APPENDIX 10: THE WORKED STONE FROM STAINTON WEST: INTERPRETATION AND CONCLUSIONS

A Dickson

The worked stone from Stainton West represents a large and secure assemblage, which has been recovered from a lowland area close to the head of the Solway Firth. The bulk relates to Late Mesolithic activity and occupation in the *Grid-square area*, though Neolithic worked stone is also present, being generally confined to the *Principal palaeochannel*. Significantly, given its chronology and size, and also a result of the detailed programme of analysis undertaken (*Appendices 2-9*), in regional terms, the assemblage is unique. Moreover, it has provided valuable details on the character and nature of worked stone at a Late Mesolithic occupation site, Neolithic stone-working and depositional practices, and also stone procurement and networks of contact throughout both these periods.

Late Mesolithic Stone-working and Technology

Flaked lithics: narrow-blade technology

The Late Mesolithic flaked lithics form a narrow-blade assemblage, a characteristic feature of the later Mesolithic period (*Ch 3*). Narrow blades seem to have first appeared in the British Isles in the second half of the ninth millennium cal BC (Waddington 2015; Waddington *et al* 2017), whilst an analogous technological development took place on the other side of the North Sea basin, in Scandinavia and the Low Countries, at a similar time (Waddington 2007). Indeed, one idea (proposed by Clive Waddington (2015)) is that the introduction of the narrow-blade techno-complex into the British Isles was a direct response to the inundation of the North Sea basin, which resulted in a secondary Mesolithic colonisation of Britain. In this hypothesis, a narrow-blade technology would have been introduced into northern Britain by Mesolithic people initially moving out of Doggerland, as a result of the rising sea levels, into north-eastern coastal areas, extending between County Durham and the Firth of Forth, at *c* 8400-7900 cal BC (Fig 592). It was further suggested (*ibid*) that this was followed, in 7900-7700 cal BC, by the spread of narrow-blade users out from this 'core' area into western Britain via the northern seaways. This 'model' was, however, largely based on the radiocarbon-dating evidence available in 2013, but, with the dating of several other narrow-blade sites, it now seems that many of the early sites appeared in both the eastern and western parts of northern Britain at near-identical times, in the latter part of the ninth millennium cal BC, though the Firth of Forth does still seem to contain some of the earliest (*cf* Gregory and Brown forthcoming). It is therefore possible that other motivating factors were responsible for the appearance of narrow blades, such as more widespread changes in hunting strategies, in response to a changing ecology brought about by improving climatic conditions, as opposed to the specific movements and spread of Mesolithic peoples (*ibid*; Conneller *et al* 2016). In any event, given that the Stainton West narrow-blade assemblage dates from the late seventh millennium cal BC, it represents a continuing techno-complex, which had been established in the British Isles for over two millennia, and continued in use at the site until at least the mid-fifth millennium cal BC.

Narrow-blade assemblages

Late Mesolithic primary narrow-blade technology revolves around the reduction of several core types for the production of narrow blades and bladelets, although flakes of various morphologies can also form a significant component of most assemblages (Mithen 2000a; 2000b; Waddington 2007; Gregory and Brown forthcoming). Inevitably, the cores from Late Mesolithic sites, particularly those from regions where knappable pebbles are the dominant raw-material type, reach a final form where they are often very small. Analysed assemblages from excavated sites and surface collections also vary in their composition of cores and debitage and, whilst this may reflect differing task activities undertaken between sites, recovery methods may influence their composition.

In terms of the secondary technology, Late Mesolithic narrow-blade assemblages are often dominated by a variety of small geometric microlith forms made on narrow blades/bladelets, which are produced during the reduction of cores (however, not all lithic analysts define blade width/size as in this study, *see Appendix 4*). Alongside microlith implements, a range of non-microlithic tools, including various scraper forms, awls, and burins to name a few, is also known (Butler 2005, 99-114).

Variation in tool types, particularly microliths, between sites is often seen as reflecting different tasks being undertaken at different locales, and has also been seen as a reflection of mobility strategies (Donahue and Lovis 2006; Preston 2012). In addition, typological distinctions in Late Mesolithic microlith assemblages have been interpreted as signifying chronological, and, potentially, geographical developments (Switsur and Jacobi 1979; Griffiths 2011; 2014; Preston

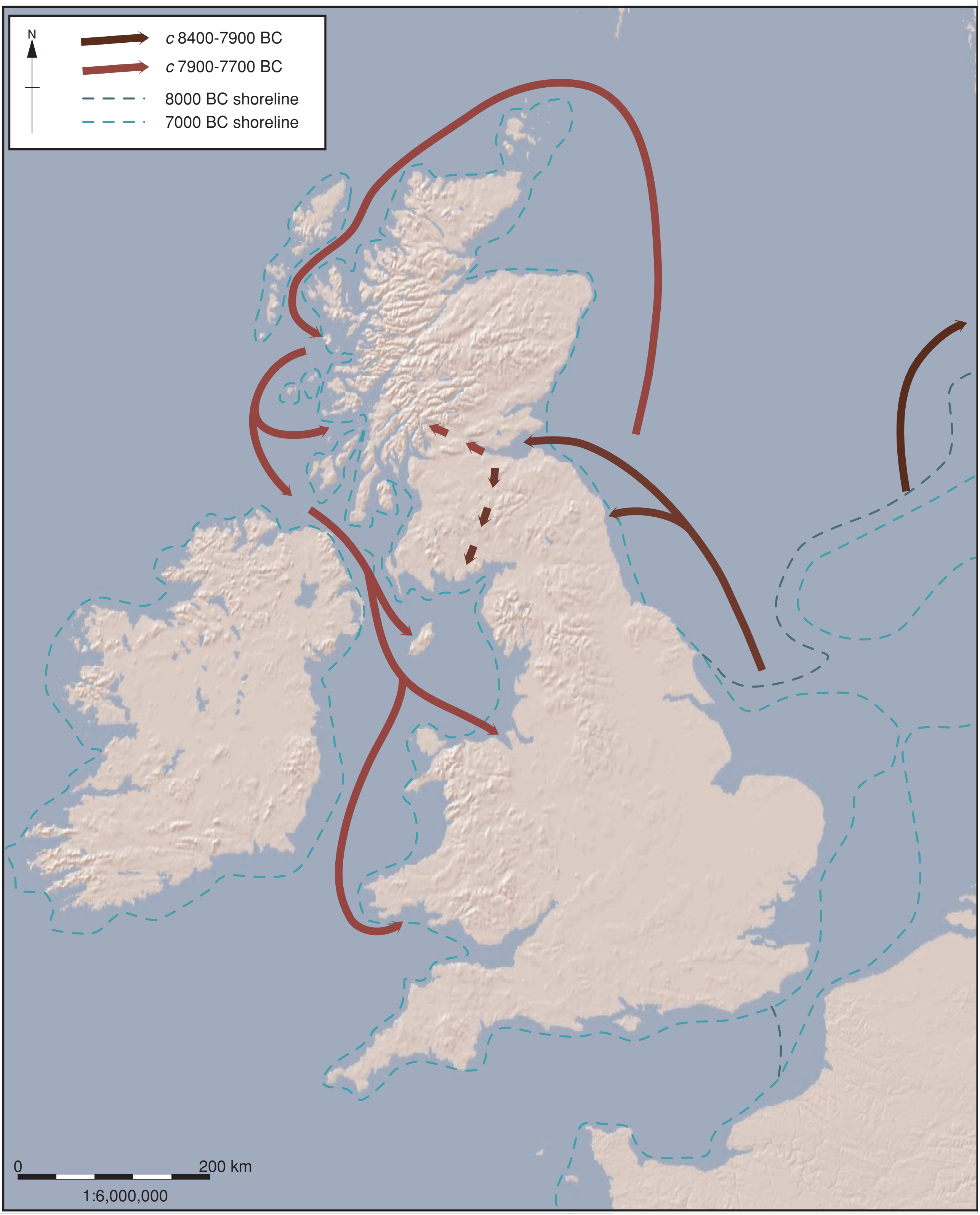

Figure 592: The proposed spread of the Mesolithic narrow-blade technology across northern Britain (after Waddington 2015)

2012). Considering this in terms of the Stainton West assemblage, two assumed techno-complexes dominated by specific types of microliths have been broadly assigned to successive phases of typological development: micro-triangle-dominated assemblages are seen as being chronologically earlier, while rod-dominated assemblages are viewed as later (Preston 2012, 136-42), these being often referred to as 'terminal' Mesolithic (Spikins 2003; Griffiths 2011; 2014). However, definitions of assemblage composition can, in some cases, be equivocal, and the available secure radiocarbon dating is patchy (Spikins 2003; Chatterton 2007; Griffiths 2011; 2014; Albert and Innes 2015). For example, in the case of assemblage composition, Roger Jacobi's (Switsur and Jacobi 1979) typological classification of Late Mesolithic microlith assemblages dominated by rod microliths included backed bladelets, or straight-backed microliths. In this instance, these latter types were all called 'rods', although they are often classified as individual lithic types in other rod and micro-triangle-dominated assemblages (Preston 2012, 121-3). Therefore, the use of the term 'rod microliths' can be confusing (*see* Saville and Ballin 2009 for a critique) and can lead to ambiguities in microlith classification, making it difficult to distinguish what types are being referred to in some published accounts (Chatterton 2007, 72; Griffiths 2011).

The narrow-blade assemblage at Stainton West

It is evident from the Stainton West assemblage that a wide range of different raw-material types was procured during the Late Mesolithic period, in order to produce flaked lithics. These raw materials (*Appendix 3*) were primarily pebble-flint; brown/grey flint; black, grey, and brown cherts, along with good-quality brown chert (GQB/chert) and Scottish Southern Uplands chert (SSUC); chalcedony/agate; quartz; tuff; and pitchstone. However, the assemblage is largely dominated by flaked lithics produced from pebble-flint and chert. Following acquisition, these different raw materials were taken to the site in a variety of forms. For instance, some arrived as pebbles, which were then subjected to complete reduction, whilst others had probably seen some preparatory flaking.

The reduction of the various raw-material types generally followed a similar strategy, revolving around a narrow-blade technology from which a variety of small geometric microliths was produced. The dominant microlith forms were backed bladelets, scalene triangles, and fine points, which were put to use in a variety of tasks, including hunting, dry-hide working, butchery, and the processing of a variety of organic materials (*Appendix 7*). A wide range of other retouched tools and debitage was also produced and applied to a similar range of tasks.

Significantly, in terms of situating the assemblage within a regional technological framework, an appraisal of several surface assemblages from disparate geographical sites in Cumbria, which contain a strong Late Mesolithic technological character, has identified a similar range of core types, which were worked using a similar range of reduction strategies (*cf* Dickson and Cherry in prep). The application of a similar range of reduction strategies has also been recorded for lithic assemblages beyond the region, where cores and associated debitage exhibit technological attributes commensurate with the Stainton West material (*cf* Ballin 2015b; Waddington 2007; Wickham-Jones 1990).

Backed bladelets were the most common type of microlith recorded, and these tend to dominate collections from spreads and clusters of flaked lithics (Fig 593), which are interpreted as representing *in-situ* stone working (*Appendix 9*). Backed bladelets were also associated with Structure 1 (*'Earliest Mesolithic activity'* phase; Lithic Entity 21), in the south-west corner of Peripheral Area, indicating that they were a significant component of the late seventh/early sixth-millennium toolkit, and there were large numbers associated with the Tool-production Area (Lithic Entity 7), the Midden Area (Lithic Entities 18 and 19), and, relatively speaking, Structure 6 (Lithic Entity 1), in the Habitation Area (*'Mesolithic encampment I'* and *'Mesolithic encampment II'* phases). Therefore, there appears to have been a trend for greater concentrations of backed bladelets in parts of the site where occupation was sustained and intensive in nature (the exceptions to this were Structures 4/5, in the Habitation Area, where scalene triangles were the dominant microlith type; *below*). In contrast, there were significantly fewer backed bladelets associated with sporadic occupation associated with the *'Mesolithic tree-throws/activity'* phase, in the north-east of the Peripheral Area (Lithic Entity 25) and the Butchery Area (Lithic Entities 15 and 16). In addition, in relative terms, backed bladelets occurred less frequently in the Hide-working Area (Lithic Entity 13) and the Axe-working Area.

Significantly, microwear analysis has identified backed bladelets as being associated with a wide range of activities (*Appendix 7*). This implies that large concentrations were associated with occupation where a diverse range of tasks was undertaken within a domestic context. This is in contrast to areas where sporadic phases of occupation have been identified, and their relative rarity there points to an association with short-lived and specialist-based activities, such as hunting (it is of note that in these areas microlith fragments were more common, supplemented by small numbers of other microlith types). Therefore, the use of a different tool system than that associated with longer durations of occupation is implied. In summary,

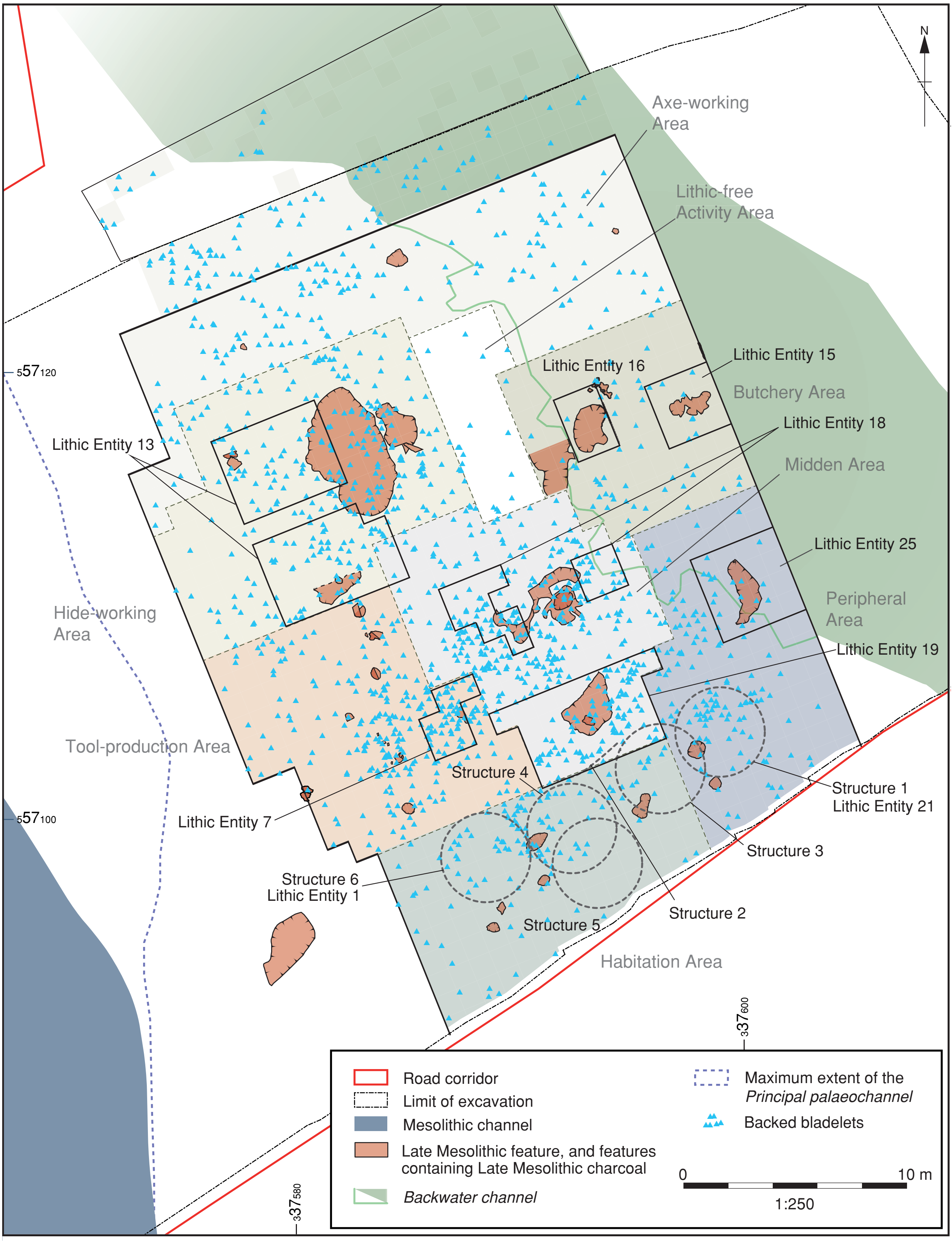

Figure 593: The distribution of backed bladelets in the Grid-square area

backed bladelets enjoyed a long currency of use at Stainton West and their distribution was linked with a specific form of occupation activity.

The quantity and distribution of rods is also significant (Fig 594). They are far less numerous than the backed bladelets (*Appendix 3*), and microwear

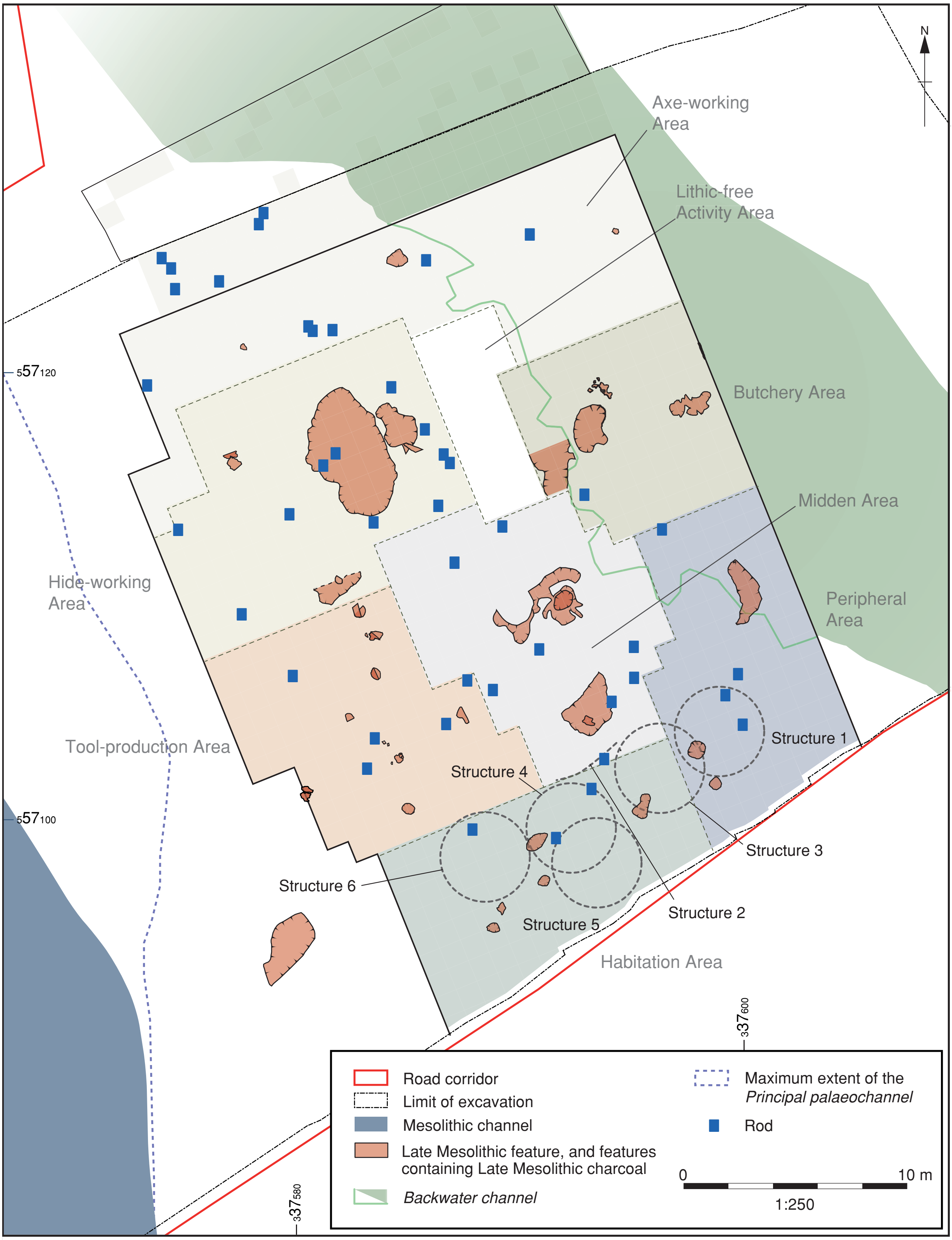

Figure 594: The distribution of rods in the Grid-square area

analysis shows that they were probably armatures associated with hunting weaponry (*Appendix 7*). With this in mind, they have a dispersed distribution across the site and, like the backed bladelets, are associated with all activity areas and, by extension, all phases of occupation; they thus do not directly signify a typo-chronological indicator relating to the 'terminal' Mesolithic (*above*).

The distribution of the other dominant microlith forms at Stainton West, scalene triangles (Fig 595) and fine points, also exhibits a similar pattern to the backed bladelets. However, scalene triangles exhibited distinct concentrations in specific parts of the Midden Area (Lithic Entities 18D, 18H, 18I, and 19A) and Structure 6 (Lithic Entity 1E) in the

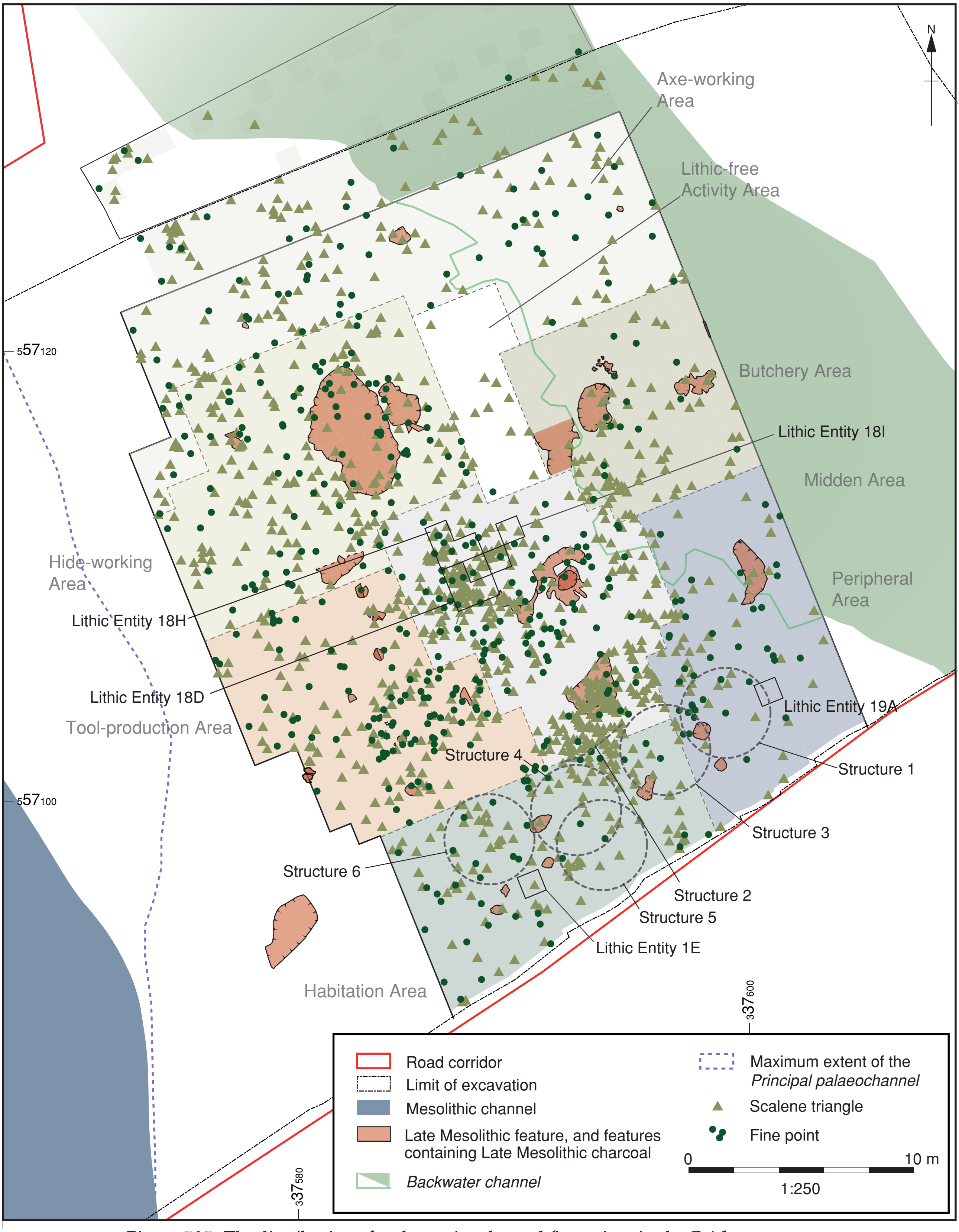

Figure 595: The distribution of scalene triangles and fine points in the Grid-square area

Habitation Area, and were less common in Structure 1 in the Peripheral Area.

Coarse-stone tools

It is clear that a range of coarse-stone tools, mostly probably of volcaniclastic origin, also formed an element of the Late Mesolithic worked-stone assemblage. This was particularly evident in the *Grid-square area,* where the majority of the tools were spatially associated with concentrations of Late Mesolithic flaked lithics, or were present at the base of, or within, the *Backwater channel* (Fig 596), which had become filled with alluvium by the late fifth millennium cal BC.

This assemblage is highly significant as, although a few of the Stainton West items can be reconciled with other Late Mesolithic material from Scotland (*cf* Mithen 2000a; 2000b), most have no known Late Mesolithic parallels. Those from the *Backwater channel* mainly comprised cobble tools employed in grinding tasks, whilst the remainder of the *Grid-square area* produced a wide-range of tool types, which represented either flaked coarse-stone tools or tools which had been pecked and ground. The flaked tools comprised both cores and core tools, several of the cores having been minimally flaked, and two have areas of pecking commensurate with their additional use as hammerstones.

Tools with pecking and grinding were the most numerous and include anvils, cobble tools, faceted hammerstones, facially pecked stones, ground stones, a hollowed stone (which could be part of another anvil), incised tools, and a notched stone. Of the anvils, only one has clear evidence for pecking, indicating that it could have been used during bipolar reduction, while one of the unworn anvils from the Tool-production Area has a patch of a residue on one face, suggesting that it was used in processing other materials, such as birch-bark tar (*Appendix 2*). The ground stones are of note as they appear to represent complete and fragmented stone rubbers, used for processing other materials. The notched stone is also of interest, as it has pecked grooves on each edge which may have facilitated hafting or holding as the piece was used, possibly as a fishing weight.

In addition, there were many unworn cobbles and heat-cracked stones, along with several hammerstones. Although they exhibit no visible evidence for use, the unworn cobbles are worthy of comment, since they had in all probability been brought onto site, so it is possible that some were blanks to create coarse-stone tools, while some showed close spatial affinities with concentrations of flaked lithics and ochre, suggesting that they were used in the processing of those materials. The hammerstones were made on a variety of sizes of cobbles and pebbles, the smaller specimens perhaps being used for knapping flaked lithics, while the larger may have been used for heavy-duty tasks.

Polished-stone tools

One of the more surprising discoveries at Stainton West was the apparent evidence for Late Mesolithic ground-stone axes (Fig 597). These were identified in the *Grid-square area* were made from volcanic tuff, and, in most cases, were fragments produced through reworking, or through use. Importantly, most were stratigraphically and/or spatially associated with the Late Mesolithic flaked-lithic concentrations and/or features, and one could be confidently dated to the Late Mesolithic period, being found at the base of the *Backwater channel,* sealed by the *Mesolithic overbank alluvium* (***90181***). This item was a simple retouched tool, which had been made from a flake that had been removed from the lateral edge of a Group VI ground-stone axe blade. It thus represents an exceptional discovery, in that it indicates that Group VI sources were being exploited during the Late Mesolithic period and were used to produce polished-stone axes.

Given the presence of this axe blade, it is also quite possible that another two items from the *Backwater channel* related to the Late Mesolithic use of ground-stone tools. These were recovered from the deposit of *Mesolithic overbank alluvium* (***90181***) that had filled the channel in the late fifth millennium cal BC, and comprised a dacite-tuff axe/adze blade, which to all intents and purposes appears to have been an edge-ground stone axe, and a polished-axe fragment, which had been reworked into a core. Interestingly, the axe/adze has some technological attributes which characterise Mesolithic axes from Ireland: a pointed butt; an asymmetrical blade end with a flat face, while the opposite face is convex in profile; and extensive bruising along a lateral edge (*cf* Woodman 2015, 147), although some of the latter could be the result of chemical weathering.

Moreover, it is also of note that the *Backwater channel* contained several cobble grinders, which may imply that the grinding of stone tools was undertaken in this part of the site, again, perhaps, during the Late Mesolithic period. Significantly, another comparable edge-ground axe/adze to that from Stainton West, made from a tuff cobble, is also known from Cumbria, which shows similarities to the Mesolithic axes from Ireland. This came from Holbeck Park, near Barrow-in-Furness (Evans 2018), and appears to have been associated with redeposited material that filled an Early Neolithic tree-throw (*Ch 7*).

Three polished-tuff axe fragments that probably date to the Late Mesolithic period also came from the *Stabilised land surface*. Significantly, two were

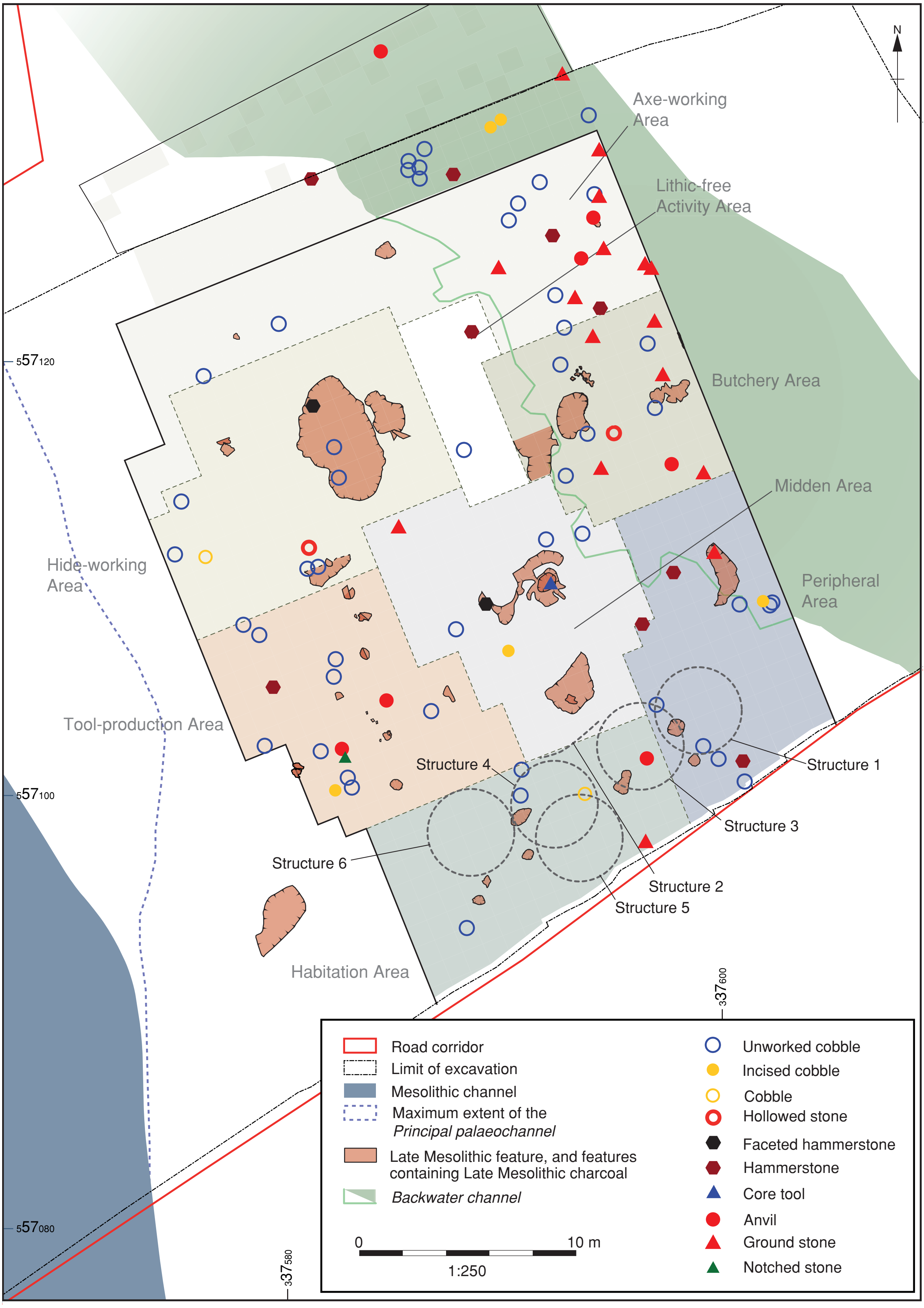

Figure 596: The distribution of coarse-stone tools in the Grid-square area

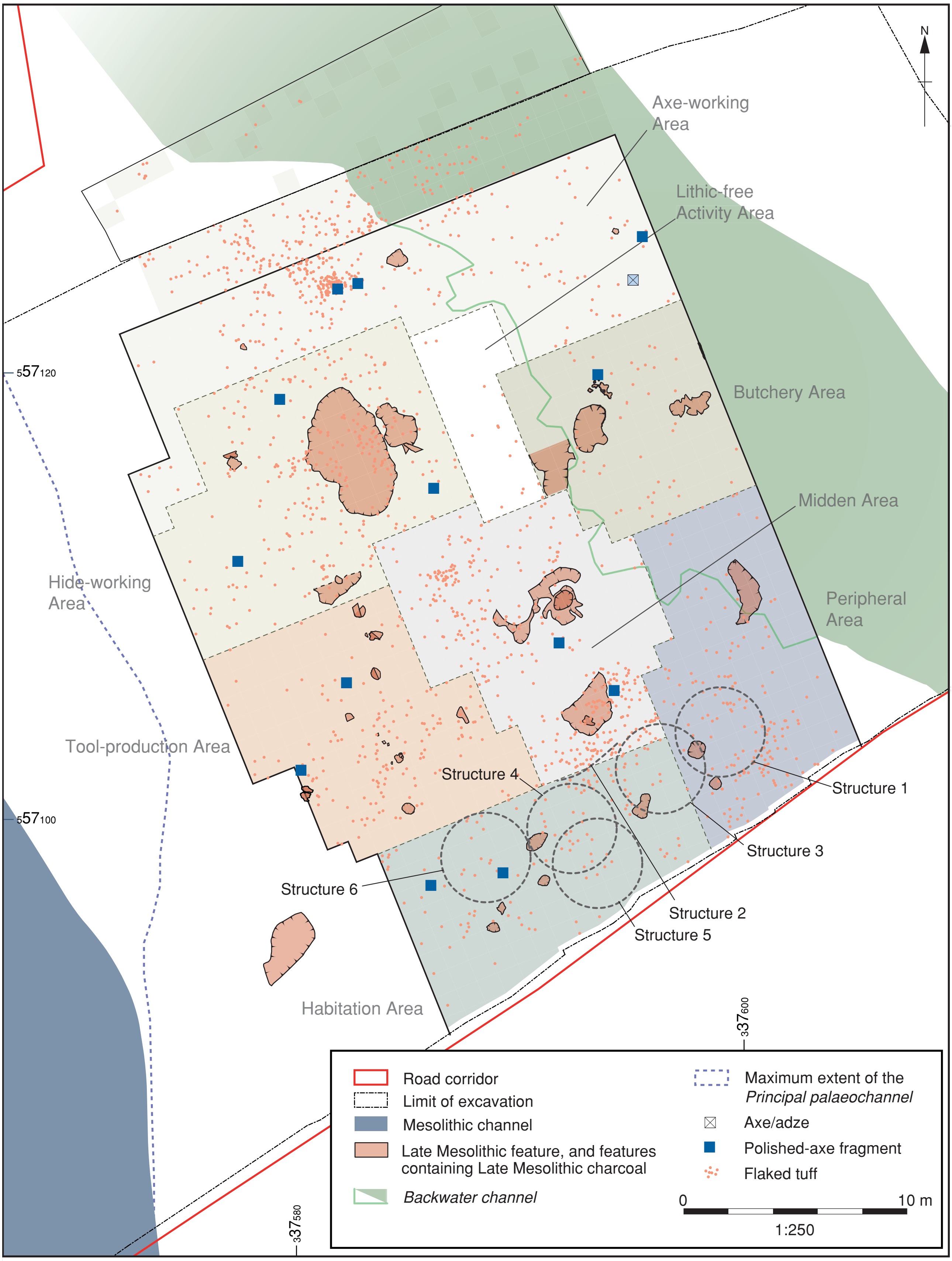

Figure 597: The distribution of the stone implements in the Grid-square area

in association and also with a concentration of tuff debitage and microliths that contained material from two knapping groups (112 and 113); therefore, together, this material appears to relate to the Late

Mesolithic reworking of ground-stone implements in the northern part of the *Grid-square area* (in the Axe-working Area; *Ch 4*; *Appendix 9*). Presumably this related to activity within the Mesolithic encampment, dating to the second and third quarters of the fifth millennium cal BC. However, tellingly, the character of the assemblage suggested that the flaked tuff represents knapping activity that had been later disturbed and, in this respect, it may have been related to the early fifth millennium cal BC phase of activity. The other polished-tuff fragment was derived from the area occupied by the Late Mesolithic midden, and it seems to have been dumped into the southern part, along with other pieces of tuff. In addition, several polished-stone axe fragments were present within the *Mesolithic overbank alluvium* that covered the *Stabilised land surface*. Although its date is less certain, it is quite possible that it was Late Mesolithic material. Indeed, perhaps it was originally derived from the *Stabilised land surface,* as spatially, the items appear to map the underlying lithic concentrations.

Although to date these potential Late Mesolithic ground-stone axes are the first such examples from England, ground-stone technology does appear to be a feature of the Mesolithic period more generally. For instance, several coarse-stone tools that had been ground into shape, and possibly decorated by applying the same technique, have been recorded from a Mesolithic structure on the Isle of Man, which dates to *c* 8000 cal BC (Gregory and Brown forthcoming). More pertinently, axe blades exhibiting varying degrees of grinding and polishing, made from stone and flint, are known from Mesolithic contexts in Ireland (Little *et al* 2016; Woodman 2015, 125-6, 146-48; Collins and Coyne 2003), Wales (David 1989; David and Walker 2004, 325-7), and possibly Scotland (Saville 1994; 2009). Moreover, in Ireland, at least, this tradition appears to have emerged from the early to the late eighth millennium BC (*cf* Little *et al* 2016).

It is of note that these are all within the Irish Sea 'province', as is Cumbria, particularly as it has been argued that similarities in material culture are likely to represent the transfer of ideas and material culture bound up in notions of regional identity. While this assertion has been made in relation to events in the Neolithic period (Cummings 2009; Bradley and Watson 2009), it is possible that social connections between communities around the Irish Sea had their origins in the Mesolithic period.

Pitchstone

It is generally accepted that pitchstone is derived from the Isle of Arran (Williams Thorpe and Thorpe 1984), where artefacts attributable to the Mesolithic, Neolithic, and early Bronze Age have been recorded (Ballin 2015a, 9), including microliths (Affleck *et al* 1988). Nevertheless, until comparatively recently, beyond the Isle of Arran, pitchstone was generally viewed as dating to the Early Neolithic period and slightly later (Ballin 2015a). This idea has, however, now been revised, as a result of several discoveries from mainland Scotland (Ballin *et al* 2018). These include Mesolithic pits at Succoth, Argyll, and Dunragit, Dumfries and Galloway, which contained worked pitchstone, and dated to the first half of the sixth millennium cal BC and the first half of the seventh millennium cal BC, respectively (*ibid*; Ballin 2021). In addition, a pitchstone microlith, in the form of a scalene fragment, has been identified within an assemblage from Tayvallich, Argyll (*ibid*).

Pitchstone objects have also been recovered from Early Neolithic pits/postholes associated with Group VI ground-stone axe blades, and, in some cases, Carinated Bowl-type pottery and leaf-shaped arrowheads (Ballin 2015b). Significant quantities of pitchstone have also been identified at Luce Bay, on the Scottish side of the Solway Firth (Coles 2010; 2011a; 2011b). There, complete and fragmentary Group VI ground-stone axe blades were also relatively common, as were Neolithic pottery, leaf-shaped arrowheads, and flaked lithics made on flint from beyond the area (Coles 2011b). Moreover, Group VI material and pitchstone has been found in association in distinct parts of Luce Bay and, in one instance, a working floor, comprising at least two discrete areas of *in-situ* pitchstone reduction, has been identified, which has been accorded a Neolithic date (*ibid*). The pitchstone from Luce Bay has been subject to analysis, the assemblage consisting of aphyric material, technologically characterised by, mainly, small bladelet cores that had been worked to exhaustion; a significant number of blade blanks, which were often small in dimensions, with a curving long profile and crudely manufactured; and very few retouched items, of which none were microliths (*ibid*).

The pitchstone assemblage from Stainton West displays several of the technological attributes displayed by the Luce Bay assemblages, and there are several examples where pitchstone has been found in association with leaf-shaped arrowheads (in the Midden Area, Hide-working Area, and Axe-working Area; Fig 598). However, in most instances, spatially, the pitchstone was closely associated with spreads and clusters of flaked lithics which are Late Mesolithic in technological character. In addition, stratigraphically, most of the pitchstone came from Late Mesolithic deposits, and, notably, such items were recovered from the *Stabilised land surface* sealed beneath Burnt Mound 1, which dates to the late Neolithic period (*Ch 10*; *Appendix 20*). It is also likely that the pitchstone from Neolithic tree-throw ***90262*** (*Ch 8*) were probably elements of a Late Mesolithic assemblage redeposited in the tree-throw

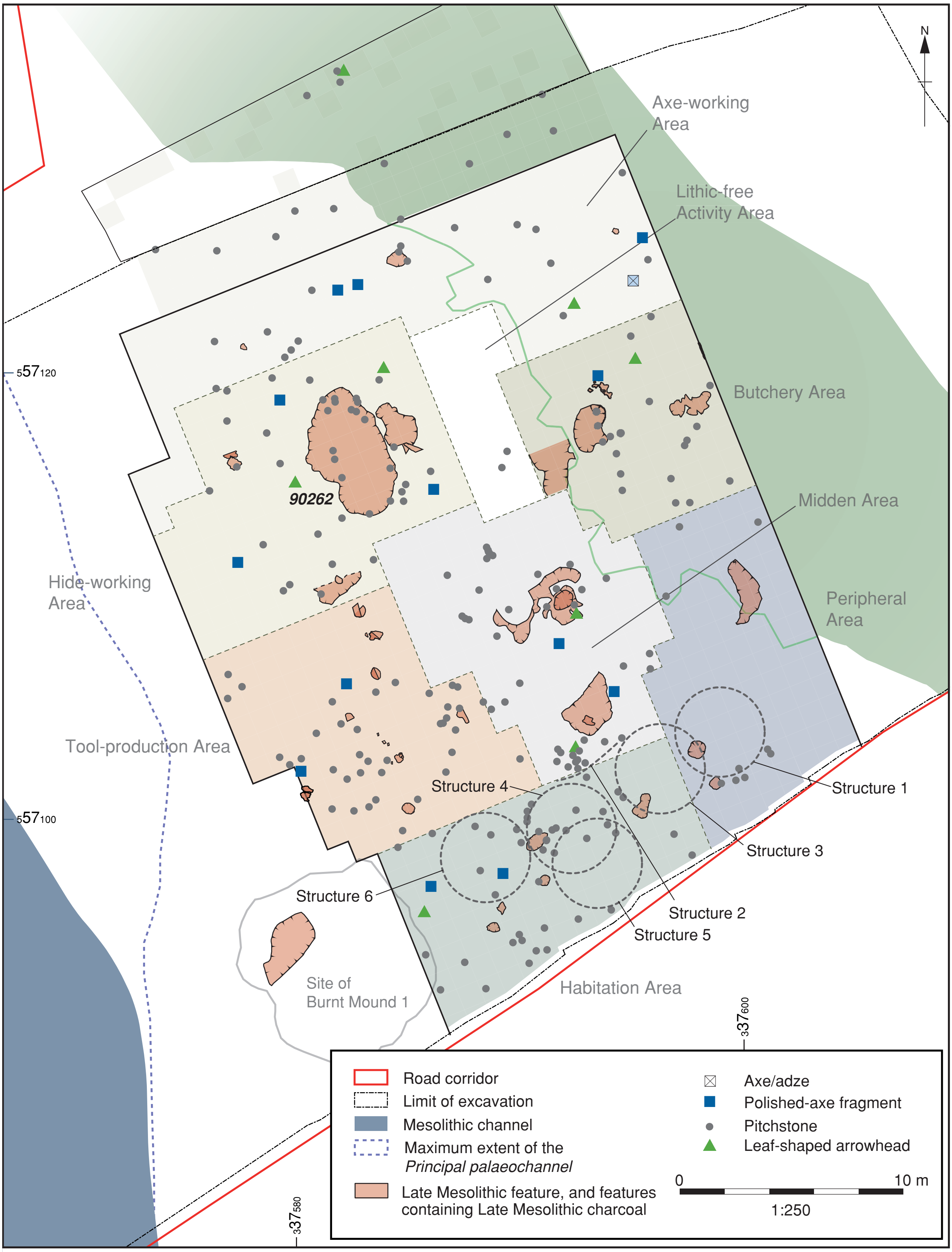

Figure 598: The distribution of pitchstone, polished-axe fragments, the axe/adze, and leaf-shaped arrowheads in the Grid-square area

after it was uprooted (*Ch* 4). Indeed, the only possible example of Neolithic pitchstone relates to that from the Axe-working Area, which came from above the *Mesolithic overbank alluvium*, and was associated

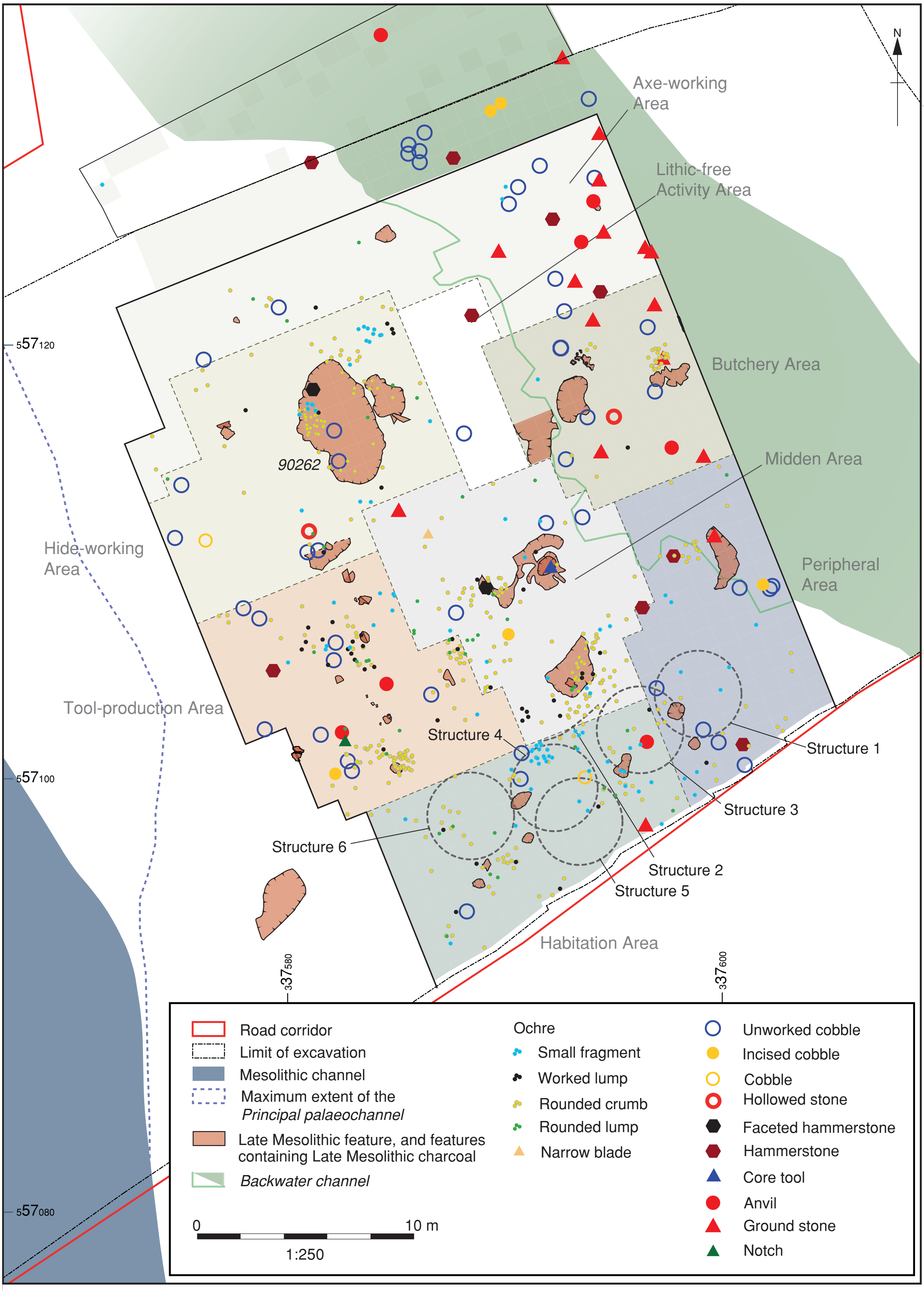

Figure 599: The distribution of ochre, and a selection of coarse-stone tools which could have been associated with its processing/use

with a leaf-shaped arrowhead. These observations, therefore, suggest that, at Stainton West, pitchstone had a long chronology of use, which spanned both the Late Mesolithic and Neolithic periods.

When freshly knapped, pitchstone produces very sharp cutting edges (Ballin 2015c) and it is possible that blades were manufactured for their sharp edges, for limited use, and then discarded (Coles 2011b, 148). Given this, it can be postulated that pitchstone might have had a symbolic resonance with those who acquired and used it, and it may have been used in special circumstances which elevated it beyond the social significance attributed to material associated with daily routines. This could be one reason why apparently very few microliths were manufactured on this material. Indeed, microwear analysis of obsidian artefacts has identified blanks manufactured from this material that were used in tattooing/scarification/bloodletting (Kononenko *et al* 2016).

Ochre

Another interesting feature of the worked-stone assemblage was the presence of a small collection of ochre. This was associated with both concentrations of Late Mesolithic flaked lithics and some of the coarse-stone tools (Fig 599), which were probably used to process this material. It also seems to have had a close spatial association with the pitchstone (*above*), with a significant concentration of ochre being present in and around tree-throw ***90262***, which also produced several retouched pitchstone flakes and blades.

At Stainton West, the precise use that this material was put to during the Late Mesolithic period is largely unknown, although a number of suggestions can be made. One is that it was used as a pigment that was applied to objects to give them a red/orange colour, which was perhaps reminiscent of blood (Isbister 2000). As well as a decorative application, ochre could have been used in the preparation of hides (*ibid*). Indeed, a probable hide polisher from an Italian Upper Palaeolithic site had traces of ochre, which may have been applied as an abrasive (Cristiani and Dalmeri 2011). In terms of hide working, it has also been noted that ochre's high iron content preserves leather (Hodgkiss 2010), while another of its uses may have been in the hafting of stone tools (Cristiani *et al* 2009). For example, it was noted that in some hafted items from the excavation at Vralsbu, Norway, ochre had been combined with a fatty binding material (Bang-Andersen 1983).

Moreover, at several South African Stone Age sites, ochre was found to be a component of hafting adhesives, and experimental replication highlighted its role in combining various elements (wax and resin), that made the adhesive easier to manipulate and more pliable when dried (Lombard 2007). Many ethnographic applications in medicine and healing have also been recorded, as well as its use as a pigment in the process of skin modification (Isbister 2000; 2009). Therefore, another possibility is that at Stainton West it was used in acts of tattooing/scarification. If this was the case, such processes may have been undertaken using some of pitchstone blades, which seem to mirror the distribution of ochre in certain parts of the *Grid-square area* (*above*).

Late Mesolithic Occupation

The character of the worked-stone assemblage, in conjunction with the chronological dimensions of the site, indicates that Late Mesolithic occupation at Stainton West consisted of both short-lived, sporadic phases of activity and a more long-lived and substantial phase of settlement. This latter possibly related to a single large group, or smaller bands, of people who aggregated at the site.

Early activity

During the earliest phase of occupation (*'Earliest Mesolithic activity'*), dating to the late seventh or early sixth millennium cal BC, a small circular structure (Structure 1; Fig 600; *Ch 3*) appears to have been established in the south-eastern part of the *Grid-square area*, which possibly relates to a wider pattern of Late Mesolithic habitation along the River Eden, some 150 years after the 8.2 ka climatic event (Alley *et al* 1997). The footprint of this structure was visible as a horseshoe-shaped cluster of flaked lithics, associated with a hearth and pit, and it appears to have had a south-westerly-facing entrance. Analysis of the flaked lithic raw-materials suggest that pebble flint was the main material worked within Structure 1, along with lesser amounts of chert and tuff (Lithic Entity 21). Brown/grey flint was also present, though this does not appear to relate to *in-situ* working and this, along with the small quantities of pitchstone present, may derive from later phases of stone-working in this part of the site. Another hearth (***90593***) to the north-west lay within a hollow (***90314***), beneath the later midden (*below*), and these features probably relate to another early structure (2). Although the hearth and hollow have not been scientifically dated, it is quite possible that the associated structure was contemporary with Structure 1, or related to another episode of early activity at the site. Significantly, the hollow contained a large concentration of chert and a dispersed spread of flaked tuff, which in both cases included lithics from all stages of the reduction sequence (Lithic Entity 19). In addition, it contained pebble-flint cores, surrounded by a concentration of debitage, which together may reflect *in-situ* stone-working, prior to the formation of the midden.

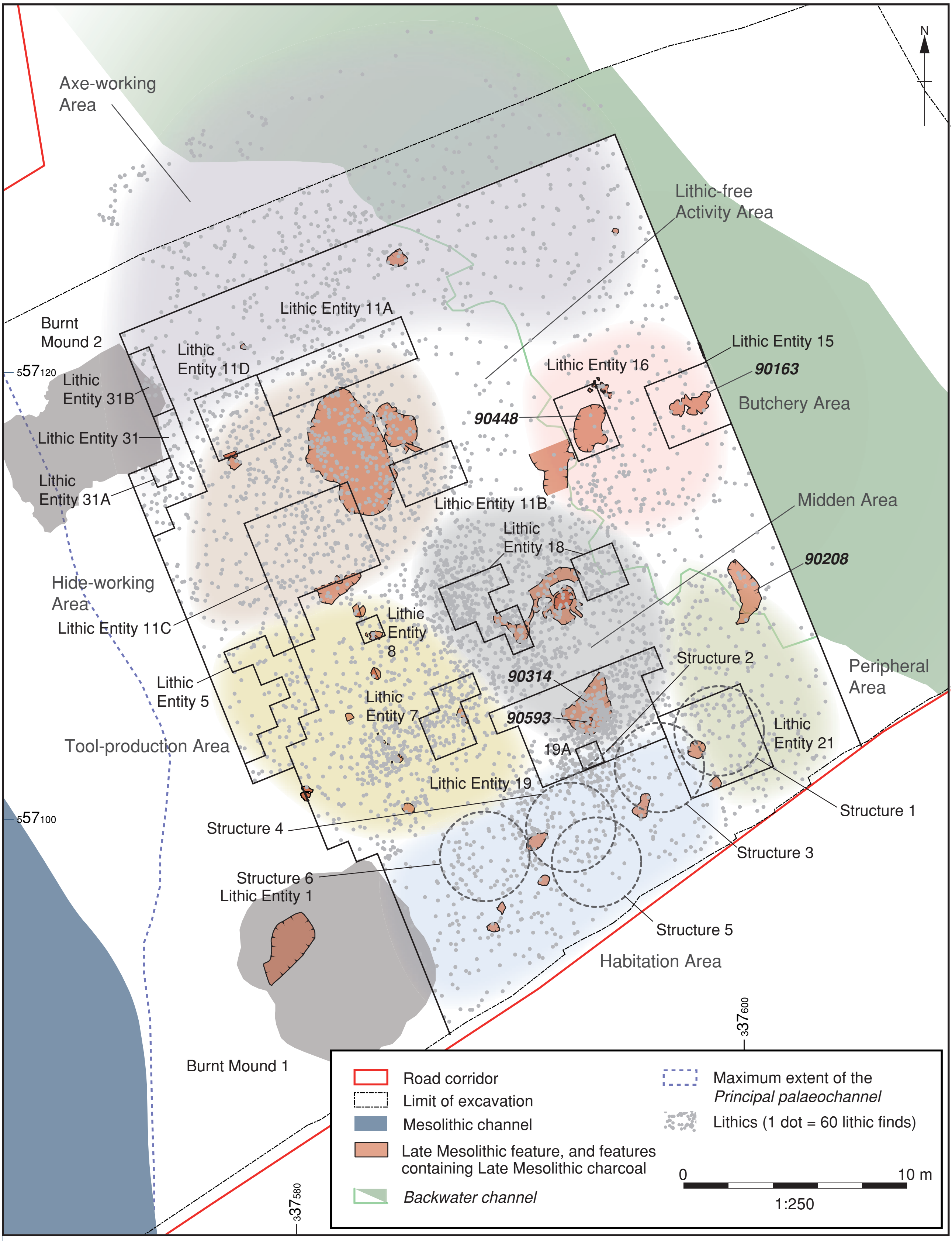

Figure 600: The structure of the Mesolithic encampment

This early phase of occupation was followed by a phase (*'Mesolithic tree-throws/activity'*) of sporadic occupation dating to the early fifth millennium cal BC. This was defined by knapping or other activity in the northern, southern, south-eastern, and eastern parts of the *Grid-square area*, in deposits beneath

Burnt Mounds 1 and 2, and also by limited amounts of worked stone from the *Mesolithic organic deposit* in the *Principal palaeochannel*.

In the northern part of the *Grid-square area* and immediately to its west, an early knapping area was represented by a lithic spread (Lithic Entity 31) within the *Mesolithic alluvium*, beneath Burnt Mound 2, which continued into the *Grid-square area*. However, it is quite likely that this material pre-dated the formation of this alluvium and originally lay on the underlying land surface on the banks of the *Principal palaeochannel*. Within this spread, two activity areas (Lithic Entities 31A and 31B) were identified, associated with the reduction of chert and pebble flint. Moreover, these appear to have been associated with different activities, with possibly an emphasis on tool production, use, and maintenance in one, whilst in the other tasks utilising backed bladelets and fine points were undertaken, alongside tool production, use, and maintenance. To the south, sealed beneath Burnt Mound 1, was another comparable deposit of *Mesolithic alluvium* that contained a small collection of flaked lithics (Lithic Entity 48). However, in this instance, this material does not appear to have been a knapping area, but instead may have been a dump of flaked lithics derived from activity elsewhere on the site.

In the south-eastern part of the *Grid-square area*, early knapping activity was focused on/around tree-throw ***90208***, which had led to the incorporation of flaked lithics into this feature (Lithic Entity 25). The assemblage from the tree-throw was dominated by chert (including a small amount of Scottish Southern Uplands chert) and pebble flint, along with smaller amounts of brown/grey flint. Although much of this material may have been derived from the land surface surrounding the tree-throw, it is also possible that some was deliberately deposited within this feature. Similarly, in the eastern *Grid-square area*, Late Mesolithic activity may have been focused on, or occurred around, another tree-throw (***90163***), which contained a small assemblage of chert and pebble-flint flaked lithics (Lithic Entity 15). It is also likely that the midden was created within the central part of the *Grid-square area* during this phase (the Midden Area), which may even have referenced an earlier structure (Structure 2; *above*). In addition, this midden probably covered several early knapping areas (Lithic Entity 18A), which were perhaps associated with early fifth millennium cal BC activity at the site (*above*).

The Mesolithic encampment

During the second quarter of the fifth millennium cal BC, hunter-gatherer occupation intensified at Stainton West, as evidenced by the presence of a Mesolithic encampment (*'Mesolithic encampment I'* and *'Mesolithic encampment II'*; *Ch 4*), which was probably visited seasonally over a period of up to *90-320 years* (*95% probability*; *Appendix 20*). The available evidence indicates that the camp contained several structures and was associated with both the working and use of flaked lithics, along with the use of coarse-stone tools and ochre (*above*). Importantly, the character and spatial pattern of the worked-stone assemblage, together with the archaeological features and some of the evidence derived from microwear analysis, enable the structure of this camp to be discerned and also allow the identification of specific task/activity areas. The results of analysis of the knapping groups and the chert-sourcing study indicate that these areas were probably contemporaneously occupied and used, and, significantly, it also seems likely that they became formalised, with the same tasks and activities being undertaken in the same parts of it each time the site was revisited and reoccupied.

In terms of the spatial organisation, the now-sizable midden lay at the centre of the camp, probably first created in the early fifth millennium cal BC (*above*). This midden appears to have been continually added to during the life of the encampment through the dumping of stone-working waste and tools. The lithic signature indicates that the midden was largely composed of dumps of pebble flint, chert, and brown/grey flint, and contained smaller amounts of Scottish Southern Uplands chert, pitchstone, and tuff (Lithic Entities 18 and 19). Much of this material comprised knapping waste gathered from other parts of the site and then dumped onto the midden. Aside from knapping waste, tools used for specific tasks also appear to have been dumped onto specific parts of the midden. For instance, scalene triangles were dominant in the southern part (Lithic Entity 19A), and in certain areas these were associated with clusters of microlith fragments, which appears to suggest that composite tools were thrown onto this end of the midden. Microwear analysis (*Appendix 7)* also suggested that the southern part contained a higher proportion of tools with impact damage, and also tools associated with the working of dry hide, and plant and woody material. In contrast, the northern end contained a higher proportion of tools associated with bone/antler working and butchery. Moreover, given their presence in this area, it is possible that those associated with butchery were thrown onto the midden following their use in an adjacent part of the site, probably used for this purpose (*below; Ch 4*).

The Habitation Area to the south contained several structures, pits, and hearths, one of the latter being radiocarbon dated to the second quarter of the fifth millennium cal BC (*'Mesolithic encampment I'* phase; *Ch 4*; *Appendix 20*). The footprints of four structures could be confidently discerned (Structures 3-6), one of which (Structure 6) was marked by a horseshoe-shaped lithic cluster that contained the best evidence for the types of flaked lithics associated with the use of the structures (Lithic Entity 1). Interestingly, the flaked lithics from Structure 6 did not appear to relate to *in-situ* knapping, but instead probably reflect stone-working undertaken in and around the structure.

The assemblage was dominated by pebble flint, with smaller amounts of chert, and there was also a relatively large number of brown/grey-flint flaked lithics, which were mainly clustered on the eastern side of the structure. In addition, it was associated with small amounts of pitchstone, Scottish chert, and tuff. This structure also contained a significant collection of microliths, comprising backed bladelets and microlith fragments, and an almost exact repertoire made from the same material, to that recorded from a stone-working area to the north, forming an element of the Tool-production Area (*below*). This suggests that tools produced in this area, during the mid-fifth millennium cal BC (*'Mesolithic encampment II'* phase; *Ch 4*), were used in the structure. Other non-microlithic tools were also associated with Structure 6, including awl/borers, scrapers and related pieces, and simple edge-retouched pieces, whilst knife forms also formed a significant component of the macro-tool assemblage.

Although the other structures in this area (Structures 3-5) were not associated with dense spreads of flaked lithics, scalene triangles were the dominant microlith type associated with two of the structures (Structures 4 and 5), which had overlapping footprints. Beyond these, there were also several isolated clusters in the wider area which mainly consisted of pebble-flint cores, debitage, and tools (Lithic Entities 2 and 3). Although it is clear that this part of the site was associated with domestic occupation, the microwear analysis suggested that hide working was the main activity associated with Structures 4-6, and that butchery was also a significant activity undertaken in this part of the encampment.

Immediately north of the Habitation Area, at the centre of the Tool-production Area, was a spread of lithics, comprising large quantities of cores, debitage, microliths, and other retouched tools, along with two anvils/rests (Lithic Entity 7). This spread represents a stone-working area, which has been dated to the mid-fifth millennium cal BC (*'Mesolithic encampment II'* phase; *Ch 4*). The material from this spread suggests that chert was the main material being knapped, with lesser amounts of pebble flint and brown/grey flint. Another stone-working area to the north-west was defined by a reversed C-shaped cluster of flaked lithics (Lithic Entity 5). In contrast to the working area to the south-east, brown/grey flint and pebble flint were the main materials, and there were also relatively few microliths present. Another smaller knapping area was identified, focused on a hearth, to the south of the central stone-working area, and there chert was the main raw material being knapped (Lithic Entity 8).

The Hide-working area to the north was defined on the basis of the microwear analysis, which indicated that, of those pieces exhibiting interpretable use-wear, 50% were associated with the working of hide. More specifically, the tools associated with this activity included microliths and scrapers, simple edge-retouched blades and flakes, and a notch. In addition, the area contained a large number of awl/borers, which, again, were probably associated with hide working. Although hide could have been used in clothing, it may also have been used for covering structures, such as skin boats (Hurcombe 2014). Given that the Hide-working Area was adjacent to an active river during the Late Mesolithic period, its use in boat making is a distinct possibility. This area also contained four main knapping areas, associated with the working of brown/grey flint, chert, and pebble flint (Lithic Entities 11A-D). Two of these areas were also associated with pitchstone blades (Lithic Entities 11A and 11B).

Another activity area to the east appears to have been used for butchery. Of the tools analysed for microwear, many had been used in butchery, and a large proportion had also been used to cut bone/hard surfaces, which again may have related to butchery. Moreover, a concentration of tools used in butchery was present in that part of the midden adjacent to this area (*above*). Perhaps, therefore, these tools were originally used in the area and were then tossed onto the midden. Given this evidence, it is tempting to see activity as representing the communal butchery of kills, possibly undertaken as part of the relationships and obligations associated with a communal gathering. It is also clear that knapping was undertaken in this area (Lithic Entities 14 and 15), though this may have related to earlier activity in this part of the site focused in or around a tree-throw (***90163***). The Butchery Area did, however, contain another tree-throw (***90448***), which was contemporary with the Mesolithic encampment (*'Mesolithic encampment I'* phase). This contained mainly chert and pebble-flint lithics, along with smaller amounts of brown/grey flint, good-quality brown chert (GQB/chert), and material of the 'cannot determine' lithology, as well as a single pitchstone flake (Lithic Entity 16).

Sandwiched between the Hide-working Area and the Butchery Area was one largely devoid of lithics (Lithic-free Activity Area). Therefore, tasks which did not involve their use appear to have been undertaken there, perhaps involving organic materials. Two other areas were also identified on the northern (Axe-working Area) and south-eastern (Peripheral Area) sides of the encampment. Both contained discrete spreads of flaked lithics, though those in Peripheral Area probably related to an earlier phase of occupation associated with Structure 1. Although the Axe-working Area also contained a spread of material that was associated with early occupation, knapping-group analysis and the chert-sourcing study suggest that the other lithic spreads might have been contemporary with the Mesolithic encampment. If this was the case, the knapping of chert and pebble flint occurred there during the life of the encampment, along with the more occasional knapping of brown/grey flint and other raw materials. Significantly, there is also strong evidence for the Late Mesolithic reworking of polished-stone tools in this area, suggesting it was associated with a more specialised form of knapping.

Later activity

Probably not long after the intensive phase of occupation associated with the Mesolithic encampment came to an end, alluvial deposits began to accumulate at Stainton West (part of the Hiatus Phase; *Ch 6*), which sealed the Late Mesolithic encampment. This period of alluviation dates to between *4400-4300 cal BC* and *3990-3880 cal BC (Appendix 20)*, although there is some indication that sporadic occupation took place as this process was ongoing. This is manifest by a few knapping groups and spreads of flaked lithics which were stratigraphically associated with the *Mesolithic overbank alluvium*. This indicates a return to sporadic, low-level occupation activity, which probably focused on the acquisition of animal and fish resources at the site.

Late Mesolithic Stone Procurement

When considering the flaked lithics, it has to be remembered that all the raw materials involved in the Late Mesolithic occupation activity at Stainton West were transported to the site (Fig 601). Pebble flint is the only source of flint in the immediate area, raised shingle beaches, the source for much of this, being found on both the northern and southern shores of the Solway Firth, extending along the western coast of Scotland (Mithen 2000a; 2000b; Cummings and Robinson 2015). Deposits also extend down the west Cumbrian coast from St Bees to Walney Island.

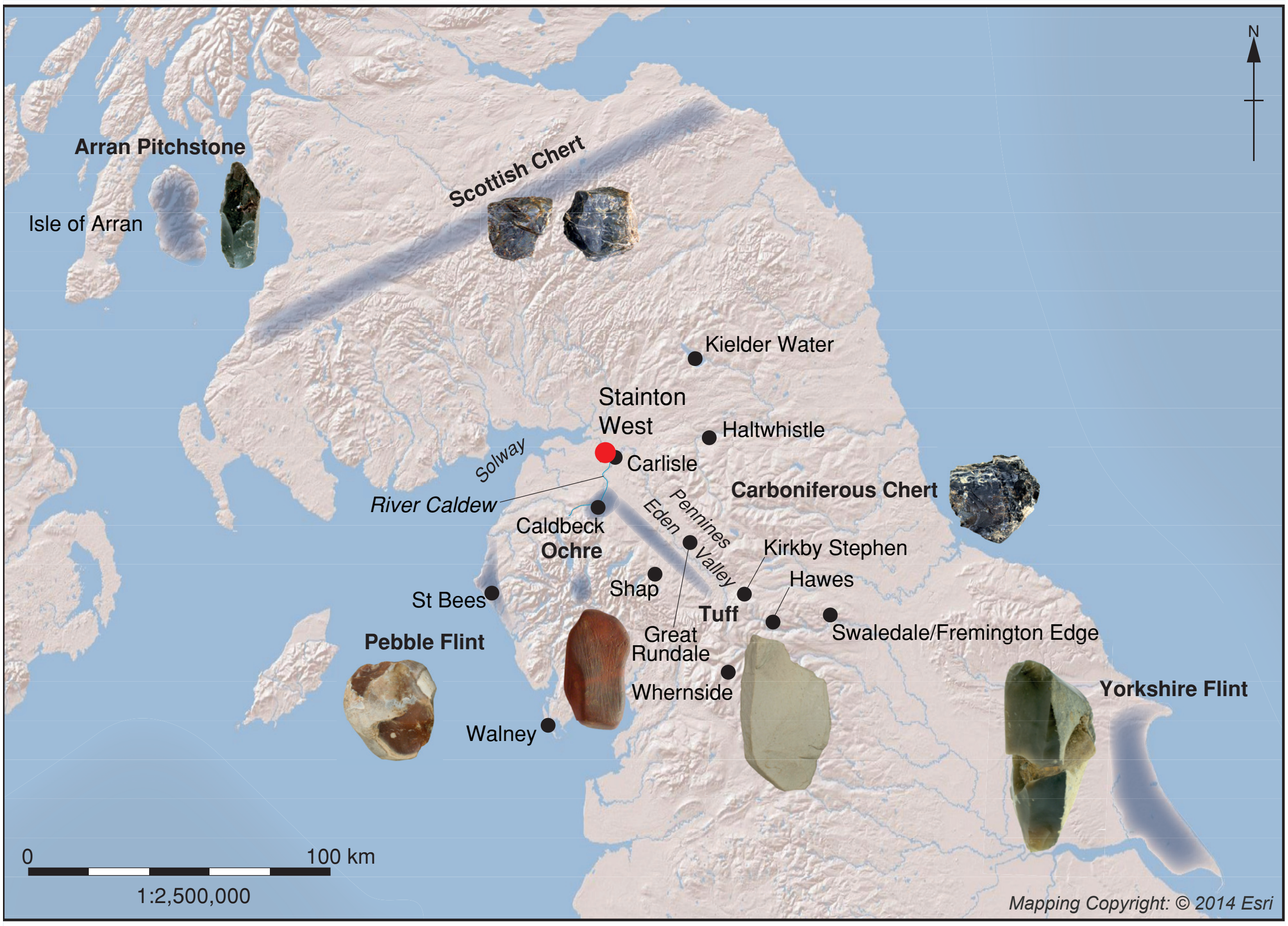

Figure 601: The possible source areas for the worked stone at Stainton West

There are reports in the latter area that flint pebbles are also contained within superficial geological deposits (Barnes and Hobbs 1950). Therefore, there is potential for pebble flint to have been procured from a variety of source areas both local to, and at some distance from, the site.

It is highly likely, based on the detailed study of the lithic raw materials (*Appendix 6*), that some of the chert at Stainton West was procured from several different limestone formations in northern England. These include sources in northern Cumbria, with some of the chert probably being obtained from along the course of the Cald Beck, which flows into the Caldew, the confluence of that river with the Eden being *c* 2 km upstream from Stainton West. In Cumbria, another geochemically identified source encompassed the upper reaches of the Eden Valley, with some chert also being procured from the nearby uplands between Shap and Kirkby Stephen. Another potential chert source in the Eden Valley may have been Great Rundale, where an assemblage of flaked lithics, including chert, pebble flint, and possible Yorkshire flint, was recorded adjacent to a tarn (Skinner 2000). There, it is claimed that much of the chert was procured locally from stream beds and outcrops within the limestone geology, and the presence of struck limestone flakes reflected the dressing of chert nodules (*ibid*). Presumably, comparable exposures also allowed access to chert along the Cald Beck and in the Eden Valley, particularly as the landscape survey conducted as part of the chert-sourcing study identified outcropping bedrock sources of chert in riverine locations on the periphery of the northern Cumbrian fells (*Appendix 6*).

Chert from other sources in the northern Pennines also reached Stainton West, apparently including material from Whernside and Hawes, near the head of Wensleydale, and Fremington Edge, Swaledale (*Appendix 6*). What is now Northumberland was another source. The chert-sourcing study again suggested that some of this material may have come from riverine areas, with one source being identified at Haltwhistle, within the Tyne drainage system, where other chert sources, centred around Kielder Water, have also been identified (Wickham-Jones and Collins 1978). In addition to those sources in northern England, Scottish chert was also present, most probably procured from the Southern Uplands.

Other raw materials were also derived from specific parts of northern England and Scotland. Some of the Late Mesolithic axe fragments were made on Group VI tuff, which came from the central fells of the Lake District, indicating connections with that part of Cumbria. Brown/grey flint and pitchstone also came from distant sources, with the former likely to have been procured from Yorkshire (*Appendix 6*), whilst the latter was from the Isle of Arran. In contrast, the volcaniclastic, sedimentary, and metamorphic rocks used to produce the Late Mesolithic coarse-stone tools were probably liberated locally, where they were present as glacial erratics (Livingstone *et al* 2010). These were most probably obtainable from the beds and banks of rivers, such as the nearby River Eden, with smaller amounts perhaps coming from tree-throws or through the intentional disturbance of surface deposits.

Naturally, the varied nature of the raw materials used at Stainton West and the wide geographical range of the disparate sources has various implications, not least that it potentially links the movement of people, or resources, between the site and the wider landscape of northern England. It also appears that initially, during the early phase of activity at the site, when Structure 1 was in use, raw materials were primarily obtained from the local area, with fairly limited access to those from northern England and southern Scotland. Indeed, following the analysis of the assemblage, this was confirmed by a separate study of the lithics from Structure 1, which indicated that 'exotic' raw materials (*ie* Yorkshire flint and Scottish chert) were rarely used, when compared with those in later structures, particularly Structure 6 (Leedham 2020). Hence, it is evident that during the period when the Mesolithic encampment was most intensively inhabited, groups occupying it would have had greater access to raw materials from both local and regional sources, and also those from more distant places. This might, in turn, indicate a widening of the exchange networks, and areas of interaction, or perhaps even relate to the creation of extensive hunter-gatherer territories during this period (*Ch 5*).

Earlier Neolithic Activity

Understanding of early Neolithic flaked-lithic technology in Cumbria is limited, largely because of the lack of analysed assemblages of any size from securely dated contexts. While early Neolithic sites have been excavated, they have produced no stratified lithic material, or are flaked-lithic assemblages, chiefly characterised by debitage (*cf* Bewley 1993; Davies 2008; Railton 2009). Given this, interpretation of the early Neolithic stone-working technology is largely reliant on information that can be gleaned from surface lithic scatters (Evans 2008, 31, ch 9). This approach has problems, however, as large-scale fieldwalking surveys have been restricted to specific parts of the landscape, such as the west coastal plain and the limestone uplands. Therefore, there is a biased representation of prehistoric activity in selected topographical zones, which can be difficult to interpret in terms of chronological and technological character (Evans 2004, 126). For example, leaf-shaped arrowheads are often found in association with blade debitage, but they are invariably components of assemblages that also contain diagnostic pieces and reduction sequences from a variety of stone-working technologies (Cherry and Cherry 2002, 6).

Additionally, while the presence of leaf-shaped arrowheads is recorded from various parts of Cumbria (*op cit*, 5), their chronological and stylistic attributes have yet to be considered in detail, although the evidence from Stainton West points to a possible broad chronological sequence of production and use. Furthermore, it has also been postulated that polished-stone axeheads made from tuff, and fragments of these, when found in association with leaf-shaped arrowheads, and an ostensibly blade-based technology, reflect the continuation of a Late Mesolithic technology into the early Neolithic period (Evans 2008, 31). While, in some instances, this is probably the case, the evidence from Stainton West points to a protracted use of ground-stone implements spanning the Late Mesolithic/early Neolithic periods. Caution is, therefore, required when applying such reasoning, and it cannot be assumed that such items simply reflect early Neolithic occupation, particularly when they are components of lithic assemblages from undated contexts.

Within Cumbria, these problems are compounded by the physical nature of the local raw materials, which restricts the dimensions and morphology of the debitage. Therefore, elements of core technology and blade and flake debitage can appear technologically similar, even though it was produced within different chronological periods. Given these problems, assemblages with a narrow blade/narrow flake and microlithic technology are often interpreted as Late Mesolithic/early Neolithic in chrono-technological terms, particularly in the case of surface-collected assemblages (*cf* Evans 2008; Dickson and Cherry in prep). Furthermore, this apparent lack of lithic technological development in the early Neolithic period has prompted some researchers to question the existence of a conventional early Neolithic culture in Cumbria, especially in the transition phase (Cherry and Cherry 2002, 6-7; Evans 2008, 31).

Firm evidence for Neolithic worked stone is limited in the *Grid-square area*. In the main, it consists of a scattering of diagnostic tools, including leaf-shaped, kite-shaped, and transverse (*petit tranchet* and chisel form) arrowheads, awls/borers, bifacially flaked fragments, scrapers, and a knife form with edge-use gloss (Lithic Entities 38-41 and 43-6). It is also possible that at least some of these, such as the scrapers, might date to the early Bronze Age, particularly as a barbed-and-tanged arrowhead was also discovered in this part of the site (Lithic Entity 42). In addition, a collection of cores and debitage with relatively large dimensions was identified, which in isolation might be considered indicative of Neolithic stone-working; however, they were all associated with concentrations of Late Mesolithic lithics, and most are instead probably a product of this period of occupation. Indeed, much of this material might relate to the opening, testing, and discard of raw-materials during the Late Mesolithic period, and, perhaps tellingly, only one core (an opposed-platform example made from red basalt) could be confidently related to Neolithic stone-working.

Significantly, the few diagnostic tools and debitage from the *Grid-square area* with a technological character that possibly post-dates the late Mesolithic period point to only sporadic and low-level activity in the Neolithic period, extending into the Bronze Age. The earlier Neolithic worked stone is suggestive of specialised activity, such as hunting, with a reliance on specific tool types. Moreover, within the *Grid-square area*, other than the few natural features, dated to the Neolithic period, which could relate to tree clearance, no distinctive features, such as pits, postholes, stakeholes, or hearths, were present that could be associated with early Neolithic settlement. Indeed, all of the hearths, pits, and structures from this part of the site have been either scientifically dated to the Late Mesolithic period or are spatially associated with Late Mesolithic stone-working activity.

In contrast, the *Principal palaeochannel* contained abundant evidence for earlier Neolithic activity (Fig 602), and it is quite likely that this natural feature acted as a receptacle for intentional deposition, akin to those practices normally associated with constructed Neolithic monuments. These appear to have involved transporting unused cobbles to the site and placing them into the channel, along with cores/core tools, flakes and flake tools, ground stones and anvils, and ground-stone axeheads. Flaked lithics also appeared to have been deposited as part of this process. These included a leaf-shaped arrowhead (Lithic Entity 47), placed in the channel together with a group of chert cores (*eg* knapping group 116) and debitage, and also a concentration of brown/grey flint that was probably ultimately derived from Yorkshire (Lithic Entity 48). This latter material serves to highlight that movement between the north-west and the north-east of England, which had been established during the late Mesolithic period, continued, and that this raw material may have held some form of symbolic significance.

Three tuff axe blades were recovered from earlier Neolithic deposits (*Ch 8*; *Appendix 9*), while another,

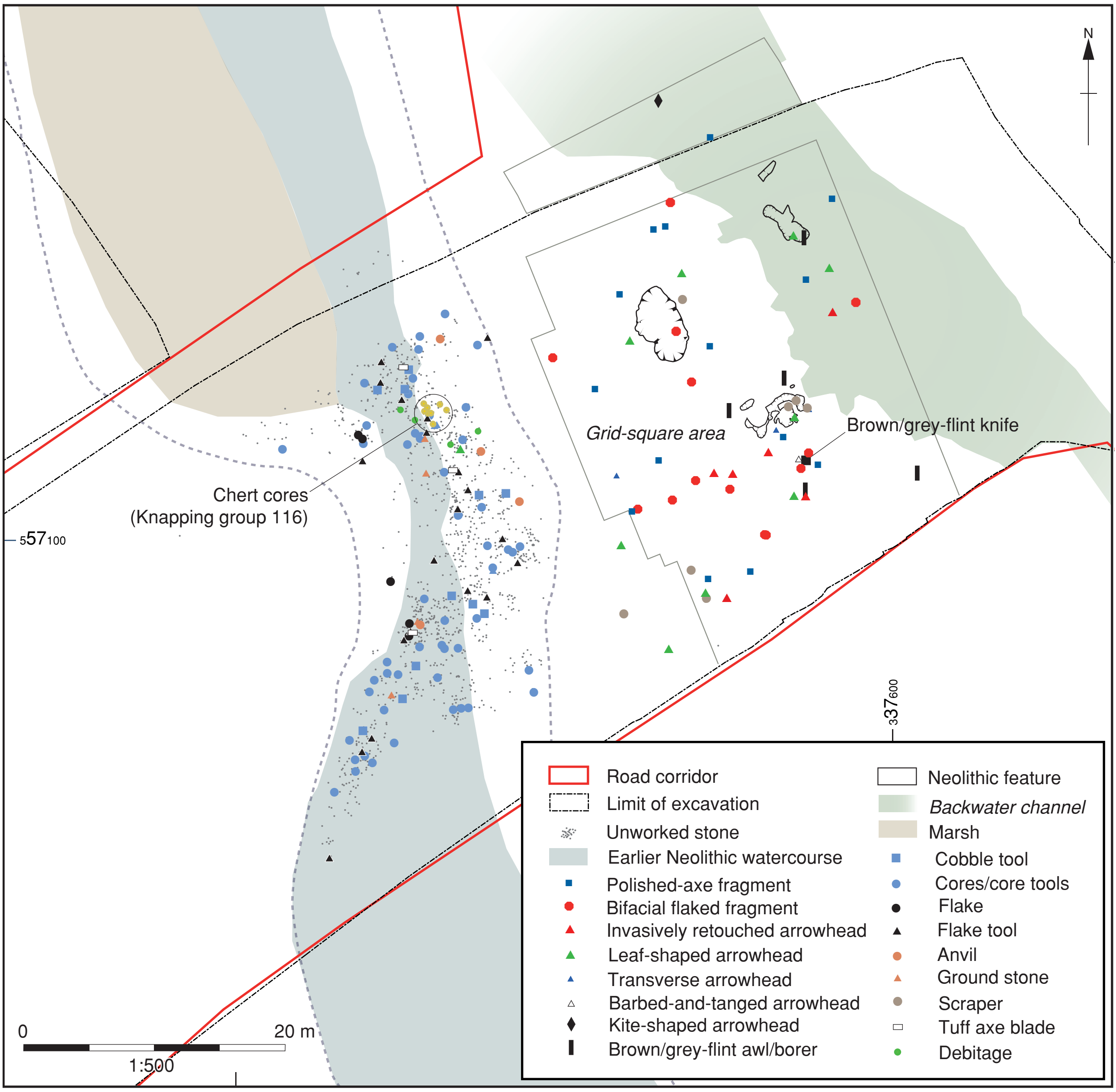

Figure 602: Earlier Neolithic activity in the Principal Palaeochannel *and* Grid-square area

made from a quartz dolerite cobble, was associated with a late Neolithic deposit. Two of the tuff axe blades had been reworked extensively, while the third, a Cumbrian Club (*Appendix* 2), also exhibited evidence for limited modification. All three pieces had been dehafted prior to their deposition in the channel. The fact that the pecked and ground cobble was also lacking a haft could indicate that this was linked with the early Neolithic axes, and, as such, it could have been disturbed from its original context. The deposition of the tuff axe blades in the channel is dated to *c* 3700 cal BC, although they were probably in circulation for some time before this, especially the two that had been significantly reworked. Given this, it is possible that the axes had extensive biographical and symbolic histories, which may have stretched back over a protracted period.

Taken together, the axe blades form a small but very significant group. In raw-material terms, the three tuff examples reflect the working of stone from within the classic Group VI range, together with other stone which also outcrops in the same general area, whilst the quartz dolerite example was made from a glacial erratic. The variety in the form of blades is not uncommon and it is relatively easy to find parallels for each of the pieces both within and beyond Cumbria (Bradley and Edmonds 1993). Such parallels are, inevitably, more significant for some of the blades than for others. Of the four, it is the small Cumbrian Club which invites the closest comparisons. These distinctive blades are well-represented in several parts of Cumbria, most notably in several hoards and at Ehenside Tarn, though most are rather larger than that from Stainton West (*ibid*; Darbishire 1874). At the source, finely worked roughouts with many of the same characteristics have a close concentration in the area between Pike o'Stickle and Harrison Stickle, suggesting that many may have been made in the vicinity. This finds further support in a relatively high degree of similarity identified in the petrological 'fingerprint' of a number of Cumbrian Clubs, which is consistent with the material outcropping in this general area (Davis and Edmonds 2011; Edmonds 2004). Therefore, the wide and varied distribution of these blades suggests that even within Cumbria, they may well have been circulated between people. Broader associations suggest that many of the Cumbrian Clubs date to the first half of the fourth millennium cal BC (Davis and Edmonds 2011), a date consistent with the Stainton West example.

Given the presence of tuff axe blades, it may also be significant that, in terms of raw materials, the majority of the coarse-stone tools and unworn cobbles from the channel probably have a volcaniclastic origin. It is therefore tempting to see a symbolic connection between this material and that from sources in the central fells, not only in terms of their similarity in colour (grey/green) and physical properties, but also in the character of their deposition. Indeed, this may have motivated the selection of volcaniclastic cobbles and pebbles, which were most easily obtained from rivers. Furthermore, such locations may have been bound up in symbolic narratives revolving around how the landscape was perceived and lived in (Morphy 1995) and, if the riverine procurement hypotheses hold true, then sources could have had a social and symbolic meaning connected to their relationship with wet environments. Perhaps, therefore, at Stainton West, a cycle involving procurement of material from or near to rivers may be witnessed, their symbolic conception through modification and/or use, and their subsequent redeposition into a wetland context, effectively returning them to where they came from. It is of interest that a similar cycle of procurement, creation, and deposition in, or near, wetlands for tuff axe blades also appears to have existed (Bewley 1994; Clare *et al* 2002).

Later Neolithic and Early Bronze Age activity

In terms of determining later Neolithic and early Bronze Age stone-working technologies, as with those of the early Neolithic (*above*), there is a paucity of analysed lithic assemblages from dated, secure contexts, with many diagnostic of the Late Neolithic/Early Bronze Age only being present within mixed assemblages. Conventional mid-/late Neolithic diagnostic implements have been recorded from various parts of Cumbria, such as *petit tranchet*-derivative arrowheads; blades and flakes with serrated edges; scraper forms; fabricators; and edge-ground knives and scrapers (*cf* Cherry and Cherry 1987b). However, serrates and edge-ground pieces are more common to lithic scatters recorded on the limestone uplands in the east of the county, and a particularly fine example of an edge-ground knife/scraper was recorded in a lithic scatter identified near Orton (*pers obs*). The arrowheads, serrates, and edge-ground flint implements have parallels with specimens from East Yorkshire in middle and Late Neolithic contexts (Manby 1988).

Diagnostic lithic artefacts attributable to an Early Bronze Age technology chiefly consist of scraper and knife forms (*cf* Cherry and Cherry 1987a), along with barbed-and-tanged arrowheads. The latter are relatively rare on sites on the West Cumbrian coast, but are more common in the eastern uplands, where they are often discovered as single artefacts, suggesting hunting losses. Additionally, surface scatters, assumed to be Late Neolithic or Early Bronze Age in date, form a diffuse spread of small assemblages, which at a landscape level show a dispersed distribution in those areas examined (Cherry and Cherry 2002, 12). Furthermore, while some Late Neolithic/Early Bronze Age occupation sites have been identified (*op cit*, 8; Evans and Coward 2004; Evans 2008; Cherry and Cherry 1987b), they remain few in number, especially on the west coast. Indeed, more can be known about the settlement pattern from plotting cairnfields, burial sites, and ceremonial monuments (*eg* Fell 1953; Turnbull and Walsh 1997; Evans 2008; Quartermaine and Leech 2012), which tend to survive better on the marginal uplands, where there has been less intensive agricultural improvement.

At Stainton West, during the later Neolithic/Chalcolithic/earlier Bronze Age, the artefactual evidence suggests that low-level specialised activity occurred, which may have been linked to ritual acts. For instance, in the *Principal palaeochannel*, a possible pit containing late Neolithic Grooved Ware pottery points to ritual activity (*Ch 10*), which might also have involved the reworking of earlier artefacts. More specifically, it appears that an early Neolithic *polissoir* was reappropriated in the late Neolithic period and then symbolically burnt and smashed into several fragments. The sequence of late Neolithic, Chalcolithic, and Bronze Age burnt mounds also related to specialised activity, which in this instance was perhaps linked to ritualised acts of bathing and purification (*Ch 11*). Tellingly, these acts did not use worked stone, and it is likely that most of the lithics and coarse-stone tools from the burnt mounds, Bronze Age features, and Chalcolithic and Bronze Age alluvium within and beyond the *Principal palaeochannel* are residual, and date to the Late Mesolithic period. That said, the all-round scraper from Burnt Mound 6 (*Ch 11*), could well date to the late third millennium BC and was perhaps contemporary with its use.

Procedural Assessment

Overall, the analysis of the worked stone from Stainton West has proved extremely beneficial for unravelling the complexities of this site and the nature of its occupation. Three procedures were, however, integral to achieving these results. These were the excavation methodology; the lithic-recording system; and the technological analysis.

Excavation methodology

The excavation techniques employed at Stainton West were key to the recovery and analysis of the worked-stone assemblage. In the eastern part of the site, the implementation of a grid-square system and a comprehensive finds-retrieval strategy based on hand excavation, and the off-site sieving of spoil from each grid square, ensured that a high degree of control was maintained during the recovery of the worked-stone assemblage. Given that the lithics were largely *in situ*, this methodology proved vital, and also assisted enormously in the stratigraphical and spatial analysis of the assemblage. Furthermore, it ensured that all elements of flaked-lithic reduction sequences were recovered, allowing for detailed insights into stone-working activity and post-depositional processes. During the excavation of the *Principal palaeochannel* and the retention pond area, a different methodology was applied. In both, items of worked stone were hand-excavated and their positions were three-dimensionally recorded. During the excavation of the *Principal palaeochannel*, and the areas immediately adjacent to it, bulk samples were taken and sieved, which allowed for the recovery of additional flaked lithics, amounting to approximately 44% of the total assemblage recovered from this part of the site. Of course, as not all of the excavated deposits from the *Principal palaeochannel* and retention pond area were sieved, this inevitably meant that the smaller fraction of the lithic resource was not fully represented in the assemblage; however, a significant quantity of worked stone was still recovered from these areas, which enabled valid statements to be made regarding the character of the material and the circumstances of its deposition.

The excavation methodologies for the recovery of the worked stone have therefore allowed the nature of Late Mesolithic and Neolithic activities at the site to be discerned. It is clear that such processes should be considered at other lithic sites, particularly those of a Mesolithic character, where it is often only worked stone that survives as a residue of early occupation and activity. Indeed, Stainton West exemplifies the value of implementing a comprehensive finds-retrieval strategy, to realise the maximum potential that can be gained from lithic material when interpreting occupation activity at both the intra- and inter-scale of analysis.

Lithic-recording system

The lithic-recording system used to analyse the Stainton West worked-stone assemblage was based on that designed by Caroline Wickham-Jones (1990) to record the Mesolithic and Neolithic artefacts from excavations on Rum, Scotland. This is particularly suited to the analysis of large lithic assemblages and, while it undoubtedly has it problems (*cf* Preston 2012), its strengths lie in its adaptability. In this respect, it proved of great value when recording the Stainton West assemblage. On one level, it allowed the recording of the complete assemblage to an assessment level of inquiry, but once the assessment data had been collated and entered onto the project database, the ensuing records provided a reliable and extensive resource which could be interrogated at various scales of analysis (*ie* typologically and spatially). This informed the decisions to be taken as to how the more detail recording of a sample of the worked stone should be implemented. Once these decisions had been made, significantly, the system could be adapted to record a detailed typological and technological account of the flaked lithics, which incorporated additional approaches to recording lithic technological attributes drawn from several other recording systems (*cf* Mithen 2000a; Preston 2012).

The relational database was designed to store the results of all strands of analysis involved in the interpretation of the worked-stone assemblage, which proved invaluable during the post-excavation analysis. Indeed, the main value of the database was its ability to query and collate data, and present the results in different formats, in order to define the technological composition of the assemblage. Moreover, through querying the data, it was possible to explore the social implications behind the varied processes relating to how lithic raw materials reached the site; how they were worked, modified, and used; and how their deposition reflected the spatial representation of various activities. Furthermore, the creation of a chronological model (*Ch 1*) meant that this activity could be set within a secure temporal sequence, which allowed for a reasonable level of understanding into the chrono-technological formation of the site, that would otherwise be seen as a palimpsest of worked stone, lacking any dynamic quality.

A detailed record of social activity, spanning the Late Mesolithic and Neolithic periods, has been accomplished at a tenable level of enquiry. Although this is pertinent to Stainton West, the lithic-recording system and database have been designed so that they can be adapted to record worked-stone assemblages from other sites, across both the region and a wider area. Indeed, the application of a similar recording system at other regional sites should be seen as essential, as this will allow the data from other sites to be similarly interrogated, to define similarities and differences in regional lithic facies.

Technological analysis

The analysis of the worked-stone assemblage has provided a detailed account of raw-material procurement, and the reduction strategies applied to the material once it had reached the site. Additionally, it has recorded copious information relating to the production and use of a wide range of tool types in the Solway area, and also a wider part of north-west England, during the Mesolithic and Neolithic periods. Spatial analysis linked to the chronological model for the site has allowed the interpretation of how the various types of stone were worked, and how this relates to activity during specific phases of occupation. Several important findings have also been recognised, which include the potential use of tuff sources from the central fells for the production of ground-stone tools in a Late Mesolithic context. Consequently, there now exists a corpus of published data, based on the study of an extensive worked-stone assemblage, which is unparalleled in northern Britain, and relates to many aspects of Late Mesolithic and Neolithic lithic techno-complexes.

This corpus is of great significance as data do not as yet exist within the region relating to excavated sites comparable to Stainton West. Discussion of regional lithic technological developments and period-based settlement patterns thus relies on information gleaned from the study of insecure, often technologically mixed, surface assemblages. While this body of material is of huge potential and significance, it is in desperate need of detailed analysis and synthesis, which would go some way to determining if any regional technological patterns and idiosyncrasies can be detected. In this respect, it is hoped that the results from Stainton West will provide a template for such work.

Future work

Although the analysis of the worked-stone assemblage from Stainton West has produced, at a regional and national scale, unprecedented results, further work on certain elements of the lithic archive would undoubtedly allow for greater insights into the assemblage.

Lithic Archive

During post-excavation analysis, it became clear that further sorting of the lithic archive would benefit an understanding of raw-material procurement, use, and distribution. There is therefore considerable potential for select raw-material classifications to be revisited, to refine and potentially increase their composition. These are primarily:

- the 'Other' raw-material category. A macroscopic inspection of this material alongside raw-material reference collections from northern England and Scotland could further define the geological variation of the raw materials included in this category. This should include material classified as limestone, which could be degraded tuff;

- the 'SSUC' raw-material category. A macroscopic identification of the chert raw materials held in the lithic archive could add significantly to the SSUC material already recorded, and broaden an understanding of its use and distribution across the *Grid-square area*.

Technological analysis

The lithic typological and technological attribute analysis (*Appendices 4* and *5*) identified several programmes that would allow greater insights into regional flaked-stone industries. These are:

- a full typological and attribute analysis of that part of the Stainton West flaked-lithic assemblage which has only been assessed, to define whether the current results can be expanded on, refined, or disputed;

- the technological analysis of all knapping groups, to confirm their character, especially those that were included in the chert-sourcing study (*eg* knapping groups 1 and 24);

- the identification of sites of a similar size and extent in Cumbria relating to the Mesolithic and Early Neolithic periods, and to that of Stainton West, to provide case studies for comparative sample analysis and to understand the development of regional lithic industries;

- detailed analysis of existing lithic collections should be seen as an important priority, as the study of insular lithic technological trajectories will bring about a deeper understanding of the region's impact in the wider social and technological developments in the north of England and southern Scotland;

- a refitting study could explore the distribution of the flaked lithics across the site, both spatially and stratigraphically. The discovery of several short refitting sequences during the lithic diagnostic and technological analysis, particularly within the knapping groups, demonstrates the potential of this type of study.

Raw materials

Stone implements

The petrological analysis of the tuff ground-stone implements (*Appendix 6*) highlighted the need for:

- further analysis of the sub-groups identified, such as the dacite and spotted tuff, to define their source areas within the central Lakeland fells;

- identifying the precise source of the tuff used to produce axe blade 70325.41 (which was not matched to the published description of Group VI; *Appendix 6*) through comparison of its polished thin section with archaeological and geological samples from the presumed source area (west of Stake Pass and around Scafell);

- identifying the precise source of a fragment of a polished ground-stone tool, seemingly made from andesitic tuff, through petrological and geochemical analysis of geological and archaeological material;

- further analysis of the polished thin sections which have been generally matched with the geochemical analysis. This would broaden the present understanding of procurement strategies at sources in the central Lakeland fells (Davis and Edmonds 2011) and also extend the database of known source areas.

Coarse-stone tools

The macroscopic analysis of the coarse-stone tools suggested that petrological analysis, together with geological studies of the local glacial tills, might shed more light on the range and extent of available raw materials and the procurement strategies used in their collection.

Flaked lithics

The raw-material studies on the brown/grey flint and chert has brought about an initial understanding of the procurement strategies employed by those occupying Stainton West (*Appendix 6*). Additional work could further explore the procurement, use, and distribution of these raw materials, not only at Stainton West, but across the wider region.

Brown/grey flint

The results of the pXRF analysis (Study 2; *Appendix 6*) of a sample of Late Mesolithic brown/grey flint from Stainton West matched the samples with geological material from chalk flint in East Yorkshire. There, geological outcrops of flint deposits are relatively rare, but potential sources would seem to be both inland and coastal (Henson 1982; 1985). Given this:

- further geochemical investigation of primary geological and archaeological samples could possibly refine the source areas for this material and allow for a better understanding of long-term exchange networks. As there is a possibility that some of the Stainton West brown/grey flint could have come from other sources in north-east England, other than East Yorkshire, the potential for this should also be explored;

- the study should be rolled out regionally, to define the extent of brown/grey-flint use within Cumbria during the Mesolithic and Neolithic periods.

Chert

The preliminary results of the chert-sourcing analysis (*Appendix 6*) are important, and could be extended to define the geological relationships of the material and source areas within a broad regional geographical area. Specifically, this might entail:

- testing the geochemical signatures of the IG1 sub-groups against other geological samples from chert outcrops in the local area and beyond, to attempt to identify the general and discrete sources within that area, particularly for the IG1 sub-group 1. This could refine the current knowledge of procurement strategies and help to inform patterns of movement in the Mesolithic period and potentially beyond. It is possible that, from this, wider notions of territorial organisation in the Late Mesolithic period in northern England could also be explored;

- further geochemical analysis of IG2 could establish source areas within the southern Scottish uplands. This should be extended to material from other sites within Cumbria and south-west Scotland;

- distinguishing the source area of the GQB/chert through geochemical analysis would aid an understanding of the links that the social groups knapping this material at Stainton West had with the wider region;

- the chert-sourcing analysis could be extended to other sites with a Late Mesolithic/Early Neolithic technological character in the region and beyond, where there is an abundance of chert available for sampling. A pioneering study using pXRF could be implemented, to attempt to realise the potential of similar chert raw materials on selected sites, which could be complemented by geochemical analysis of archaeological and geochemical samples.

Microwear analysis

The Stainton West microwear study has indicated that the flaked lithics from a number of stratigraphic groups have excellent edge preservation (*Appendix 7*). The study also indicated that the formal tools and debitage were put to a wide variety of uses, and that certain tasks were spatially organised at the site. Further analysis could define the types of tasks in more detail, as well as their spatial representation across the site.

- All the rods and crescents not included in the present study could benefit from such work to substantiate the preliminary results;

- Some tool types, which appear to have been used in specific tasks, could benefit from further work, such as scalene triangles and links to fishing. This would have particular relevance to understanding site function within the wider landscape;

- Further work on the microlith-fragment component of the assemblage could identify if there was any spatial patterning between broken, unused microliths, and damaged/used examples. This would enhance the current understanding of the organisation of stone-working activity and other related tasks across the site;

- The distribution of artefacts used for cutting herbaceous plants and working wood is very similar, and further work might examine features or other kinds of tools and their uses in the same activity areas, to explore the activities that may have been undertaken;

- The flaked lithics and coarse-stone tools from the palaeochannel might be able to elucidate whether task variation can be identified both vertically, through the stratigraphic sequence, and also horizontally, across the depositional zones. This should also be extended to the cobble tools from the Grid-square area, particularly from the Backwater channel and those found in association with collections of ochre.

Statistical analysis

Statistical analysis could be carried out on the worked-stone assemblage, to test hypotheses, particularly those relating to the spatial distribution of the flaked-lithic assemblage. Various statistical approaches are available which could be applied; for example, cluster analysis could be helpful in determining spatial patterns for the association of lithic types over the site. This could also be useful in clarifying the potential variation in reduction schemas applied to different raw-material types. Such analysis could also be extended beyond Stainton West to consider the variability of the lithic assemblage in relation to other excavated material of a similar date and technological character.

Conclusions

The analysis of the worked-stone assemblage revealed a wealth of information relating to the acquisition and use of flaked lithics, coarse-stone tools, ochre, and stone implements during the Late Mesolithic and Early Neolithic periods, as well as adding significantly to knowledge of technological developments in Cumbria. However, the results, although exceptional, currently stand in regional isolation, and, as such, the investigation of sites of comparable date is vital. Indeed, Stainton West should not solely be seen as the solution for a complete understanding lithics and their use by hunter-gatherer groups and early farmers operating at the head of the Solway, rather as a springboard for future enquiry into the early occupation of this region between the late seventh and early fourth millennia cal BC.