	-	-	-	-	-	1 (0.24g)	-	-
Indet rhizome	indet rhizome	-	7 (0.12g)	-	-	-	-	-	-	-	-
Indet charcoal	indet charcoal	-	-	-	-	-	-	-	-	-	4 (0.18g)
Cereals (carbonised)											
Avena spp	oat	-	-	-	-	-	-	-	1	-	-
Hordeum vulgare sl	barley	-	-	1	-	-	-	-	-	-	-
Triticum spp	wheat	-	-	-	-	-	-	-	1	-	-
Indet cereal	indet cereal	-	-	3	-	1	-	-	3	-	-
Seeds etc (carbonised)											
cf Aphanes arvensis	parsley piert	-	-	-	-	-	-	-	1	-	-
Carex spp biconvex	sedge biconvex	-	-	-	-	-	-	-	1	-	-
Carex spp trigonous	sedge trigonous	-	1	-	-	-	-	-	-	-	-
Corylus avellana nutshell frags	hazel nutshell	1 (<0.01g)	-	-	-	-	-	-	-	-	-
Danthonia decumbens	heath-grass	-	5	-	-	-	-	-	-	-	-
Ranunculus spp	buttercup	-	-	-	-	-	-	-	1	-	-
Spergula arvensis	corn spurrey	-	-	-	-	-	-	-	1	-	-

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Table 8: Structures 14-16

	Structure	ST14	ST15	ST16
	Context	4058	1934	1954
	Sample	2310	1092	1114
	Description	Fill of enclosure (4057)	Fill of curvilinear (1933)	Fill of curvilinear (1953)
Volume of charcoal >4 mm		<<2.5ml	-	5ml
Charcoal				
Cytisus / Ulex	broom / gorse	-	-	5 (0.10g)
Ericales	heather type	12 (0.10g)	-	81 (0.48g)
Indet rhizome	indet rhizome	-	-	1 (0.05g)
Cereals (carbonised)				
cf Avena spp	cf oat	-	-	3
Hordeum vulgare var nudum	naked barley	-	80	-
Hordeum vulgare sl	barley	-	401	-
cf Hordeum vulgare sl	cf barley	-	228	-
Triticum dicoccum	emmer wheat	-	49	-
Triticum cf dicoccum	cf emmer wheat	-	41	-
Indet cereal	indet cereal	-	276	8
Glume base	glume base	-	2	-
Seeds etc (carbonised)				
Carex spp trigonous	sedge trigonous	-	2	1
Chenopodium album	fathen	-	1	1
Fabaceae	pea family	-	1	-
Glebionis segetum	corn marigold	-	-	1
Persicaria maculosa	redshank	-	2	-

Table 9: Structure 17 gully and ditch fills

	Structure	ST17 gully & ditch fills						
	Context	447	462	463	467	469	473	725
	Sample	299	313	314	322	323	315	457
	Description	Fill of enclosure gully (446)	Upper fill of curvilinear (461)	Lower fill of curvilinear (461)	Fill of curvilinear groove (466)	Fill of curvilinear gully (468)	Fill of terminal end of curvilinear gully (466)	Fill of linear feature (726)
Volume of charcoal >4 mm		2.5ml	5ml	<2.5ml	2.ml	<2.5ml	<2.5ml	2.5ml
Charcoal								
Alnus cf glutinosa	alder	-	-	-	5 (0.06g)	-	-	1 (0.01g)
Corylus cf avellana	hazel	1 (0.02g)	16 (0.26g)	-	1 (0.01g)	-	-	1 (0.07g)
Ericales	heather type	21 (0.14g)	17 (0.11g)	1 (0.01g)	34 (0.22g)	-	2 (0.04g)	56 (0.28g)
Quercus spp	oak	5 (0.07g)	2 (0.04g)	1 (0.01g)	7 (0.14g)	-	-	1 (0.01g)
Salix spp	willow	-	-	-	-	1 (0.06g)	-	1 (<0.01g)
Indet charcoal	indet charcoal	-	-	2 (0.04g)	-	-	-	-
Cereals (carbonised)								
Avena spp	oat	-	-	-	1	-	-	-
Hordeum vulgare sl	barley	-	1	-	2	-	-	2
cf Triticum spp	cf wheat	-	1	-	-	-	-	-
Indet cereal	indet cereal	3	2	-	-	2	1	-

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Table 10: Structure 17

	Structure	ST17 pits and postholes					
	Context	485	518	681	692	713	724
	Sample	321	336	435	443	449	456
	Description	Fill of pit (484)	Fill of pit (517)	Fill of posthole (680)	Fill of pit (691)	Fill of Posthole (712)	Fill of posthole (723)
Volume of charcoal >4 mm		<2.5ml	2.5ml	<<2.5ml	<<2.5ml	<2.5ml	2.5ml
Charcoal							
Alnus cf glutinosa	alder	-	1 (0.01g)	1 (0.03g)	-	1 (0.02g)	-
Betula spp	birch	-	1 (0.02g)	-	-	-	-
Corylus cf avellana	hazel	-	-	-	1 (0.03g)	-	6 (0.15g)
Ericales	heather type	12 (0.14g)	18 (0.16g)	-	-	17 (0.14g)	13 (0.14g)
Fraxinus spp	ash	-	-	-	-	-	-
Prunus spinosa type	blackthorn type	-	1 (0.02g)	-	-	-	-
Quercus spp	oak	-	-	-	-	-	4 (0.02g)
Indet rhizome	indet rhizome	-	-	-	-	4 (0.15g)	-
Cereals (carbonised)							
Hordeum vulgare sl	barley	-	-	-	-	-	1
Triticum dicoccum	emmer wheat	-	-	-	-	-	-
Indet cereal	indet cereal	-	-	-	-	-	-
Seeds etc (carbonised)							
cf Aster type	cf daisy type	-	-	-	-	-	-
Carex spp trigonous	sedge trigonous	-	-	-	-	-	-
Eleocharis spp	spike-rush	-	-	-	-	-	-

	Structure	ST17 pits and postholes						
	Context	763	781	815	864	864	109	119
	Sample	474	479	725	523	524	088	091
	Description	Fill of posthole (762)	Fill of pit (774)	Fill of pit (814)	Fill of pit (863)	Fill of pit (863)	Fill of pit (108)	Lower fill of pit (108)
Volume of charcoal >4 mm		<2.5ml	5ml	<<2.5ml	<<2.5ml	<2.5ml	10ml	5ml
Charcoal								
Alnus cf glutinosa	alder	3 (0.06g)	-	-	-	-	-	-
Betula spp	birch	-	-	-	-	1 (0.02g)	-	-
Corylus cf avellana	hazel	-	-	-	-	-	-	-
Ericales	heather type	-	31 (0.17g)	-	4 (0.02g)	4 (0.07g)	166 (1.68g)	63 (1.06g)
Fraxinus spp	ash	-	-	1 (0.01g)	-	-	-	-
Prunus spinosa type	blackthorn type	-	-	-	-	-	-	-
Quercus spp	oak	-	4 (0.04g)	-	-	-	-	-
Indet rhizome	indet rhizome	-	-	-	-	-	-	-
Cereals (carbonised)								
Hordeum vulgare sl	barley	-	-	-	-	-	-	1
Triticum dicoccum	emmer wheat	-	-	-	-	-	-	2
Indet cereal	indet cereal	-	3	-	-	-	2	6
Seeds etc (carbonised)								
cf Aster type	cf daisy type	-	-	-	-	-	-	1
Carex spp trigonous	sedge trigonous	-	-	-	-	-	-	2
Eleocharis spp	spike-rush	-	-	-	-	-	-	1

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Table 11: Structure 18

	Structure	ST18					
	Context	068	070	718	730	750	756
	Sample	041	042	451, 452, 453	461	702	469
	Description	Fill of pit (067)	Fill of pit (069)	Fill of curvilinear gully (717)	Fill of pit (729)	Fill of pits (757) and (749)	Fill of curvilinear (755)
Volume of charcoal >4 mm		5ml	<2.5ml	5ml	5ml	2.5ml	2.5ml
Charcoal							
Alnus cf glutinosa	alder	1 (0.31g)	-	-	1 (0.02g)	-	-
Betula spp	birch	-	-	-	-	-	-
Corylus cf avellana	hazel	-	-	-	1 (0.02g)	1 (0.02g)	-
Cytisus / Ulex	broom / gorse	-	-	-	-	-	-
Ericales	heather type	31 (0.56g)	12 (0.20g)	17 (0.13g)	36 (0.17g)	-	36 (0.12g)
Quercus spp	oak	-	-	-	15 (0.25g)	9 (0.11g)	1 (0.01g)
Salix spp	willow	-	-	-	-	3 (0.07g)	-
Indet rhizome	indet rhizome	-	-	1 (0.04g)	-	-	-
Indet charcoal	indet charcoal	-	-	3 (0.16g)	-	-	-
Cereals (carbonised)							
Hordeum vulgare sl	barley	-	-	1	-	-	1
Triticum spp	wheat	-	-	-	-	2	-
cf Triticum spp	cf wheat	-	-	1	-	-	-
Indet cereal	indet cereal	-	-	1	2	-	-
Seeds etc (carbonised)							
Arrhenatherum elatius ssp bulbosum bulb	tuber oat grass	1	-	-	-	-	-
Corylus avellana nutshell frags	hazel nutshell	-	-	-	-	-	-

	Structure	ST18					
	Context	776	790	828	866	1228	1232
	Sample	480	707	514	540	716	717
	Description	Fill of linear ditch (775)	Fill of curvilinear (789)	Fill of pit (827)	Upper fill of pit (865)	Fill of posthole (1227)	Fill of pit (1231)
Volume of charcoal >4 mm		2.5ml	<2.5ml	2.5ml	10ml	<<2.5ml	2.5ml
Charcoal							
Alnus cf glutinosa	alder	-	1 (0.02g)	-	6 (0.15g)	-	-
Betula spp	birch	-	1 (0.01g)	-	-	1 (0.01g)	-
Corylus cf avellana	hazel	-	1 (0.02g)	-	5 (0.56g)	1 (0.03g)	-
Cytisus / Ulex	broom / gorse	-	-	-	-	-	-
Ericales	heather type	32 (0.17g)	-	1 (<0.01g)	49 (0.42g)	-	15 (0.12g)
Quercus spp	oak	1 (0.12g)	-	9 (0.18g)	7 (0.12g)	-	-
Salix spp	willow	-	1 (0.02g)	-	-	1 (0.05g)	-
Indet rhizome	indet rhizome	-	-	-	12 (0.48g)	-	3 (0.15g)
Indet charcoal	indet charcoal	-	-	-	-	-	-
Cereals (carbonised)							
Hordeum vulgare sl	barley	2	-	1	2	-	3
Triticum spp	wheat	-	-	-	-	-	-
cf Triticum spp	cf wheat	1	-	-	-	-	-
Indet cereal	indet cereal	7	-	1	3	-	-
Seeds etc (carbonised)							
Arrhenatherum elatius ssp bulbosum bulb	tuber oat grass	-	-	-	1	-	-
Corylus avellana nutshell frags	hazel nutshell	-	-	-	-	1 (<0.01g)	-

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Table 12: Structure 18

	Structure	ST35		
	Context	1280	1282	1315
	Sample	690	694	741
	Description	Fill of pit (1279)	Fill of cut (1281)	Fill of enclosure (1312), (1342), (1343)
Volume of charcoal >4 mm		10ml	<<2.5ml	<2.5ml
Charcoal				
Corylus cf avellana	hazel	1 (0.02g)	-	-
Ericales	heather type	82 (0.67g)	-	-
Quercus spp	oak	-	1 (0.01g)	4 (0.04g)
Salix spp	willow	1 (0.03g)	-	-
Indet rhizome	indet rhizome	8 (0.31g)	-	-
Seeds etc (carbonised)				
Corylus avellana nutshell frags	hazel nutshell	-	-	5 (0.05g)

Table 13: Structure 19

	Structure	ST19	
	Context	3053	3307
	Sample	1888	1969
	Description	Fill of curvilinear (3052)	Fill of linear (3306)
Volume of charcoal >4 mm		5ml	5ml
Charcoal			
Alnus cf glutinosa	alder	15 (0.42g)	-
Ericales	heather type	2 (0.01g)	4 (0.07g)
Quercus spp	oak	-	1 (0.29g)
Seeds etc (carbonised)			
Carex spp trigonous	sedge trigonous	-	1
Fabaceae	pea family	-	1
Poaceae	grass	-	1

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Table 14: Structure 20 and 21

	Structure	ST20					
	Context	2820	2962	3004	3006	3008	3013
	Sample	1807	1795	1793	1794	1796	1800
	Description	Upper fill of pit (3032)	Fill of pit (2961)	Fill of pit (3003)	Fill of pit (3005)	Fill of pit (3007)	Fill of posthole (3012)
Volume of charcoal >4 mm		<2.5ml	5ml	5ml	<2.5ml	10ml	2.5ml
Charcoal							
Alnus cf glutinosa	alder	-	13 (0.20g)	-	-	3 (0.08g)	-
Corylus cf avellana	hazel	-	-	-	-	-	-
Ericales	heather type	5 (0.07g)	11 (0.19g)	2 (0.02g)	6 (0.03g)	7 (0.07g)	6 (0.08g)
Quercus spp	oak	1 (<0.01g)	43 (0.51g)	90 (1.29g)	3 (0.03g)	33 (1.03g)	17 (0.40g)
Salix spp	willow	-	-	-	-	-	-
Cereals (carbonised)							
Avena spp	oat	-	-	-	-	-	-
Hordeum vulgare sl	barley	1	1	-	-	2	-
Triticum spp	wheat	-	1	-	-	1	-
Indet cereal	indet cereal	-	2	-	-	4	-
Misc							
Cramp	cramp	-	-	-	-	20 (0.44g)	-

	Structure	ST20			ST21	
	Context	3033	3043	3045	3821	3845
	Sample	1812	1822	1823	2184	2196
	Description	Lower fill of pit (3032)	Fill of posthole (3042)	Fill of pit (3044)	Fill of posthole (3820)	Fill of pit (3844)
Volume of charcoal >4 mm		2.5ml	-	<2.5ml	2.5ml	2.5ml
Charcoal						
Alnus cf glutinosa	alder	-	-	-	-	4 (0.19g)
Corylus cf avellana	hazel	-	-	4 (0.16g)	2 (0.13g)	-
Ericales	heather type	8 (0.02g)	-	8 (0.05g)	2 (0.01g)	-
Quercus spp	oak	3 (0.08g)	-	4 (0.04g)	9 (0.08g)	3 (0.24g)
Salix spp	willow	-	-	1 (0.02g)	-	-
Cereals (carbonised)						
Avena spp	oat	1	-	-	-	-
Hordeum vulgare sl	barley	1	-	-	-	-
Triticum spp	wheat	-	-	-	-	-
Indet cereal	indet cereal	2	-	-	1	-
Misc						
Cramp	cramp	-	-	-	-	-

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Table 15: Structure 1

	Structure	ST1							
	Context	797	856	934	986	1015	1224	882	1236
	Sample	715	528	556	578	593	713	531	505
	Description	Fill of palisade enclosure (796)	Fill of pit (855)	Fill of pit (933)	Fill of pit (985)	Fill of pit (1016)	Fill of pit (1222)	Fill of possible posthole (881)	Fill of pit (1235)
Volume of charcoal >4 mm		2.5ml	<2.5ml	5ml	<<2.5ml	2.5ml	2.5ml	2.5ml	2.5ml
Charcoal									
Alnus cf glutinosa	alder	-	-	-	-	-	-	1 (0.03g)	1 (0.05g)
Betula spp	birch	-	-	-	-	1 (0.02g)	-	-	-
Corylus cf avellana	hazel	-	-	-	-	-	1 (0.03g)	-	-
Ericales	heather type	25 (0.14g)	13 (0.07g)	22 (0.19g)	10 (0.02g)	14 (0.11g)	7 (0.02g)	27 (0.09g)	-
Quercus spp	oak	-	-	4 (0.09g)	-	4 (0.07g)	-	1 (0.03g)	12 (0.28g)
Salix spp	willow	-	-	-	-	-	-	1 (0.01g)	-
Indet rhizome	indet rhizome	-	-	-	-	1 (0.04g)	-	-	-
Cereals (carbonised)									
Avena spp	oat	-	-	1	-	-	-	-	-
Hordeum vulgare sl	barley	2	-	2	-	-	2	-	-
cf Hordeum vulgare sl	cf barley	-	-	-	-	-	-	2	-
Indet cereal	indet cereal	3	-	-	-	-	1	18	-
Seeds etc (carbonised)									
Corylus avellana nutshell frags	hazel nutshell	-	-	-	-	-	-	14 (0.02g)	-
Fallopia convolvulus	black bindweed	1	-	-	-	-	-	-	-

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Table 16: Structure 23 and 24

	Structure	ST23			ST24		
	Context	3399	3664	3668	3878	3900	3908
	Sample	2002	2102	2099	2213	2223	2227
	Description	Fill of posthole (3398)	Fill of posthole (3663)	Fill of posthole (3667)	Fill of posthole (3877)	Fill of posthole (3899)	Fill of posthole (3907)
Volume of charcoal >4 mm		30ml	<<2.5ml	<<2.5ml	<<2.5ml	<<2.5ml	<<2.5ml
Charcoal							
Corylus cf avellana	hazel	-	1 (0.01g)	-	1 (0.02g)	-	-
Ericales	heather type	-	1 (0.01g)	1 (0.01g)	-	6 (0.03g)	4 (0.03g)
Quercus spp	oak	69 (6.43g)	1 (0.02g)	-	3 (0.07g)	-	3 (0.06g)
Cereals (carbonised)							
Triticum spp	wheat	1	-	-	-	-	-
Seeds etc (carbonised)							
Corylus avellana nutshell frags	hazel nutshell	-	-	-	-	-	1 (0.02g)

Table 17: Structure 25 and 26

	Structure	ST25		ST26				
	Context	3327	3743	2691	2693	2751	2753	2757
	Sample	1963	2138	1599	1600	1658	1690	1689
	Description	Fill of posthole (3326)	Fill of posthole (3742)	Fill of pit (2690)	Fill of pit (2692)	Fill of structure (2750)	Fill of posthole (2752)	Fill of posthole (2756)
Volume of charcoal >4 mm		<2.5ml	<2.5ml	<2.5ml	<<2.5ml	2.5ml	5ml	<<2.5ml
Charcoal								
Alnus cf glutinosa	alder	-	-	-	-	-	-	-
Betula spp	birch	-	-	-	-	-	-	-
Corylus cf avellana	hazel	-	-	-	-	7 (0.16g)	4 (0.16g)	1 (0.01g)
Ericales	heather type	-	-	10 (0.13g)	21 (0.12g)	15 (0.11g)	35 (0.29g)	15 (0.11g)
Quercus spp	oak	5 (0.13g)	4 (0.07g)	-	-	-	2 (0.03g)	-
Salix spp	willow	-	-	-	-	-	-	1 (0.01g)
Indet rhizome	indet rhizome	-	-	-	-	-	2 (0.06g)	-
Indet charcoal	indet charcoal	-	7 (0.41g)	-	-	-	-	-
Cereals (carbonised)								
Avena spp	oat	-	-	-	-	-	-	-
cf Avena spp	cf oat	-	-	-	-	-	-	-
Hordeum vulgare sl	barley	-	-	1	-	-	1	-
cf Hordeum vulgare sl	cf barley	-	-	-	1	-	-	-
Indet cereal	indet cereal	-	-	-	-	-	-	-
Seeds etc (carbonised)								
Corylus avellana nutshell frags	hazel nutshell	-	1 (0.02g)	-	-	9 (0.07g)	-	-

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Table 17 *(continued)*: **Structure 26**

	Structure	ST26						
	Context	2778	2781	2793	2824	2840	2846	2848
	Sample	1671	1683	1685	1706	1709	1712	1713
	Description	Fill of pit (2779)	Fill of posthole (2780)	Fill of posthole (2792)	Fill of posthole (2823)	Fill of posthole (2839)	Deposit	Fill of posthole (2847)
Volume of charcoal >4 mm		<<2.5ml	<<2.5ml	2.5ml	<<2.5ml	<2.5ml	<<2.5ml	<<2.5ml
Charcoal								
Alnus cf glutinosa	alder	-	-	1 (0.02g)	-	-	-	-
Betula spp	birch	1 (0.01g)	-	-	-	-	-	-
Corylus cf avellana	hazel	-	-	3 (0.04g)	-	-	1 (0.01g)	-
Ericales	heather type	13 (0.09g)	7 (0.04g)	27 (0.19g)	12 (0.07g)	7 (0.06g)	1 (0.01g)	5 (0.02g)
Quercus spp	oak	-	-	-	-	-	-	-
Salix spp	willow	-	-	-	-	-	-	-
Indet rhizome	indet rhizome	1 (0.02g)	-	-	-	-	-	-
Indet charcoal	indet charcoal	1 (0.02g)	-	-	-	-	-	-
Cereals (carbonised)								
Avena spp	oat	-	-	1	-	-	-	-
cf Avena spp	cf oat	-	-	1	-	-	-	-
Hordeum vulgare sl	barley	-	-	-	-	-	-	-
cf Hordeum vulgare sl	cf barley	-	-	1	-	-	-	-
Indet cereal	indet cereal	-	-	-	2	-	-	-
Seeds etc (carbonised)								
Corylus avellana nutshell frags	hazel nutshell	-	-	-	-	-	-	-

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Table 18: Structure 27 and 28

	Structure	ST27			ST28
	Context	1885	1895	1916	1853
	Sample	1062	1076	1086	1054
	Description	Fill of posthole (1884)	Fill of curvilinear (1894)	Fill of posthole (1915)	Fill of pit (1852)
Volume of charcoal >4 mm		2.5ml	<<2.5ml	<<2.5ml	<<2.5ml
Charcoal					
Alnus cf glutinosa	alder	1 (0.04g)	-	1 (0.03g)	-
Corylus cf avellana	hazel	1 (0.02g)	-	-	-
Ericales	heather type	-	15 (0.08g)	1 (0.02g)	-
Quercus spp	oak	9 (0.35g)	-	-	5 (0.04g)
Cereals (carbonised)					
Avena spp	oat	-	-	1	-
Hordeum vulgare sl	barley	-	-	1	-
Indet cereal	indet cereal	-	3	1	-
Seeds etc (carbonised)					
Corylus avellana nutshell frags	hazel nutshell	-	1 (<0.01g)	-	1 (<0.01g)

Table 19: Structures 31, 34, 37 and 38

	Structure	Structure 31			
	Context	1182	1997	2356	2414
	Sample	676	1387	1388	1404
	Description	Fill of curvilinear (1181)	Fill of pit/ cist (1996)	Fill of pit (2355)	Charcoal fill of possible stone cist (1996)
Volume of charcoal >4 mm		5ml	20ml	<<2.5ml	100ml
Charcoal					
Alnus cf glutinosa	alder	1 (0.02g)	-	-	-
Betula spp	birch	-	-	-	-
Corylus cf avellana	hazel	-	-	-	-
Ericales	heather type	40 (0.39g)	-	-	-
Prunoideae	cherry type	-	-	-	-
Quercus spp	oak	1 (0.01g)	69 (4.33g)	2 (0.01g)	224 (30.29g)
Salix spp	willow	-	-	-	-
Indet rhizome	indet rhizome	-	-	-	-
Cereals (carbonised)					
Avena spp	oat	-	-	1	-
Hordeum vulgare var nudum	naked barley	-	-	-	-
Hordeum vulgare sl	barley	1	-	-	-
cf Hordeum vulgare sl	cf barley	-	-	-	-
Triticum spp	wheat	-	-	-	-
Indet cereal	indet cereal	3	-	-	-
Seeds etc (carbonised)					
Corylus avellana nutshell frags	hazel nutshell	-	-	-	-
Danthonia decumbens	heath-grass	1	-	-	-
Fucoid seaweed	Fucoid seaweed	-	-	-	-
Rumex spp	docks	-	-	-	-

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Table 19 *(continued)*: **Structures 31, 34, 37 and 38**

	Structure	Structure 34				
	Context	943	1012	1033	1253	1254
	Sample	612	598	613	628	629
	Description	Fill of ditch (942)	Fill of pit (1011)	Fill of pit (1032)	Upper fill of pit (1252)	Lower fill of pit (1252)
Volume of charcoal >4 mm		2.5ml	5ml	5ml	10ml	10ml
Charcoal						
Alnus cf glutinosa	alder	-	1 (0.26g)	7 (0.08g)	5 (0.56g)	-
Betula spp	birch	-	-	-	-	2 (2.48g)
Corylus cf avellana	hazel	1 (0.04g)	1 (0.02g)	12 (0.36g)	-	-
Ericales	heather type	30 (0.24g)	17 (0.10g)	-	85 (0.48g)	32 (0.28g)
Prunoideae	cherry type	-	1 (0.01g)	-	-	-
Quercus spp	oak	-	1 (0.01g)	-	4 (0.08g)	-
Salix spp	willow	-	-	1 (0.02g)	-	-
Indet rhizome	indet rhizome	-	2 (0.06g)	-	4 (0.08g)	1 (0.03g)
Cereals (carbonised)						
Avena spp	oat	-	-	-	-	-
Hordeum vulgare var nudum	naked barley	-	-	-	1	-
Hordeum vulgare sl	barley	1	3	10	8	2
cf Hordeum vulgare sl	cf barley	-	-	-	-	7
Triticum spp	wheat	-	-	-	1	-
Indet cereal	indet cereal	1	-	9	4	3
Seeds etc (carbonised)						
Corylus avellana nutshell frags	hazel nutshell	-	-	1 (0.01g)	-	-
Danthonia decumbens	heath-grass	-	-	-	-	-
Fucoid seaweed	Fucoid seaweed	-	-	-	-	-
Rumex spp	docks	-	-	3	-	-

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Table 19 *(continued)*: **Structures 31, 34, 37 and 38**

	Structure	Structure 37		Structure 38	
	Context	1132	1134	3506	3512
	Sample	645	646	2078	2075
	Description	Fill of curvilinear (1131)	Fill of curvilinear (1133)	Fill of curvilinear (3505)	Fill of pit (3511)
Volume of charcoal >4 mm		5ml	<2.5ml	2.5ml	<2.5ml
Charcoal					
Alnus cf glutinosa	alder	-	-	-	1 (0.03g)
Betula spp	birch	-	-	-	-
Corylus cf avellana	hazel	-	-	-	-
Ericales	heather type	30 (0.34g)	30 (0.20g)	32 (0.23g)	1 (<0.01g)
Prunoideae	cherry type	-	-	-	-
Quercus spp	oak	1 (0.01g)	-	3 (0.02g)	3 (0.08g)
Salix spp	willow	-	2 (0.05g)	-	-
Indet rhizome	indet rhizome	-	-	-	-
Cereals (carbonised)					
Avena spp	oat	-	-	-	-
Hordeum vulgare var nudum	naked barley	-	-	-	
Hordeum vulgare sl	barley	1	1	-	-
cf Hordeum vulgare sl	cf barley	-	-	-	-
Triticum spp	wheat	-	-	-	-
Indet cereal	indet cereal	3	-	-	-
Seeds etc (carbonised)					
Corylus avellana nutshell frags	hazel nutshell	-	-	-	-
Danthonia decumbens	heath-grass	-	-	-	-
Fucoid seaweed	Fucoid seaweed	-	3 (0.02g)	-	-
Rumex spp	docks	-	-	-	-

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Table 20: Pit Groups 1-3

	Group	Pit Group 1				
	Context	235	240	241	248	427
	Sample	171	176	177	187	293
	Description	Fill of pit (234)	Lower fill of pit (242)	Upper fill of pit (242)	Fill of pit (247)	Fill of pit (426)
Volume of charcoal >4 mm		2.5ml	2.5ml	5ml	70ml	10ml
Charcoal						
Alnus cf glutinosa	alder	-	-	9 (0.36g)	-	6 (1.37g)
Corylus cf avellana	hazel	2 (0.05g)	6 (0.23g)	-	-	-
Ericales	heather type	38 (0.32g)	45 (0.48g)	114 (1.07g)	-	78 (0.82g)
Fraxinus spp	ash	-	-	-	-	-
Quercus spp	oak	-	-	-	-	-
Salix spp	willow	-	-	-	-	-
Indet rhizome	indet rhizome	-	-	-	-	-
Indet cinder	indet cinder	-	-	-	19 (0.70g)	-
Cereals (carbonised)						
Hordeum vulgare var vulgare	hulled barley	-	-	-	-	-
Hordeum vulgare sl	barley	1	1	-	3	2
cf Hordeum vulgare sl	cf barley	-	-	-	-	-
Triticum dicoccum	emmer wheat	-	-	-	-	-
Triticum spp	wheat	-	-	-	-	-
cf Triticum spp	cf wheat	-	-	-	-	-
Indet cereal	indet cereal	2	1	-	-	3
Seeds etc (carbonised)						
cf Aphanes arvensis	parsley piert	-	-	-	-	-
Carex spp biconvex	sedge biconvex	-	-	-	-	-
Corylus avellana nutshell frags	hazel nutshell	-	-	-	1208 (29.60g)	1 (<0.01g)
Corylus avellana nutshell whole	hazel nutshell whole	-	-	-	3 (1.38g)	-
Lamiaceae	dead nettle familiy	-	-	-	-	-
Misc						
Bone	bone	-	-	-	-	-

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Table 20 *(continued)*: **Pit Groups 1-3**

	Group	Pit Group 2				
	Context	204	212	231	258	284
	Sample	147	168	164	183	211
	Description	Upper fill of pit (203)	Upper fill of pit (211)	Lower fill of pit (203)	Fill of post pit (257)	Fill of pit (263)
Volume of charcoal >4 mm		10ml	5ml	15ml	<<2.5ml	<2.5ml
Charcoal						
Alnus cf glutinosa	alder	-	10 (0.24g)	-	-	-
Corylus cf avellana	hazel	-	-	-	-	-
Ericales	heather type	89 (1.62g)	11 (0.17g)	41 (0.65g)	4 (0.04g)	10 (0.14g)
Fraxinus spp	ash	-	-	-	-	-
Quercus spp	oak	-	-	9 (1.51g)	-	3 (0.04g)
Salix spp	willow	-	-	-	-	-
Indet rhizome	indet rhizome	-	-	-	-	-
Indet cinder	indet cinder	-	-	-	-	-
Cereals (carbonised)						
Hordeum vulgare var vulgare	hulled barley	-	-	-	-	-
Hordeum vulgare sl	barley	6	1	2	2	-
cf Hordeum vulgare sl	cf barley	-	-	-	-	-
Triticum dicoccum	emmer wheat	-	-	-	-	-
Triticum spp	wheat	-	-	-	-	-
cf Triticum spp	cf wheat	1	-	-	-	-
Indet cereal	indet cereal	11	-	2	-	-
Seeds etc (carbonised)						
cf Aphanes arvensis	parsley piert	-	-	-	-	-
Carex spp biconvex	sedge biconvex	-	-	-	-	-
Corylus avellana nutshell frags	hazel nutshell	-	-	-	3 (<0.01g)	-
Corylus avellana nutshell whole	hazel nutshell whole	-	-	-	-	-
Lamiaceae	dead nettle familiy	-	-	-	-	-
Misc						
Bone	bone	-	24 (0.52g)	-	-	-

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Table 20 *(continued)*: **Pit Groups 1-3**

	Group	Pit Group 2			Pit Group 3	
	Context	292	345	2443	349	389
	Sample	205	230	1451	249	259
	Description	Upper fill of pit (291)	Fill of pit (291)	Fill of pit (2442)	Fill of pit (348)	Upper fill of pit (388)
Volume of charcoal >4 mm		15ml	70ml	<<2.5ml	2.5ml	5ml
Charcoal						
Alnus cf glutinosa	alder	6 (0.61g)	4 (0.44g)	-	-	-
Corylus cf avellana	hazel	4 (0.13g)	3 (1.65g)	-	-	-
Ericales	heather type	28 (0.27g)	-	5 (0.01g)	24 (0.19g)	36 (0.44g)
Fraxinus spp	ash	-	146 (13.98g)	-	-	-
Quercus spp	oak	2 (0.06g)	-	3 (0.05g)	-	-
Salix spp	willow	2 (0.72g)	-	-	1 (0.04g)	1 (0.58g)
Indet rhizome	indet rhizome	-	-	-	-	6 (0.23g)
Indet cinder	indet cinder	-	-	-	-	-
Cereals (carbonised)						
Hordeum vulgare var vulgare	hulled barley	1	-	-	-	-
Hordeum vulgare sl	barley	53	23	-	1	3
cf Hordeum vulgare sl	cf barley	34	11	-	-	-
Triticum dicoccum	emmer wheat	1	-	-	-	-
Triticum spp	wheat	-	1	-	-	-
cf Triticum spp	cf wheat	-	-	-	-	-
Indet cereal	indet cereal	7	-	-	3	7
Seeds etc (carbonised)						
cf Aphanes arvensis	parsley piert	2	-	-	-	-
Carex spp biconvex	sedge biconvex	3	-	-	-	-
Corylus avellana nutshell frags	hazel nutshell	-	-	-	-	-
Corylus avellana nutshell whole	hazel nutshell whole	-	-	-	-	-
Lamiaceae	dead nettle familiy	2	-	-	-	-
Misc						
Bone	bone	-	-	-	-	-

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Table 21: Pit Groups 4-6

	Structure	Pit Group 4			Pit Group 5	
	Context	1552	1575	1597	1140	1318
	Sample	850	875	876	649	692
	Description	Fill of pit (1551)	Fill of pit (1574)	Fill of pit (1596)	Fill of pit (1139)	Fill of pit (1317)
Volume of charcoal >4 mm		2.5ml	5ml	10ml	5ml	5ml
Charcoal						
Alnus cf glutinosa	alder	-	1 (0.03g)	-	-	-
Betula spp	birch	-	-	-	-	-
Corylus cf avellana	hazel	-	1 (0.22g)	8 (0.81g)	1 (0.01g)	-
Ericales	heather type	37 (0.28g)	56 (0.38g)	34 (0.33g)	82 (0.35g)	52 (0.50g)
Quercus spp	oak	3 (0.02g)	3 (0.07g)	-	2 (0.02g)	4 (0.03g)
Salix spp	willow	-	-	-	-	-
Indet rhizome	indet rhizome	-	1 (0.03g)	-	-	-
Cereals (carbonised)						
Hordeum vulgare var nudum	naked barley	-	-	-	-	-
Hordeum vulgare sl	barley	-	1	1	-	1
cf Hordeum vulgare sl	cf barley	-	-	-	-	-
Triticum spp	wheat	-	-	1	-	-
Indet cereal	indet cereal	-	3	1	1	-
Rachis internode	Rachis internode	-	-	-	-	-
Seeds etc (carbonised)						
Bromus spp	brome grass	-	-	-	-	-
Carex spp biconvex	sedge biconvex	-	-	-	-	-
Carex spp trigonous	sedge trigonous	-	-	-	2	-
Cerastium / Stellaria	mouse-ear/ stitchwort	-	-	-	-	-
Chenopodium album	fathen	-	-	-	-	-
Corylus avellana nutshell frags	hazel nutshell	-	-	-	-	-
Danthonia decumbens	heath-grass	-	-	-	-	-
Plantago spp	plantain	-	-	-	-	-
Rumex spp	docks	-	-	-	-	-

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Table 21 *(continued)*: **Pit Groups 4-6**

	Structure	Pit Group 6					
	Context	1339	1349	1362	1363	1405	1406
	Sample	?	745	777	775	778	779
	Description	Fill of pit (1338)	Upper fill of pit (1348)	Upper fill of pit (1361)	Lower fill of pit (1348)	Fill of pit (1361)	Lower fill of (1361)
Volume of charcoal >4 mm		10ml	5ml	2.5ml	<2.5ml	<<2.5ml	<<2.5ml
Charcoal							
Alnus cf glutinosa	alder	-	-	3 (0.04g)	-	-	-
Betula spp	birch	-	-	1 (0.07g)	-	-	-
Corylus cf avellana	hazel	5 (0.05g)	5 (0.24g)	1 (0.05g)	-	1 (0.02g)	-
Ericales	heather type	107 (1.05g)	145 (1.10g)	66 (0.47g)	50 (0.35g)	20 (0.06g)	6 (0.06g)
Quercus spp	oak	-	4 (0.05g)	-	-	-	-
Salix spp	willow	1 (0.03g)	-	1 (0.02g)	-	-	-
Indet rhizome	indet rhizome	13 (0.33g)	-	-	-	-	-
Cereals (carbonised)							
Hordeum vulgare var nudum	naked barley	3	-	-	-	-	-
Hordeum vulgare sl	barley	7	-	-	-	-	-
cf Hordeum vulgare sl	cf barley	-	2	-	-	-	-
Triticum spp	wheat	-	-	-	-	-	-
Indet cereal	indet cereal	22	4	1	3	-	-
Rachis internode	Rachis internode	1	-	-	-	-	-
Seeds etc (carbonised)							
Bromus spp	brome grass	1	-	-	-	-	-
Carex spp biconvex	sedge biconvex	7	2	-	-	-	-
Carex spp trigonous	sedge trigonous	15	-	-	-	-	-
Cerastium / Stellaria	mouse-ear/ stitchwort	1	1	-	-	-	-
Chenopodium album	fathen	2	-	-	-	-	-
Corylus avellana nutshell frags	hazel nutshell	-	-	1 (<0.01g)	-	-	-
Danthonia decumbens	heath-grass	3	3	-	-	-	-
Plantago spp	plantain	1	-	-	-	-	-
Rumex spp	docks	-	1	-	-	-	-

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Table 22: Pit Groups 7 and 8

	Structure	Pit Group 7						
	Context	1357	1366	1367	1369	1370	1374	1380
	Sample	751	756	757	759	760	761	776
	Description	Fill of pit (1302)	Upper fill of pit (1308)	Lower fill of pit (1308)	Upper fill of pit (1368)	Lower fill of (1368)	Fill of pit (1373)	Fill of pit (1368)
Volume of charcoal >4 mm		<2.5ml	5ml	<<2.5ml	5ml	10ml	2.5ml	10ml
Charcoal								
Betula spp	birch	-	-	-	-	10 (1.59g)	-	-
Corylus cf avellana	hazel	1 (0.02g)	1 (0.05g)	-	4 (0.48g)	4 (0.07g)	-	4 (0.06g)
Ericales	heather type	11 (0.11g)	31 (0.27g)	3 (0.04g)	9 (0.08g)	13 (0.14g)	20 (0.15g)	37 (0.58g)
Quercus spp	oak	-	-	-	-	1 (0.10g)	-	5 (0.03g)
Salix spp	willow	-	-	-	-	-	1 (0.02g)	-
Indet rhizome	indet rhizome	-	-	4 (0.16g)	-	5 (0.10g)	-	-
Cereals (carbonised)								
Hordeum vulgare sl	barley	-	-	-	1	4	-	1
Triticum dicoccum	emmer wheat	-	-	-	-	1	-	-
Indet cereal	indet cereal	-	1	-	-	6	-	-
Seeds etc (carbonised)								
Bromus spp	brome grass	-	-	-	-	1	-	1
Carex spp biconvex	sedge biconvex	-	-	-	-	-	-	-
Carex spp trigonous	sedge trigonous	-	-	1	-	2	-	2
Cerastium / Stellaria	mouse-ear/ stitchwort	-	-	-	-	1	-	-
Chenopodium album	fathen	-	-	-	-	-	-	1
Corylus avellana nutshell frags	hazel nutshell	-	1 (<0.01g)	-	-	-	-	-
Danthonia decumbens	heath-grass	-	-	-	-	-	-	1
Galeopsis tetrahit	common hemp-nettle	-	-	-	-	1	1	-
Persicaria maculosa	redshank	-	-	-	-	-	-	-
Potentilla spp	cinquefoil	-	-	-	-	-	-	-
Rumex spp	docks	-	-	-	-	-	-	-
Scirpus spp	rush	-	-	-	-	-	1	-
Vicia spp	vetch	-	-	-	-	-	-	-

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Table 22 (continued): Pit Groups 7 and 8

	Structure	Pit Group 8	
	Context	1577	1587
	Sample	865	882
	Description	Fill of pit (1576)	Fill of pit (1588)
Volume of charcoal >4 mm		2.5ml	5ml
Charcoal			
Betula spp	birch	6 (0.20g)	-
Corylus cf avellana	hazel	-	-
Ericales	heather type	10 (0.03g)	128 (1.02g)
Quercus spp	oak	-	-
Salix spp	willow	-	-
Indet rhizome	indet rhizome	1 (0.02g)	4 (0.27g)
Cereals (carbonised)			
Hordeum vulgare sl	barley	1	-
Triticum dicoccum	emmer wheat	-	-
Indet cereal	indet cereal	1	-
Seeds etc (carbonised)			
Bromus spp	brome grass	1	-
Carex spp biconvex	sedge biconvex	1	-
Carex spp trigonous	sedge trigonous	6	6
Cerastium / Stellaria	mouse-ear/ stitchwort	-	-
Chenopodium album	fathen	-	-
Corylus avellana nutshell frags	hazel nutshell	-	-
Danthonia decumbens	heath-grass	-	2
Galeopsis tetrahit	common hemp-nettle	-	-
Persicaria maculosa	redshank	2	-
Potentilla spp	cinquefoil	-	1
Rumex spp	docks	1	-
Scirpus spp	rush	-	1
Vicia spp	vetch	2	-

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Table 23: Pit Groups 9 and 10

	Structure	Pit Group 9				Pit Group 10	
	Context	1615	1616	1617	1629	2060	2111
	Sample	899	901	903	909	1202	1236
	Description	Uppermost fill of pit (1614)	Middle fill of pit (1614)	Third/ lower fill of pit (1614)	Fill of pit (1628)	Fill of pit (2059)	Fill of pit (2112)
Volume of charcoal >4 mm		<<2.5ml	<2.5ml	<2.5ml	2.5ml	<<2.5ml	5ml
Charcoal							
Alnus cf glutinosa	alder	-	-	-	-	-	1 (0.02g)
Betula spp	birch	-	-	-	1 (0.04g)	-	-
Corylus cf avellana	hazel	-	-	-	-	-	3 (0.06g)
Ericales	heather type	20 (0.15g)	60 (0.37g)	42 (0.36g)	31 (0.16g)	13 (0.08g)	130 (0.76g)
Indet rhizome	indet rhizome	-	-	-	1 (0.07g)	-	-
Cereals (carbonised)							
Avena spp	oat	-	-	-	-	-	1
Hordeum vulgare sl	barley	-	1	-	-	1	6
Indet cereal	indet cereal	-	3	5	-	1	8

Table 24: Pit Groups 11 and 12

	Structure	Pit Group 11					
	Context	2104	2125	2126	2274	2275	2276
	Sample	1229	1247	1248	1317	1318	1319
	Description	Upper fill of pit (2103)	Fill of pit (2103)	Lower fill of pit (2103)	Upper fill of pit (2273)	Fill of pit (2273)	Lower fill of (2273)
Volume of charcoal >4 mm		5ml	2.5ml	<2.5ml	<<2.5ml	2.5ml	2.5ml
Charcoal							
Alnus cf glutinosa	alder	-	-	-	-	-	-
Betula spp	birch	-	-	-	-	-	1 (0.02g)
Corylus cf avellana	hazel	1 (0.08g)	-	-	-	-	-
Ericales	heather type	70 (0.59g)	27 (0.26g)	53 (0.39g)	12 (0.11g)	25 (0.26g)	60 (0.30g)
Quercus spp	oak	-	4 (0.02g)	-	-	-	-
Indet rhizome	indet rhizome	-	3 (0.06g)	-	-	-	-
Cereals (carbonised)							
Avena spp	oat	1	-	-	-	-	-
cf Avena spp	cf oat	-	-	-	-	-	4
Hordeum vulgare sl	barley	4	-	-	-	-	1
Triticum spp	wheat	-	-	-	-	-	2
cf Triticum spp	cf wheat	-	-	-	-	-	-
Indet cereal	indet cereal	7	-	1	4	2	7
Seeds etc (carbonised)							
Bromus spp	brome grass	-	-	-	-	-	-
Carex spp trigonous	sedge trigonous	-	-	-	-	-	-
Danthonia decumbens	heath-grass	-	-	-	-	-	-
cf Linum catharticum	cf fairy flax	-	-	-	-	-	-

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Table 24 *(continued)*: **Pit Groups 11 and 12**

	Structure	Pit Group 12						
	Context	2711	2952	2954	2956	2966	2994	2995
	Sample	1606	1773	1772	1762	1767	1788	1789
	Description	Fill of ard mark (2710)	Lower fill of pit (2953)	Upper fill of pit (2953)	Fill of curvilinear (2955)	Upper fill of pit (2965)	Lower fill of pit (2993)	Upper fill of (2993)
Volume of charcoal >4 mm		-	<2.5ml	5ml	2.5ml	<2.5ml	10ml	2.5ml
Charcoal								
Alnus cf glutinosa	alder	-	-	-	5 (0.17g)	-	-	-
Betula spp	birch	-	-	-	-	-	-	-
Corylus cf avellana	hazel	-	-	4 (0.04g)	-	-	1 (0.02g)	1 (0.02g)
Ericales	heather type	-	4 (0.06g)	102 (0.86g)	14 (0.12g)	24 (0.22g)	226 (2.19g)	83 (0.43g)
Quercus spp	oak	-	3 (0.03g)	-	5 (0.13g)	-	2 (0.04g)	2 (0.02g)
Indet rhizome	indet rhizome	-	2 (0.03g)	-	2 (0.05g)	-	3 (0.25g)	-
Cereals (carbonised)								
Avena spp	oat	-	-	-	-	-	-	-
cf Avena spp	cf oat	-	-	-	-	-	-	-
Hordeum vulgare sl	barley	-	-	3	-	5	3	3
Triticum spp	wheat	-	-	-	-	-	-	-
cf Triticum spp	cf wheat	-	-	-	-	-	1	-
Indet cereal	indet cereal	-	-	3	-	5	7	3
Seeds etc (carbonised)								
Bromus spp	brome grass	-	-	-	-	1	-	-
Carex spp trigonous	sedge trigonous	-	-	2	-	-	2	-
Danthonia decumbens	heath-grass	-	-	1	-	1	1	-
cf Linum catharticum	cf fairy flax	-	-	1	-	-	-	-

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Table 25: Pit Alignments

	Structure	East / West Pit alignment				
	Context	1905	1905	1907	1909	1909
	Sample	1103	1139	1081	1125	1129
	Description	Backfill of stone lining of (1903)	Backfill of stone lining of (1903)	Fill of pit/ possible cist (1906)	Fill of pit/ possible cist (1908)	Fill of pit/ possible cist (1908)
Volume of charcoal >4 mm		-	<<2.5ml	2.5ml	-	<<2.5ml
Charcoal						
Alnus cf glutinosa	alder	-	-	-	-	-
Corylus cf avellana	hazel	-	-	4 (0.07g)	-	1 (0.01g)
Ericales	heather type	-	-	10 (0.10g)	-	-
Quercus spp	oak	-	-	2 (0.01g)	-	-
Salix spp	willow	-	-	-	-	-
Cereals (carbonised)						
Hordeum vulgare sl	barley	-	-	2	-	-
cf Hordeum vulgare sl	cf barley	-	-	2	-	-
Seeds etc (carbonised)						
Arrhenatherum elatius ssp bulbosum bulb	tuber oat grass	-	-	1	-	-
Corylus avellana nutshell frags	hazel nutshell	-	1 (<0.01g)	1 (<0.01g)	-	-
Galium aparine	cleavers	-	-	2	-	-
Spergula arvensis	corn spurrey	-	-	1	-	-

	Structure	NE / SW Pit alignment	Small pit alignment	Double pit alignment	
	Context	1991	025	3272/3273	3283
	Sample	1177	011	1929	1945
	Description	Fill of pit (1990)	Fill of pit (024)	Cut of pit (3272)	Fill of pit (3282)
Volume of charcoal >4 mm		30ml	-	<<2.5ml	<2.5ml
Charcoal					
Alnus cf glutinosa	alder	78 (3.93g)	-	-	-
Corylus cf avellana	hazel	-	-	-	4 (0.10g)
Ericales	heather type	-	-	10 (0.09g)	3 (0.01g)
Quercus spp	oak	-	-	-	2 (0.02g)
Salix spp	willow	22 (2.01g)	-	-	-
Cereals (carbonised)					
Hordeum vulgare sl	barley	-	-	-	-
cf Hordeum vulgare sl	cf barley	-	-	-	-
Seeds etc (carbonised)					
Arrhenatherum elatius ssp bulbosum bulb	tuber oat grass	-	-	-	-
Corylus avellana nutshell frags	hazel nutshell	-	-	-	-
Galium aparine	cleavers	-	-	-	-
Spergula arvensis	corn spurrey	-	-	-	-

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Table 26: Isolated Pits

	Structure	Isolated pits					
	Context	1549	1550	1818	1819	2084	2089
	Sample	868	869	1029	1030	1218	1243
	Description	Upper fill of pit (1548)	Lower fill of pit (1548)	Upper fill of pit (1817)	Lower fill of pit (1817)	Upper fill of pit (2083)	Lower fill of pit (2083)
Volume of charcoal >4 mm		<2.5ml	20ml	5ml	2.5ml	<<2.5ml	<2.5ml
Charcoal							
Betula spp	birch		1 (0.04g)	-	-	-	-
Corylus cf avellana	hazel		-	1 (0.05g)	-	-	-
Ericales	heather type	15 (0.19g)	112 (1.07g)	35 (0.42g)	14 (0.40g)	2 (0.04g)	18 (0.14g)
Quercus spp	oak		1 (0.02g)	-	-	-	-
Cereals (carbonised)							
Hordeum vulgare var vulgare	hulled barley	-	3	-	-	-	-
Hordeum vulgare var nudum	naked barley	-	4	-	-	-	-
Hordeum vulgare sl	barley	47	56	-	-	-	-
cf Hordeum vulgare sl	cf barley	22	58	-	-	-	-
Triticum dicoccum	emmer wheat	-	4	-	-	-	-
Triticum cf dicoccum	cf emmer wheat	-	13	-	-	-	-
Triticum spp	wheat	14	-	-	-	-	-
Indet cereal	indet cereal	64	214	1	-	-	2
Seeds etc (carbonised)							
Carex spp biconvex	sedge biconvex	-	7	-	-	-	-
Carex spp trigonous	sedge trigonous	-	1	-	-	-	-
Corylus avellana nutshell frags	hazel nutshell	-	-	42 (0.65g)	17 (0.16g)	-	-
Galeopsis tetrahit	common hemp-nettle	-	1	-	-	-	-
Plantago spp	plantain	-	-	-	-	-	1

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Table 27: Linears

	Structure	Rectangular linear		Curvilinear	
	Context	011	591	019	2585
	Sample	022	385	007	1537
	Description	Secondary fill of ditch (010)	Fill of square ditch (590)	Fill of curvilinear (018)	Fill of enclosure ditch (2584)
Volume of charcoal >4 mm		<2.5ml	<2.5ml	<2.5ml	<<2.5ml
Charcoal					
Betula spp	birch	-	-	-	-
Corylus cf avellana	hazel	1 (0.03g)	-	-	-
Ericales	heather type	30 (0.23g)	3 (0.03g)	4 (0.06g)	32 (0.23g)
Quercus spp	oak	-	-	1 (0.01g)	3 (0.01g)
Indet charcoal	indet charcoal	-	-	-	-
Cereals (carbonised)					
cf Avena spp	cf oat	-	-	-	-
Hordeum vulgare sl	barley	-	-	-	-
cf Hordeum vulgare sl	cf barley	-	-	-	-
Indet cereal	indet cereal	-	-	-	-
Seeds etc (carbonised)					
Corylus avellana nutshell frags	hazel nutshell	1 (0.05g)	-	-	-
Raphanus raphanistrum	wild radish	-	-	-	-
Raphanus raphanistrum pod frag	wild radish pod frag	-	-	-	-

	Structure	Linear features			
	Context	953	1622	1937	2035
	Sample	591	912	1151	1220
	Description	Fill of ditch (952)	Fill of linear feature (1621)	Cut of linear (1937)	Fill of linear (2034)
Volume of charcoal >4 mm		5ml	<2.5ml	<2.5ml	<2.5ml
Charcoal					
Betula spp	birch	-	2 (0.07g)	-	-
Corylus cf avellana	hazel	-	1 (0.01g)	-	-
Ericales	heather type	56 (0.27g)	46 (0.20g)	-	22 (0.15g)
Quercus spp	oak	6 (0.21g)	1 (0.02g)	-	-
Indet charcoal	indet charcoal	-	-	7 (0.21g)	-
Cereals (carbonised)					
cf Avena spp	cf oat	-	-	-	1
Hordeum vulgare sl	barley	-	-	1	-
cf Hordeum vulgare sl	cf barley	-	-	-	1
Indet cereal	indet cereal	4	9	-	2
Seeds etc (carbonised)					
Corylus avellana nutshell frags	hazel nutshell	1 (<0.01g)	-	-	-
Raphanus raphanistrum	wild radish	-	1	-	-
Raphanus raphanistrum pod frag	wild radish pod frag	-	1	-	-

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Table 28: Fort Ditches

	Structure	Ditch 4		Ditch 3			Ditch 2		
	Context	2508	2599	2530	2531	2532	2562	2563	2564
	Sample	1524	1647	1649	1627	1651	1642	1641	1637
	Description	Fill of ditch 4 (2507)	Deposit at base of ditch (2507)	Upper fill of ditch 3 (2529)	Middle fill of ditch 3 (2529)	Lower fill of ditch 3 (2529)	Upper fill of ditch 2 (2561)	Fill of ditch 2 (2561)	Lower fill of ditch 2 (2561)
Volume of charcoal >4 mm		<<2.5ml	<<2.5ml	<<2.5ml	<<2.5ml	<<2.5ml	<2.5ml	<<2.5ml	<<2.5ml
Charcoal									
Alnus cf glutinosa	alder	-	-	-	-	-	-	1 (<0.01g)	-
Corylus cf avellana	hazel	-	-	-	1 (0.01g)	-	-	-	1 (0.02g)
Ericales	heather type	7 (0.05g)	17 (0.10g)	5 (0.03g)	12 (0.05g)	12 (0.06g)	6 (0.05g)	9 (0.03g)	1 (0.02g)
Quercus spp	oak	-	1 (<0.01g)	1 (0.01g)	-	-	2 (0.02g)	-	1 (0.01g)
Indet rhizome	indet rhizome	-	-	2 (0.03g)	2 (0.02g)	-	-	-	-
Cereals (carbonised)									
Indet cereal	indet cereal	1	2	-	-	-	1	-	1
Seeds etc (carbonised)									
Carex spp biconvex	sedge biconvex	-	-	-	-	-	-	-	-
Cerastium / Stellaria	mouse-ear/ stitchwort	-	-	-	-	-	-	-	-
Corylus avellana nutshell frags	hazel nutshell	-	1 (0.01g)	-		-	-	-	-
Danthonia decumbens	heath-grass	-	-	-	-	-	-	-	-
Persicaria maculosa	redshank	-	-	-	-		-	-	-
Poaceae	grass	-	-	-	-	-	-	-	-
Polygonum aviculare	knotgrass	-	-	-	-	-	-	-	-
Scirpus spp	rush	-	-	-	-	-	-	-	-
Misc									
Bone	bone	-	-	-	1 (0.10g)	-	-	-	-

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Table 28 *(continued)*: **Fort Ditches**

	Structure	Ditch 1			Ditch 0				
	Context	2683	2684	2686	2656	2657	2659	2660	2661
	Sample	1674	1673	1607	1571	1630	1629	1632	1633
	Description	Lower fill of ditch 1 - (2682)	Upper fill of ditch 1 - (2682)	Fill of re-cut (2685)	Upper fill of ditch 0 - (2655)	Fill of ditch 0 (2655)	Fill of ditch 0 - (2655)	Fill of ditch 0 - (2655)	Lower fill of ditch 0 - (2655)
Volume of charcoal >4 mm		<<2.5ml	<<2.5ml	<2.5ml	<2.5ml	<<2.5ml	<<2.5ml	<<2.5ml	<2.5ml
Charcoal									
Alnus cf glutinosa	alder	-	-	1 (0.01g)	-	-	-	-	-
Corylus cf avellana	hazel	-	-	-	1 (0.03g)	-	-	-	-
Ericales	heather type	7 (0.02g)	6 (0.06g)	10 (0.03g)	14 (0.11g)	5 (0.05g)	19 (0.09g)	4 (0.06g)	7 (0.04g)
Quercus spp	oak	1 (0.01g)	3 (0.04g)	-	-	-	-	1 (<0.01g)	-
Indet rhizome	indet rhizome	-	-	-	-	1 (0.02g)	-	-	-
Cereals (carbonised)									
Indet cereal	indet cereal	-	-	-	-	-	1	-	-
Seeds etc (carbonised)									-
Carex spp biconvex	sedge biconvex	-	-	2	-	-	-	-	-
Cerastium / Stellaria	mouse-ear/ stitchwort	-	-	1	-	-	-	-	-
Corylus avellana nutshell frags	hazel nutshell	-	-	2 (<0.01g)	-	-	-	1 (<0.01g)	-
Danthonia decumbens	heath-grass	-	-	1	-	-	-	-	-
Persicaria maculosa	redshank	-	-	1	-	-	-	-	-
Poaceae	grass	-	-	5	-	-	-	-	-
Polygonum aviculare	knotgrass	-	-	1	-	-	-	-	-
Scirpus spp	rush	-	-	2	-	-	-	-	-
Misc									
Bone	bone	-	-	-	-	-	-	-	-

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Table 29: Pollen

		Context 2562				
		Monolith A				
Pollen Taxa	Common name	0-1cm	7-8cm	14-15cm	21-22cm	28-29cm
Trees						
Alnus spp	alder	-	-	-	-	-
Heaths						
Calluna vulgaris	heather	-	-	1	-	-
Herbaceous						
Poaceae	grass	2	2	-	1	-
Cereal type	cereal type	-	-	-	-	1
Cyperaceae	sedge	1	-	-	-	-
Caryophyllaceae	pink family	-	-	-	-	-
Rumex spp	docks	-	-	1	-	2
Ferns						
Filicales	fern	1	1	1	-	-
Polypodium	polypody fern	1	-	-	-	-
Other						
Indeterminate pollen	indeterminate pollen	-	2	-	-	-
Gelasinospora	fungal spore	-	-	-	-	-
pre-Quaternary spore	pre-Quaternary spore	1	-	-	1	1

		Context 2562				
		Monolith B				
Pollen Taxa	Common name	0-1cm	7-8cm	14-15cm	21-22cm	28-29cm
Trees						
Alnus spp	alder	-	-	-	-	-
Heaths						
Calluna vulgaris	heather	-	-	-	-	-
Herbaceous						
Poaceae	grass	-	2	1	-	-
Cereal type	cereal type	-	-	-	-	-
Cyperaceae	sedge	-	-	-	-	-
Caryophyllaceae	pink family	-		-	-	-
Rumex spp	docks	-	-	-	-	-
Ferns						
Filicales	fern	-	-	1	-	-
Polypodium	polypody fern	-	-	-	-	-
Other						
Indeterminate pollen	indeterminate pollen	-	-	-	-	-
Gelasinospora	fungal spore	-	-	-	-	-
pre-Quaternary spore	pre-Quaternary spore	-	-	-	-	-

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Table 29 *(continued)*: **Pollen**

		Context 2562 / 2563				
		Monolith C				
Pollen Taxa	Common name	0-1cm	6-7cm	12-13cm	18-19cm	24-25cm
Trees						
Alnus spp	alder	-	-	-	-	1
Heaths						
Calluna vulgaris	heather	-	-	1	-	-
Herbaceous						
Poaceae	grass	-	1	-	-	1
Cereal type	cereal type	-	-	-	-	-
Cyperaceae	sedge	-	-	-	-	-
Caryophyllaceae	pink family	-	1	1	-	-
Rumex spp	docks	-	-	-	-	-
Ferns						
Filicales	fern	-	1	-	1	-
Polypodium	polypody fern	-	1	1	-	1
Other						
Indeterminate pollen	indeterminate pollen	-	-	-	-	-
Gelasinospora	fungal spore	-	10	1	-	-
pre-Quaternary spore	pre-Quaternary spore	-	-	2	1	2

Table 30: Pollen

		Context 2563				
		Monolith D				
Pollen Taxa	Common name	0-1cm	6-7cm	12-13cm	18-19cm	24-25cm
Trees						
Alnus spp	alder	1	-	-	-	-
Herbaceous						
Poaceae	grass	-	-	-	-	-
Caryophyllaceae	pink family	-	-	-	1	-
Lactuceae	dandelion type	-	-	-	-	-
Plantago lanceolata	ribwort plantain	-	-	-	1	-
Ranunculaceae	buttercup family	-	-	-	-	-
Succisa pratensis	devil's bit scabious	-	-	-	-	-
Ferns						
Filicales	fern	1	3	-	-	-
Polypodium	polypody fern	2	5	-	1	-
Other						
pre-Quaternary spore	pre-Quaternary spore	-	-	-	1	4

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Table 30 *(continued)*: **Pollen**

		Context 2564 / 002				
		Monolith F				
Pollen Taxa	Common name	0-1cm	7-8cm	14-15cm	21-22cm	28-29cm
Trees						
Alnus spp	alder	-	-	-	-	-
Herbaceous						
Poaceae	grass	-	2	-	-	1
Caryophyllaceae	pink family	-	1	-	-	-
Lactuceae	dandelion type	-	1	2	-	7
Plantago lanceolata	ribwort plantain	-	-	-	-	-
Ranunculaceae	buttercup family	-	-	1	-	1
Succisa pratensis	devil's bit scabious	-	-	-	1	-
Ferns						
Filicales	fern	-	-	-	-	-
Polypodium	polypody fern	1	1	-	-	-
Other						
pre-Quaternary spore	pre-Quaternary spore	4	4	2	3	1

		Context 2564 / 002				
		Monolith F				
Pollen Taxa	Common name	0-1cm	7-8cm	14-15cm	21-22cm	28-29cm
Trees						
Alnus spp	alder	-	-	-	-	-
Herbaceous						
Poaceae	grass	-	2	-	-	1
Caryophyllaceae	pink family	-	1	-	-	-
Lactuceae	dandelion type	-	1	2	-	7
Plantago lanceolata	ribwort plantain	-	-	-	-	-
Ranunculaceae	buttercup family	-	-	1	-	1
Succisa pratensis	devil's bit scabious	-	-	-	1	-
Ferns						
Filicales	fern	-	-	-	-	-
Polypodium	polypody fern	1	1	-	-	-
Other						
pre-Quaternary spore	pre-Quaternary spore	4	4	2	3	1

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Table 31: Double Kilns

	Structure	Structure 32 - Double kiln		Structure 33 - Double kiln	
	Context	2569	2591	2610	2612
	Sample	1531	1533	1549	1548
	Description	Fill of flue no. 1 (2606)	Clay fill of kiln (2593)	Fill of lower kiln (2611)	Upper fill of linear (2602)
Volume of charcoal >4 mm		10ml	<2.5ml	5ml	2.5ml
Charcoal					
Alnus cf glutinosa	alder	2 (0.07g)	-	-	-
Betula spp	birch	6 (0.43g)	-	-	-
Corylus cf avellana	hazel	-	-	1 (0.03g)	-
Ericales	heather type	31 (0.42g)	22 (0.41g)	110 (0.80g)	71 (0.47g)
Fraxinus spp	ash	2 (0.04g)	-	-	-
Maloideae	rowan type	-	-	-	1 (0.03g)
Quercus spp	oak	2 (0.06g)	-	-	-
Indet cinder	indet cinder	-	-	1 (0.15g)	-
Cereals (carbonised)					
Avena spp	oat	12	-	1	2
cf Avena spp	cf oats	-	1	-	-
Hordeum vulgare var vulgare	hulled barley	3	1	-	-
Hordeum vulgare sl	barley	23	1	2	4
Indet cereal	indet cereal	65	4	8	3
Seeds etc (carbonised)					
Cerastium / Stellaria	mouse-ear/ stitchwort	4	-	1	-
Chenopodium album	fathen	1	-	-	-
Chenopodiaceae	goosefoot family	1	-	-	-
Corylus avellana nutshell frags	hazel nutshell	-	-	1 (0.02g)	-
Danthonia decumbens	heath-grass	-	-	1	-
Fabaceae	pea family	6	-	-	-
Fallopia convolvulus	black bindweed	-	1	-	-
Galeopsis tetrahit	common hemp-nettle	1	-	-	-
Galium aparine	cleavers	1	1	-	-
Potentilla spp	cinquefoil	-	-	1	-
Rumex spp	docks	-	-	1	-
Scirpus spp	rush	-	1	-	-

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Table 32: Other Kilns

	Structure	Corn drying kiln		Lime kiln	
	Context	2115	2144	2018	2019
	Sample	1238	1264	1257	1258
	Description	Fill of kiln (2113)	Fill of kiln (2113)	Lining of lime kiln (2017)	Lining of lime kiln (2017)
Volume of charcoal >4 mm		30ml	50ml	-	-
Charcoal					
Alnus cf glutinosa	alder	39 (1.65g)	51 (2.55g)	-	-
Corylus cf avellana	hazel	9 (0.27g)	17 (1.10g)	-	-
Fraxinus spp	ash	3 (0.18g)	-	-	-
Quercus spp	oak	29 (0.68g)	34 (3.91g)	-	-
Cereals (carbonised)		15% (80ml) ID	25% (90ml) ID		
Avena spp	oat	12	4	-	-
Hordeum vulgare sl	barley	11	7	-	-
Triticum dicoccum	emmer wheat	1626	1704	-	-
Triticum cf dicoccum	cf emmer wheat	300	339	-	-
Triticum spp	wheat	807	464	-	-
Indet cereal	indet cereal	700	675	-	-
Culm frags	Culm frags	-	4	-	-
Clumps of burnt grain	Clumps of burnt grain	50ml	10ml	-	-
Seeds etc (carbonised)					
Agrostemma githago	corncockle	73	74	-	-
Carex spp biconvex	sedge biconvex	2	20	-	-
Carex spp trigonous	sedge trigonous	12	-	-	-
Cerastium / Stellaria	mouse-ear/ stitchwort	-	1	-	-
Cirsium spp	thistle	1	-	-	-
Fabaceae	pea family	292	251	-	-
Fallopia convolvulus	black bindweed	7	-	-	-
Galium aparine	cleavers	1	1	-	-
Glebionis segetum	corn marigold	58	21	-	-
Leontodon spp	hawkbit	29	15	-	-
Plantago spp	plantain	5	-	-	-
Raphanus raphanistrum pod frag	wild radish pod frag	-	3	-	-
Rumex spp	docks	9	7	-	-
Scirpus spp	rush	39	-	-	-
Spergula arvensis	Corn spurrey	2	1	-	-

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Table 33: Stone Structure 41 and 43

	Structure	ST 41					
	Context	406	407	465	512	513	541
	Sample	261	417	326	344	345	346
	Description	Deposit above deposit (407)	Deposit below deposit (406)	Fill post pit (464)	Fill of pit (510)	Fill of pit (510)	Fill of pit (510)
Volume of charcoal >4 mm		2.5ml	5ml	2.5ml	2.5ml	<<2.5ml	<2.5ml
Charcoal							
Alnus cf glutinosa	alder	-	1 (0.08g)	2 (0.08g)	1 (0.04g)	-	-
Betula spp	birch	1 (0.02g)	-	-	-	-	-
Corylus cf avellana	hazel	-	5 (0.07g)	3 (0.03g)	-	-	-
Ericales	heather type	104 (0.56g)	122 (0.67g)	37 (0.39g)	35 (0.44g)	4 (0.01g)	10 (0.08g)
Fraxinus spp	ash	-	-	-	-	-	-
Quercus spp	oak	-	-	2 (0.03g)	-	-	-
Salix spp	willow	1 (0.01g)	-	1 (0.04g)	-	-	-
Cereals (carbonised)							
Avena spp	oat	-	1	-	-	-	-
Hordeum vulgare sl	barley	-	1	3	-	-	3
Indet cereal	indet cereal	-	1	1		-	3
Seeds etc (carbonised)							
Bromus spp	brome grass	-	-	-	-	-	1

	Structure	ST 41				ST 43	
	Context	564	565	566	669	1693	1691
	Sample	470	357	358	427	948	944
	Description	Deposit similar to pit fill 563	Fill of pit (510)	Fill of pit (510)	Fill of pit (670)	Lowest fill of pit (1690)	Upper fill of stone structure (1692)
Volume of charcoal >4 mm		<<2.5ml	10ml	-	5ml	-	<2.5ml
Charcoal							
Alnus cf glutinosa	alder	-	-	-	-	-	-
Betula spp	birch	-	-	-	-	-	-
Corylus cf avellana	hazel	-	-	-	1 (0.03g)	-	-
Ericales	heather type	8 (0.04g)	2 (0.02g)	-	55 (0.26g)	-	27 (0.23g)
Fraxinus spp	ash	-	4 (2.02g)	-	-	-	-
Quercus spp	oak	3 (0.05g)	-	-	-	-	-
Salix spp	willow	-	-	-	-	-	-
Cereals (carbonised)						-	
Avena spp	oat	-	-	-	-	-	2
Hordeum vulgare sl	barley	-	-	-	-	-	-
Indet cereal	indet cereal	-	-	-	1	1	1
Seeds etc (carbonised)							
Bromus spp	brome grass	-	-	-	-	-	-

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Table 34: Stone Miscellaneous

	Structure	Stone platform	Stone wall footing	Stone Structure 42		Overburden
	Context	2046	1511	1625	1842	2460
	Sample	1309	897	937	1061	1472
	Description	Linear stone deposit	Soil deposit around stones (1515)	Deposit underlying stone structure (1626)	Overburden under stone structures (1843) & (1844)	Overburden deposit below stones (2412)
Volume of charcoal >4 mm		<2.5ml	<2.5ml	<<2.5ml	<<2.5ml	<2.5ml
Charcoal						
Betula spp	birch	-	1 (0.03g)	-	-	-
Ericales	heather type	29 (0.27g)	34 (0.15g)	6 (<0.01g)	3 (0.02g)	9 (0.07g)
Quercus spp	oak	-	1 (0.01g)	-	1 (<0.01g)	1 (<0.01g)
Indet charcoal	indet charcoal	-	-	1 (0.01g)	-	-
Cereals (carbonised)						
Avena spp	oat	1	1	-	-	-
Indet cereal	indet cereal	1	1	-	-	-
Seeds etc (carbonised)						
Arrhenatherum elatius ssp bulbosum bulb	tuber oat grass	-	1	-	-	-
Corylus avellana nutshell frags	hazel nutshell	-	3 (0.05g)	-	-	-

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Table 35: Structure 40

	Structure	ST 40					
	Context	2001	2015	2438	2441	2450	2452
	Sample	1183	1437	1496	1458	1459	1500
	Description	Deposit	Deposit within roundhouse (2000)	Fill of posthole (2506)	Fill of foundation wall (2439)	Rubble deposit in internal side of wall in (2439)	Fill of posthole (2451)
Volume of charcoal >4 mm		5ml	<<2.5ml	2.5ml	2.5ml	<<2.5ml	<2.5ml
Charcoal							
Alnus cf glutinosa	alder	1 (0.06g)	1 (0.05g)	-	-	-	-
Corylus cf avellana	hazel	1 (0.06g)	1 (0.03g)	1 (0.01g)	1 (0.03g)	-	-
Ericales	heather type	7 (0.03g)	-	-	24 (0.13g)	5 (0.04g)	8 (0.03g)
Prunoideae	cherry type	-	-	-	1 (<0.01g)	-	-
Quercus spp	oak	7 (0.12g)	-	18 (0.42g)	4 (0.06g)	1 (0.06g)	9 (0.17g)
Salix spp	willow	-	-	-	-	-	-
Indet rhizome	indet rhizome	-	-	-	2 (0.05g)	-	-
Indet cinder	indet cinder	-	-	-	-	-	5 (0.10g)
Cereals (carbonised)							
Hordeum vulgare sl	barley	-	-	2	-	-	-
cf Hordeum vulgare sl	cf barley	-	-	-	-	-	1
Indet cereal	indet cereal	-	-	-	-	-	1
Seeds etc (carbonised)							
Corylus avellana nutshell frags	hazel nutshell	-	1 (<0.01g)	-	-	-	-
Misc							
Cramp	cramp	6 (0.49g)	-	-	-	-	-
Metallic waste	metallic waste	-	-	-	-	3 (0.14g)	-

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Table 35 *(continued)*: **Structure 40**

	Structure						
	Context	2454	2455	2467	2476	2493	2495
	Sample	1491	1456	1498	1481	1480	1485
	Description	Fill of curvilinear (2453)	Deposit below curvilinear stones (2010)	Deposit between stones (2466)	Fill of pit (2477)	Upper fill of pit (2492)	Deposit
Volume of charcoal >4 mm		<2.5ml	<<2.5ml	<2.5ml	2.5ml	<2.5ml	<<2.5ml
Charcoal							
Alnus cf glutinosa	alder	-	-	-	5 (0.11g)	-	-
Corylus cf avellana	hazel	-	-	1 (0.02g)	-	1 (0.03g)	-
Ericales	heather type	1 (0.02g)	6 (0.07g)	13 (0.12g)	13 (0.19g)	6 (0.06g)	4 (0.03g)
Prunoideae	cherry type	-	-	-	-	-	-
Quercus spp	oak	1 (0.02g)	3 (0.06g)	4 (0.07g)	7 (0.12g)	5 (0.11g)	-
Salix spp	willow	1 (0.06g)	-	-	-	-	-
Indet rhizome	indet rhizome	-	-	-	-	-	-
Indet cinder	indet cinder	-	-	-	-	-	-
Cereals (carbonised)							
Hordeum vulgare sl	barley	-	-	-	-	1	-
cf Hordeum vulgare sl	cf barley	-	-	-	-	-	-
Indet cereal	indet cereal	-	-	-	2	1	-
Seeds etc (carbonised)							
Corylus avellana nutshell frags	hazel nutshell	-	-	1 (<0.01g)	-	-	-
Misc							
Cramp	cramp	-	-	-	-	-	-
Metallic waste	metallic waste	-	-	-	-	-	-

Table 36: Structure 44

	Structure	Structure 44	
	Context	2639	2653
	Sample	1567	1574
	Description	Fill of linear (2638)	Deposit beneath structure (2644) & above ditch (2655)
Volume of charcoal >4 mm		10ml	2.5ml
Charcoal			
Alnus cf glutinosa	alder	5 (0.62g)	-
Corylus cf avellana	hazel	2 (1.32g)	1 (0.05g)
Ericales	heather type	67 (0.51g)	1 (0.01g)
Quercus spp	oak	4 (0.58g)	1 (0.01g)
Cereals (carbonised)			
Avena spp	oat	-	1
Hordeum vulgare sl	barley	1	-
Indet cereal	indet cereal	7	-

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Table 37: Miscellaneous

	Structure	Shell midden	Structure 36	Misc	Misc
	Context	1559	1184	2895	3277
	Sample	872	670	1740	1941
	Description	Shell midden deposit possibly used as field drainage	Fill of posthole (1183)	Fill of pit 2894	Fill of pit (3276)
Volume of charcoal >4 mm		<2.5ml	<<2.5ml	5ml	<2.5ml
Charcoal					
Alnus cf glutinosa	alder	-	1 (0.03g)	-	4 (0.07g)
Corylus cf avellana	hazel	-	-	1 (0.02g)	-
Ericales	heather type	7 (0.04g)	-	76 (0.68g)	1 (<0.01g)
Quercus spp	oak	-	-	2 (0.02g)	-
Indet cinder	indet cinder	7 (0.11g)	-	-	-
Cereals (carbonised)					
Hordeum vulgare sl	barley	-	1	1	-
Seeds etc (carbonised)					
Corylus avellana nutshell frags	hazel nutshell	-	-	-	1 (0.01g)

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Appendix 2: Coarse stone catalogue

Coarse stone catalogue

By Beverley Ballin Smith

This catalogue is not comprehensive as only the most informative stones are portrayed here.

Spindle-whorls

SF Nr	*Description*	*Image*
SF 163 Context 278, upper fill of pit 277, PG2 Pale fine sandstone	Roundel with smooth surfaces and smooth sides, perforated centrally. Scratches on the surface and sides may be natural. Some nicks on the rounded edges. The perforation was made by drilling through the stone, but wear is apparent around its aperture, and especially on one surface. Wt 54 g, Diameter 45-45.6 mm, MT 16.3 mm Perforation 8 mm diameter, splay 10-11 mm diameter.	
SF 197 Context 349, fill of pit 348, PG3 Stone not identified	Laminating dense stone with degraded white crystals. Fragment of a roundel perforated centrally. Its surfaces and are flat, with copious multi-directional fine lines and some deeper scratches to make them smooth. Some chips on the edges of the piece are probably from manufacture, but others are from wear. The central hole was chipped out from either side and the shaft made smooth. Wt 36.6 g, ML 48.8 mm, MW 32.7 mm, MT 16.3 mm Perforation 7 mm diameter, splay 10 mm diameter.	
SF 278 Context 465, fill post-pit 464, PG1/ST41 Blonde sandstone	Thick stone roundel perforated centrally, with surface iron deposits. Fine surface scratches over all surfaces. The perforation was drilled and the splay indicates wear around the hole. Wt 31.8 g, Diameter 35.7 mm, MT 16.8 mm Perforation 6 mm diameter, splay 11 mm diameter.	
SF 990 Context 2317 fill of pit 2316, NW of fort Fine-grained, soft micaceous schist	Oval-shaped stone with central perforation. The stone is irregular with frequent nicks on surface and especially around the edges and side. The side is straight to rounded. The perforation has been drilled through the stone and is worn into a splay on both surfaces. Wt 21.4 g, ML 39.3 mm, MW 33.9 mm, MT 11.3 mm Perforation 5 mm diameter, splay 9-10 mm diameter.	

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SF 1463 Context 2952, lower fill of pit 2953, PG12 Fine-grained stone not identified	Slightly oval roundel with off-centre perforation. Badly chipped around edges, some possibly from manufacture and others are later. Copious multi-directional scratches on surfaces and on side though smoothing during manufacture. There is a regular splay on one surface with wear around it. The wear on the other surface is more irregular. Wt 25.8 g, ML 38.8 mm, MW 35.8 mm, MT 12.6 mm Perforation 5 mm diameter, splay 10 mm diameter.	
SF 492 Context 1354, fill of pit 1353 Mudstone	Sliver of a whorl or roundel that has been perforated. The piece has laminated losing both surfaces and broken across the perforation. The perforation is c. 5 mm in diameter. The piece has had a band tight around its edge where it has worn a V shaped notch into it as if it has been a fly wheel. The piece would have been c. 30 mm in diameter if complete. Wt 2 g, ML 25.2 mm, MW 17.4 mm, MT 5 mm Perforation c. 6.5 mm diameter.	

Possible loom-weights

SF Nr	*Description*	*Image*
SF 310 Context 407, deposit below deposit 406, PG1/ST41 Old Red Sandstone	Thin, egg-shaped flattened cobble, perforated centrally, with smooth surfaces. The narrowest end is flaked from being used as a hammer, possibly secondarily. The perforation has been chipped from both sides with a narrow pick to form a splay on both surfaces (hour glass shaped). The edges of the perforation are smooth. One particular part of the perforation is also smooth on both sides, but there is no corresponding wear on the stone's surfaces. Wt 268 g, ML 103 mm, MW 90 mm, MT 21 mm Perforation 16.8 mm diameter, splay 27.4-33.4 mm diameter.	
SF 479 Context 1280, fill of pit 1279, ST35 Sandstone	Thin roundel, irregularly rounded but with two straight parts of its sides. It has one predominantly smooth surface, and one natural that has been smoothed possibly through use. The edges have been ground smooth. The perforation is slightly off -centre, and is splayed on both sides, with smoothing around the splay across one half of the perforation. There is no corresponding wear on the surfaces of the stone, and none noticeable on the edges of the piece. Wt 171.5 g, ML 102 mm, MW 99 mm, MT 11 mm Perforation 13 mm diameter, splay 17-19 mm diameter.	

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Pot lid

SF Nr	*Description*	*Image*
SF 236 Context 424, upper fill of pit 423, ST3 Mica schist	Sliver from a large cobble made into a roundel. Surfaces possibly smoothed through wear, The circumference has been ground smooth in places. Wt 207 g, Diameter 106-111 mm, MT 10.2 mm.	

Axeheads

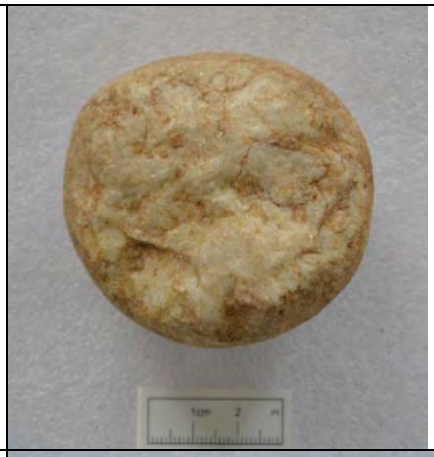
SF Nr	*Description*	*Image*
SF 123 unstratified Old Red Sandstone	Polished and damaged axe head with much of the cutting edge and the whole of the butt end missing. A long oval in shape, with ground surfaces and cutting edge. The remainder of the cutting edge has a slight corner and is slightly blunted. The lateral sides are rounded and the only small amount of faceting is noted close to the cutting edge corner. The best preserved broad surface has two recent scars, and the other has a large flaking scar possibly from use of the axe, and pitting near the butt end from its use as a hammer. Wt 332 g, ML 115.5 mm, MW 65.3 mm, MT 33.6 mm.	
SF 924 Context 2089 lower fill of pit 2083 North of PG10 Calc-silicate hornfels (Group XXIV) from Creag na Caillich near Killin, Perthshire	Polished stone axe head, slightly asymmetrical, short, with a pointed butt end, and a curved cutting edge with noticeable corners. It is ground all over to a high polish but some flaking scars survive at the butt end, along one side and on one surface. The long profile is ovate with slightly domed broad sides. The grinding has produced facets along both sides, but with flat lateral sides tapering to the butt end and the cutting edge. The cutting edge is slightly blunted. Wt 217 g, ML 104 mm, MW 55.7 mm, MT 26.7 mm.	
SF 110 Context 204 upper fill of pit 203, PG2 Great Langdale tuff (Group V1) Lake District	Polished stone axe head, short, with missing butt end and asymmetrical loss of the cutting edge. The long profile is ovate with slightly domed broad sides. It was ground all over to a high polish and this has produced facets along both lateral sides. However, two flaking scars survive the polishing. The lateral sides taper to the butt end. Pitting is evident on the broad surfaces as well as on the lateral sides. The piece is cracked and sooting survives on its surfaces, both are evidence of it been in a fire or otherwise burnt. Cracking may have resulted in the loss of both the butt end and the cutting edge. Wt 194.3g, ML 82.6 mm, MW 52.5 mm, MT 28.8 mm.	

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Cobble tools

SF Nr	*Description*	*Image*
SF 52 Context 113, fill of pit 112, east of ST20 Quartz	Large cobble with its narrow end use as a grinder where slight faceting is noted. The broad end has Y-shaped wear from the apex and partly down two sides of the stone in narrow stripes. The surface of the stone has been removed there by slight pecking. Pestle. Wt 1565 g, ML 143.7 mm, MW 100.8 mm, MT 72.6 mm.	
SF 110b Context 204 upper fill of pit 203, PG2 Stone not identified	Small, rounded and thin cobble. The thin end has small scars from it being used as a hammer. There is a scar on one face from a natural flaw in the stone. Hammerstone. Wt 235 g, ML 107.7 mm, MW 57.5 mm, MT 24.7 mm.	
SF 114 Context 219 fill of pit 218, PG1 Fine-grained dolerite?	Curved, hand-sized, thin cobble, Shaft very smooth possibly through use. Broad end of tool has faceted wear through grinding. Narrower end has been used as a hammer: two flakes struck off one surface and the opposite surface has deeper shattering. Hammer/grinder. Wt 307 g, ML 117.7 mm, MW 50 mm, MT 34 mm.	
SF 122 Context 231, lower fill of pit 203, PG2 Quartzite	Fragment of a cobble with its surviving narrow end faceted use as a grinder. Grinder. Wt 306 g, ML 80 mm, MW 61.6 mm, MT 46 mm.	

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SF 158 Context 248, fill of pit 247, PG1 Quartz	Rounded quartz cobble, extensively pecked all around the circumference and across the surviving end, possibly to allow it to fit in the hand. The other end has been used as a hammer. Pounder/hammerstone. Wt 303 g, ML 65.3 mm, MW 63.3 mm, MT 51.6 mm.	
SF 172 Context 301, fill of pit 301, PG3 Quartzite	Hand-sized rounded cobble used as pounder around most of the circumference. Only limited areas of the original cobble surface survive. Weak facets can be seen. Pounder. Wt 935 g, ML 94.8 mm, MW 89.4 mm, MT 78.2 mm.	
SF 307 Context 553, fill of enclosure 552, ST8 Fine-grained dolerite?	Split cobble with surviving ground end. Area of use measures 40 mm by 18 mm. Grinder. Wt 420 g, ML 99.7 mm, MW 70.3 mm, MT 46.5 mm.	
SF 470 Context u/s Quartzite	Small flattened cobble with very light pecking at the surviving broad end. The other end is shattered by its use as a hammer. There is some possible wear down one side where there is a discrete flattened area possibly from its use as a whetstone. Hammerstone/whetstone. Wt 429 g, ML 106.6 mm, MW 67 mm, MT 33.8 mm.	

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SF 553 Context 147 over burden deposits Quartzite	Split cobble with part of surviving edge ground flat. Has sooty deposits. Grinder. Wt 93 g, ML 85.6 mm, MW 37 mm, MT 21.7 mm.	
SF 666 Context 1662, fill of pit 1661, external to ST6 Mica schist	Fragment of thin, small cobble, split from end to end. The one surviving end has faceted wear from grinding, with later pecking over the top. Pestle. Wt 191.7 g, ML 102.1 mm, MW 37.3 mm, MT 28.8 mm.	
SF 844 Context 2000, degraded roundhouse, ST40 Quartz	Large cobble with discrete 40 mm by 25 mm area of pecking at its narrowest end. Possible pecked or naturally damaged areas are present down both sides and on one face. The opposite face of the stone appears to have an area of dark polish. These latter areas could be natural. Pounder. Wt 1350 g, ML 106.2 mm, MW 108 mm, MT 77.3 mm.	
SF 851 Context 1, topsoil Quartzite	Fragment of a small rounded cobble, with two ends extensively pecked and ground. One end shows faceted wear. Grinder. Wt 241 g, ML 78 mm, MW 65.7 mm, MT 45.6 mm.	
SF 1674 Context 2683, lower fill of ditch 1 – 2682, Fort ditch Dolerite	Egg-shaped cobble with iron staining. Flaking of surface seems is partly natural and possibly also due to deliberate pounding. Pounder? Wt 138.8 g, ML 52.2 mm, MW 40.5 mm, MT 40 mm.	

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SF 1675 Context 2907, deposit. Large lithic scatter, ST13 Micaceous sandstone	Oval/egg-shaped cobble. One broad face appears pecked, and similarly partly around the circumference. One flake has been removed from the broad pecked face. Pounder. Wt 308 g, ML 76.5 mm, MW 67.7 mm, MT 47.6 mm.	

Whetstones

SF Nr	*Description*	*Image*
SF 211 Context u/s. Area 7S Blonde sandstone	Fragment of a split block of stone that has one face that is made extremely smooth and flat by is use for whetting metal blades. Wt 912 g, ML 121 mm, MW 73.4 mm, MT 49.7 mm	
SF 448 Context 1001 fill of pit 1000, SW of ST31 Ironstone?	Part of a large, flattish, square, fragmented boulder, possibly flaked around its edges and then smoothed. Upper surface very smoothed and with rounded edges to the worked surface. The circumference of the worked surface was pecked and then smoothed over - very well used, and very smooth. Large whetstone. Wt 11000 g, ML 335 mm, MW 330 mm, MT 100 mm.	
SF 565 Context 1449, fill of enclosure ditch 1448, ST12 Fine-grained sandstone	Small thin elongated cobble, with one face with significant linear wear producing a broad concave depression, with a groove in the bottom of it. A significant groove 2-5 mm broad and up to 2 mm deep is also present down one lateral side of the cobble. Two faint grooves are also noted on the other broad surface. Wt 93 g, ML 85.6 mm, MW 37 mm, MT 21.7 mm	

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Specialist fine tool

SF Nr	*Description*	*Image*
SF 1049 Context 2391, fill of possible pit 2390, ST40 Quartzite	Very smooth elongated pebble with cambered worn sides, tapering towards each rounded end. Possibly associated with specialist metalwork crafts. Quadrilateral burnisher. Wt 30.8 g, ML 52.2 mm, MW 27 mm, MT 13.1 mm.	

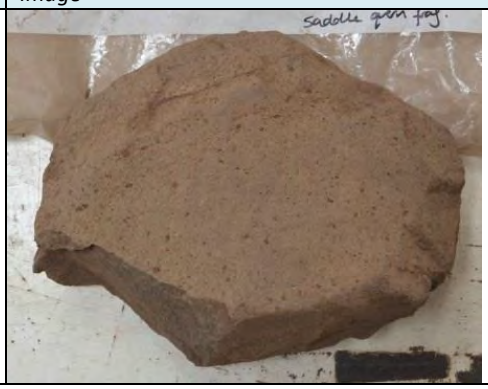
Other worked stones

SF Nr	*Description*	*Image*
SF 123b Context 235, fill of pit 234, PG1 Sandstone	Irregularly shaped rectangular stone with interface with another geologically different rock. It is perforated centrally by a large hole, which was created by a pick. It shape and sides are quite rough. The piece is heavily burnt. A possible tuyere. Wt 608 g, ML 182 mm, MW 97 mm, MT 43 mm. Perforation c. 30 mm diameter.	
SF 941 Context 2051, fill of pit 2050, SW of Fort Stone not identified	Long narrow piece, shaped by flaking on both edges, producing a slight waist on one side. The broad curved end is a worn cutting edge, with a band of further wear along the edge on the reverse. The waist or notches may have been used to fix the stone to a wooden shaft. A possible digging tool. Wt 635 g, ML 195 mm, MW 113 mm, MT 34 mm.	
SF 559 Context 1455. upper fill of pit 1454 Yellow sandstone	Block with a large pecked oval hollow in the top, with sides and base unworked. The hollow is coarsely pecked with rounded edges. Its base is roughly flat. Part of the circumference of the hollow has broken away, but is burnt at this point. A possible lamp. Wt 15000 g, ML 310 mm, MW 230 mm, MT 75 mm. Hollow 165 mm by 140 mm by 30 mm.	

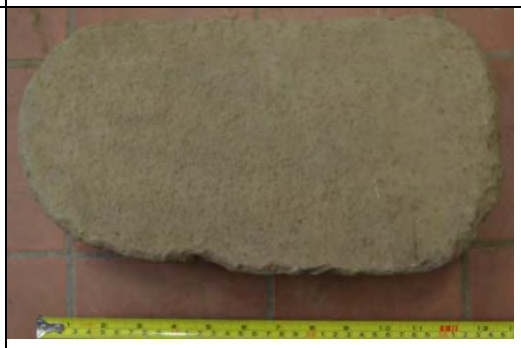
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SF 1 Context 57006, Evaluation Pale sandstone	Wedge-shaped boulder, roughly trimmed, with flattened top. Partly chipped but mainly natural surfaces of boulder survive. Hollowed on upper surface with a circular depression, with pick marks visible. Probably not used as a pivot stone, as its sides are rough. The bottom of the depression is smoother. Pivot stone. Wt n/m, ML 220 mm, MW 200 mm, MT 210 mm. Hollow MD 75 mm, 25 mm deep.	
SF 989 Context 2115, fill of kiln 2113, N of PG10 Basalt?	Fine grained igneous, irregularly shaped boulder. Possibly split in half when attempting to use a hollow in its flatter surface. The stone was turned over and an irregular on the upper surface was smoothed by wear. Sooty from reuse near a hearth. Pivot stone. Wt 10000 g ML 300 mm, MW 210 mm, MT 160 mm. Hollow 70 by 60 by 22 mm.	
SF 505 Context 368, collective number for structure ST41 Red sandstone	Boulder with large deep hollow. Has a natural flat base, but the sides and top are finely pecked, but only a small fragment of the upper edge survives. Only 1/4 of the mortar survives. The working depression of the stone was pecked and then smoothed. Mortar. Wt 8900 g, ML 280 mm, MW 250 mm, MT 165 mm. MT base 75 mm. Hollow 90 mm deep.	

Querns

SF Nr	*Description*	*Image*
SF 156 Context 258 fill of post-pit 257, PG2 Andersite	Large cobble/small boulder with concave upper surface and damage to one end. Although there is some slight wear on the upper edges of the concave surface, this could be natural. Uncertain quern. Wt 4000 g, ML 260 mm, MW 190mm, MT 90 mm	

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SF 481 Context u/s, Area 5 Mica schist (hard)	Fragmentary boulder with a slightly concave/dished based. Due to the flaking of the lower surface it is not known if it was tooled to smooth it. Parts of the concave upper surface have been damaged by flaking and especially around its surviving edge. The worked surface is mostly work smooth but with parallel faint linear striations from use. Saddle quern. Wt c. 4750 g, ML 293 mm, MW 166 mm Mt 90 mm	
SF 582 Context 1514, soil deposit around stones 1547 ST6 ex Ironstone?	Boulder, possibly flaked and pecked to shape it. More recent flaking of the stone has masked the tooling. The upper worked surface is slightly concave, but the stone has broken at its narrower end. This surfaced has been pecked all over and worn smooth in the centre. Saddle quern. Wt c. 16000. ML 285 mm, MW 265 mm, MT 100 mm	
SF 684 Context u/s Areas 6 Dolerite?	Small quern (not a quern rubber). Split boulder, elongated with rounded ends. Pecked all around the edges to produce a smooth shape. Slightly concave longitudinally from the broad to the narrow end. The broad end is smooth on the working face, but the rest is pecked and worn. A good example. Saddle quern. Wt, 11000 g, ML 335 mm, MW 180 mm, MT 110 mm.	
SF 1215 Context 2645, possible collapsed stone walling, ST44 Mica schist (hard)	Boulder with a largely flat working surface, Upper surface slightly domed towards the perforation which is splayed with some flaking or chipping around its edges. Sides of the splay are smooth down towards the perforation, which is slightly angled and not vertical. No rotary marks on the worked surface or any tooling. Tether stone. Wt 13000 g, ML 335 mm, MW 300 mm, MT 95 mm. Splay 80 by 75 mm, perforation 35 by 35 mm.	

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Appendix 3: Catalogue of daub and firedclay materials from the project area

SF Nr	Sample	Structure	Context	Total Nr pieces	Total Weight (g)	Raw clay	Prepared clay	Daub	Stone/ Mineral	Organic matter	Wattle impressions	Comment
138		Between PG1 & PG2	212 upper fill of pit 211	3	51.5			✓	✓	✓		
144, 374, 389, 390		PG1	Fill of pits 242, 510 and 700	17	1057.6		✓	✓	✓	✓		
1827		PG1	407 deposit	1	8.6		✓		✓	✓		
160a/b		PG1	Fill of pit 259	7	241		✓	✓	✓	✓		
173, 215		PG3	Fill of pits 311 and 348	2	251.3	✓		?	✓			
819		PG10	2111 fill of pit 2112	1	5.4			✓		✓		
1683		PG12	2974 fill of pit 2973	3	40.4			✓		✓		
451, 452		ST1	990 fill of pit 989	3	14.6			✓		✓		
	S230	ST1	522 a deposit or burning activity	1	7.2			✓				
	S250	ST1	709 fill of posthole 695	0	0.3			✓				
	S883, S885	ST6	Fill of postholes 2055 and 2072	1	7			✓				
	S716	ST7B	1640 fill of pit 1639	4	43.4			✓				
	287, S912	ST9	2157 burnt deposits in pit 2156	148	179.1			✓				
543		ST12	1449 fill of enclosure ditch 1448	3	132.6		✓	?	✓	✓		UBA-51749, 4299 ± 31 BP 3010 – 2880 cal BC
501		ST18	Fill of pit 772 and 519	1	8.5			✓		✓		
1709		ST20	3027 fill of pit 3026	1	26			✓	✓	✓		
1750		ST22	3793 Fill of pit 3792	1	24.2	✓						
1778		E of ST22	3230 fill of pit 3954	2	9.1			✓		✓		
1736b		ST25	3382 natural deposit	3	9.9			✓		✓		

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SF Nr	Sample	Structure	Context	Total Nr pieces	Total Weight (g)	Raw clay	Prepared clay	Daub	Stone/ Mineral	Organic matter	Wattle impressions	Comment
1013		ST31	2365 fill of pit 2364	2	79			✓	✓	✓		
403, 962		ST34	Fill of pits 765 and 2141	2	10.6			✓		✓		
781, 847, 856, 857, 864, 867, 1141		ST40	2000 - round-house	17	392.2	✓		✓		?		
1836		PG1(ST41)	465 fill post pit 464	2	6.6			✓	✓			UBA-51746, 2447 ± 26 BP 751 – 412 cal BC
1239, 1256		Fort ditch	Fill of ditch 1 - 2682	5	6.5			✓		✓		
936		NW of fort	2102 fill of linear feature 2101	1	12.2			✓	✓	✓	✓	Included grain
1265		Topsoil	1	1	15			✓	✓	✓	✓	
228		Field A	u/s?	1	5.3			✓				
	S114	Field A	432 Burnt upper fill of pit 431.	7	2.1			✓				
458		Void	890	1	27.4			✓	✓	✓	✓	
905		Area 10	u/s?	1	83.5		✓			✓		Loom weight fragment
				242	2758.1							

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Appendix 4: Medieval and later pottery catalogue

Find No.	Context No.	Fabric	No	rim	base	handle	sherds	weight	Description
1	7	SWGW	1	1				13.6	Rounded rim, undecorated, storage jar
250	438	SWGW	1				1	3.6	Light yellow/green glaze
333	451	SWGW	1				1	4.6	Undecorated body sherd
489	1332	SWGW	1	1				82	Everted square rim, with sooting, cooking pot, rim diameter 320 mm
494	1364	SWGW	1			1		72.3	Grooved strap handle, spots of yellow/green glaze
537	2201	SWGW	4				4	7.7	Undecorated body sherds
558	unstrat	SWGW	1				1	3.5	Light yellow glaze with rouletted decoration
593	1559	SWGW	2	1			1	64.9	Join, everted flat rim with sooting/fuming, cooking pot
594	1559	SWGW	1				1	22.8	Reduced with green glaze
595	1559	SWGW	1				1	18.4	Fuming on exterior -cooking pot
622	1599	SWGW	1				1	7.4	Spots of clear glaze
623	1599	SWGW	1				1	4	Undecorated body sherd, some fuming
624	1599	SWGW	1				1	13.3	Undecorated body sherd with sooting/fuming, cooking pot
645	1651	SWGW	1	1				48.8	Everted 'triangular' rim with sooting, cooking pot, rim diameter 340 mm
670	1691	SWGW	1				1	4.5	Undecorated body sherd
671	1691	SWGW	10				10	16.9	Undecorared body sherds with sooting, cooking pot
672	1169	SWGW	1	1				18	Everted flat rim? storage jar
673	1924	SWGW	2				2	2.3	Undecorated body sherds
682	unstrat	SWGW	1				1	1	Undecorated body sherd
683	1691	SWGW	1	1				14.8	Everted square rim, some sooting, cooking pot
688	1706	SWGW	1				1	2.4	Undecorated body sherd
692	1695	SWGW	1				1	2.1	Light green/brown glaze
696	1697	LCR?	1				1	1.1	Thin well-made red fabric with clear/brown glaze - Low Countries Redware?
766	1957	SWGW	1			1		32.3	Grooved strap handle undecorated
784	2000	SWGW	1		1			3.5	Undecorated with fuming on underside?
938	2102	SWGW	2				2	4.1	Undecorated body sherds
939	2102	SWGW	3	1			2	96.3	Jug rim and neck with grooved strap handle terminal, green glaze and pink heat skin
946	2102	SWGW	1				1	4.1	Undecorated body sherd
964	unstrat	SWGW	1				1	3.8	Undecorated body sherd
967	2144	SWGW	1		1			12.4	Thin flat base sherd with sooting on underside

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Find No.	Context No.	Fabric	No	rim	base	handle	sherds	weight	Description
979	2276	SWGW	1				1	5.7	Undecorated body sherd
980	2276	SWGW	1				1	6.4	Undecorated body sherd
981	2275	SWGW	1	1				10.1	Square rim from storage jar or cooking pot, reduced grey core
994	2353	SWGW	1	1				4.6	Square rim with fuming, cooking pot
1015	2373	SWGW	2	1			1	14.5	Everted flat rim, reduced core storage jar or cooking pot
1089	2460	SWGW	1				1	1	Reduced core, undecorated
1091	2461	SWGW	1				1	4.8	Undecorated body sherd
1100	2470	SWGW	1		1			21	Sooting and fuming - cooking pot base
1154	2569	SWGW	2				2	64.8	Undecorated body sherd with neck, fuming, cooking pot
1155	unstrat	SWGW	1		1			16.6	Reduced, undecorated
1170	2308	SWGW	2				2	8.2	One with spots of glaze, both sooted, cooking pot
1179	2594	SWGW	1	1				33.5	Large square rim from storage jar or cooking pot,
1717	1	SWGW	1				1	5	Undecorated body sherd with some fuming, cooking pot
1730	unstrat	SWGW	1				1	8.5	Undecorated sherd with some fuming, cooking pot
1739	1	SWGW	1	1				18.8	Flat rim with light green glaze, jug
1740	3470	SWGW	1				1	2	Undeocrated body sherd
1761	3898	SWGW	1		1			5.5	Some fuming on underside, cooking pot
1820	unstrat	Tin-glaze white earthenware	1		1			105	Flat base from large plate or platter with scene of fishermen pulling in nets, blue and white tin-glaze, import
1826	316	SWGW	1				1	5.7	Applied brown glaze strip decoration and light yellow glaze
1829	1641	SWGW	6				6	30.9	Undecorated body sherds, with pronouncd rilling or throwingmarks, some fuming, cooking pot
			75	12	6	2	55	959.1	
1136	147	white earthenware	1				1	0.7	Blue and white transfer print, modern
599	1573	modern red earthenware	1				1	4.1	Modern red earthenware, possibly from a flower pot or similar
			2	0	0	0	2	4.8	
		Total						963.9	

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