APPENDIX 9: THE WORKED STONE FROM STAINTON WEST: SPATIAL ANALYSIS

A Dickson

During the initial assessment of the worked stone from Stainton West (*Appendix 1*), it became apparent that the assemblage was chiefly preserved *in situ* and had suffered lightly from the effects of taphonomic processes. It also became clear that there was spatial structure and patterning to certain components of the assemblage, principally diagnostic tool types and some raw-material types. Building on the results of these observations, spatial analysis has played a pivotal role in defining the distribution of the worked-stone assemblage across the site. In presenting the results of this analysis, the spatial data have been divided by the site area, specifically the *Grid-square area*, *Principal palaeochannel*, the retention pond area, and also the burnt mounds, and within these areas, the spatial patterning of each main category of worked stone (*ie* coarse-stone tools, stone implements, ochre, and flaked lithics) is considered in terms of its probable chronological dimension (*ie* Late Mesolithic, Neolithic, and Chalcolithic/Bronze Age).

Methodology

The programme of spatial analysis was undertaken immediately following the assessment. Initially, this was used to identify suitable sample areas (Sample Areas 1, 2, and 5-12; *Appendix 1*) from which specific classes of flaked lithics could be subjected to more detailed forms of typological and technological analysis (*Appendices 4* and *5*), raw-material sourcing analysis (*Appendix 6*), and microwear analysis (*Appendix 7*). This was followed by more detailed spatial analysis of the entire assemblage.

During both stages of spatial analysis, data subsets were first created by establishing database queries, which were run across the main dataset. The results of the queries were then analysed spatially in Geographic Information System (GIS) software packages (QGIS, an open-source package, and ArcMap). The queries were constructed at varying levels of detail, depending on the questions being asked of the data, using one or more of the main data fields within the lithic database (*Appendices 1* and *2*). This data could then be interrogated, to try to understand the distribution of all types of worked stone over various extents (*ie* by individual grid squares, stratigraphic units, individual or groups of features, or by the site area as a whole), utilising lithic type and/or category and the different types of raw materials. Thus, the analysis of the worked stone benefited from the spatial interpretation of aspects of the *chaîne opératoire*, including raw-material use and its subsequent reduction, use, and discard.

The grid-square allocation of the lithics in the dryland part of the site was used to construct shapefiles of datasets, and these were then enhanced by applying the Kriging method. This geostatistical procedure allowed the generation of interpolated values of selected classes across the entire *Grid-square area*, based on the known lithic dataset (*cf* Burrough 1986). More specifically, during the spatial analysis, the surrounding data points within a 2 m-search sphere (with a standard deviation between two and five) for each grid location were used to calculate the estimated lithic concentrations. The resulting data have been presented as a series of shaded contour plots, which enable areas of high and low lithic values to be discerned.

Importantly, spatial analysis also allowed for the identification of specific lithic entities. These comprised particular classes of worked stone, which appeared to be associated with certain features, or which clustered in specific parts of the site. The lithic entities were designed to aid the description and interpretation of the worked-stone assemblage, and, in total, 50 were identified during the course of the spatial analysis, along with a series of lithic sub-entities. Once these entities had been defined, additional spatial analysis then allowed for the identification of specific activity areas.

The Grid-square Area

The *Grid-square area* contained all of the main categories of worked stone that together formed an extremely large assemblage, highly suitable for spatial analysis.

Therefore, spatial analysis has been used to examine four inter-linked aspects of this assemblage. First, the stratigraphic distribution of the flaked lithics has been considered, to determine the effects of post-depositional processes on the horizontal and vertical positioning of these items. Second, spatial analysis has been used to determine the overall horizontal patterning of the entire worked-stone assemblage. Third, detailed spatial analysis of those items subjected to the chert-sourcing analysis has been completed, to gain an insight into the distribution of this particular material and associated knapping groups. Finally, the spatial patterning of those pieces included in the micro-wear study has been considered, to determine the presence/function of any Late Mesolithic activity areas.

Stratigraphic Distribution of the Flaked Lithics

Spatial analysis has been employed to explore the stratigraphic distribution of the flaked lithics across the *Grid-square area*. This considered all of the raw-material types and, significantly, these produced a similar set of results (preserved as GIS shape files and base maps in the project archive). Based on these results, the following conclusions can be made:

- flaked lithics in the *Basal sands and gravels* had come from overlying stratigraphic units and, as such, related to occupation associated with the *Stabilised land surface*, activity in the *Backwater channel*, and, probably to a lesser extent, the *Mesolithic overbank alluvium*;

- flaked lithics from the *Stabilised land surface* represent several phases of *in situ* Mesolithic occupation, the distribution of which has been slightly confused by vertical movement of some of the worked stone;

- the majority of the flaked lithics from the *Mesolithic overbank alluvium* relate to occupation associated with the *Stabilised land surface*. It therefore appears that the majority of the lithics from the *Mesolithic overbank alluvium* entered this stratigraphic unit as a result of post-depositional processes, including bioturbation and the suspension of struck lithics during phases of inundation, which moved these items vertically up through the stratigraphic sequence from underlying deposits. This was confirmed by the vertical overlap of concentrations of lithic material assigned to the *Stabilised land surface* and *Mesolithic overbank alluvium*. It also appears, due to the often-imperceptible nature of the interface between these two stratigraphic units, that, in some instances, lithic material was assigned to the wrong stratigraphic unit during excavation. This is exemplified by gaps in distributions of flaked lithics in the *Stabilised land surface*, which can be filled when the distribution of struck lithics from the *Mesolithic overbank alluvium* is overlain. Nevertheless, a small amount of struck lithics relating to sporadic occupation during the formation of the *Mesolithic overbank alluvium* is also a distinct possibility. This is manifest as discrete concentrations of flaked lithics, which are associated with this stratigraphic unit, and that mainly comprise knapping groups 42, 82, and 99. This is in contrast to the majority of the other knapping groups, which are either solely associated with the *Stabilised land surface*, or are dispersed throughout the *Stabilised land surface* and *Mesolithic overbank alluvium* (*Appendix 3*);

- much of the lithic material in the *Colluvium* is likely to have derived from the Late Mesolithic/Early Neolithic occupation on the Late Glacial/Early Holocene river terrace to the north-east. However, the presence of discrete knapping groups associated with the *Colluvium* (*Appendix 3*) indicates that some of the lithics are likely to relate to settlement activity associated with the *Backwater channel* and *Stabilised land surface*. In addition, as the boundaries between different stratigraphic units were diffuse (*above*), the flaked lithics from the *Colluvium* could have been assigned to the wrong stratigraphic units during excavation.

Case study: stratigraphic distribution of brown/grey flint

Although all raw-material types were considered during analysis (*above*), the stratigraphic distribution of one of the flaked-lithic raw-material groups, brown/grey flint, has been used as a case study, as its stratigraphic distribution typifies the results gained across the other raw-material categories. In terms of distribution, the material is also of sufficient quantity to produce effective spatial plots to support the analysis, while not being too dense to obscure the spatial detail.

The largest quantities of brown/grey flint within the main *Grid-square area* were recovered from the *Stabilised land surface* and the *Mesolithic overbank alluvium*. That from the *Stabilised land surface* represents *in situ* material, several concentrations being identified (Fig 479). These include: a dispersed concentration in the northern part, with clusters in grid-squares 909, 938, and 1045; a dispersed distribution to the south and east of tree-throw ***90262***; a discrete cluster of material focused on grid-square 395; and a dispersed concentration in the south-east corner, with particular clusters in grid-squares 246 and 359.

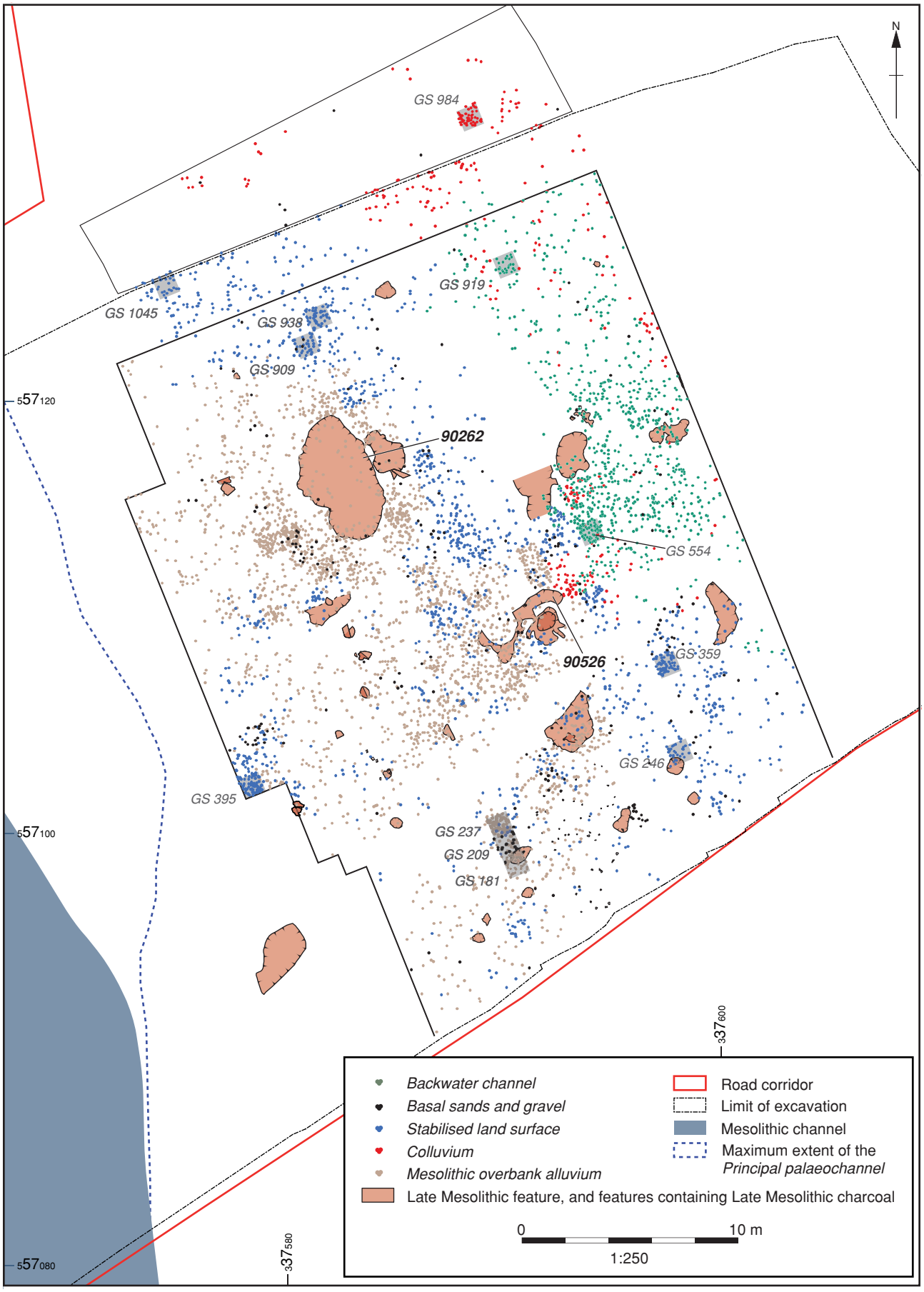

Figure 479: The distribution of brown/grey flint from the main stratigraphic units in the Grid-square area

The spatial distribution from the *Mesolithic overbank alluvium* largely agrees with that from the *Stabilised land surface*. For example, the discrete cluster centred on grid-square 395 in the *Stabilised land surface* became denser when material from the *Mesolithic overbank alluvium* was considered. Moreover, when the material from both the *Mesolithic overbank alluvium* and *Stabilised land surface* was considered, activity associated with the reduction of brown/grey flint became more concentrated around tree-throw ***90262***. Additionally, the distribution in the *Mesolithic overbank alluvium* to the south and west of tree-throw ***90262*** appears to represent a discrete concentration of activity, which probably overlapped to the south with the *Stabilised land surface* distribution. This implies that, in these areas at least, the *Mesolithic overbank alluvium* and the *Stabilised land surface* contained evidence for the same phase of stone working.

A similar situation can be envisaged for the distribution from the *Mesolithic overbank alluvium* and the *Stabilised land surface* to the east of tree-throw ***90262***; a dispersed concentration to the north, south, and west of tree-throw ***90526***; and the brown/grey flint in grid-squares 181, 209, and 237, which was probably associated with Structure 6 (*Ch 4*). It should also be noted that very little brown/grey flint was spatially associated with deposits that sealed tree-throw ***90262*** (*Ch 8*). This suggests that much of the material in its vicinity was associated with activity that took place before the formation of the feature (*Ch 4*).

In the main *Grid-square area*, a small amount of brown/grey flint was also recovered from the *Basal sands and gravels*; however, much of this can be spatially reconciled with the distribution associated with overlying deposits, particularly the *Stabilised land surface* and the *Mesolithic overbank alluvium*. Therefore, it is likely that the material from the *Basal sands and gravels* was originally associated with lithic material from overlying deposits, particularly the *Stabilised land surface*, and that these migrated downwards through the soil profile as a result of post-depositional processes.

Brown/grey flint associated with the *Backwater channel* in the eastern part of the *Grid-square area* had a strong concentration, with a cluster concentrated on grid-square 554, surrounded to the north, east, and south by a dispersed distribution of the same material. There was also a small discrete concentration of brown/grey flint in the north of the *Backwater channel*, in grid-square 919. Unsurprisingly, brown/grey flint from the *Stabilised land surface* and the *Colluvium* was also spatially associated with the material from the *Backwater channel*.

The material associated with the *Colluvium* included a discrete concentration in the northern part of the *Grid-square area*, in grid-square 984. Given that this stratigraphic unit comprised a slope-washed soil matrix, it is unclear whether this material reflects *in situ* activity, or a collection of lithics derived from natural processes. However, the fact that some of the material in grid-square 984 was assigned to knapping group 91 indicates that it is more likely to reflect discrete activity.

Late Mesolithic activity

The bulk of the worked-stone assemblage from the *Grid-square area* is probably Late Mesolithic in date, the majority probably ultimately derived from the *Stabilised land surface* (*above*). Given its probable stratigraphic provenance and the quantity of worked stone across this area, spatial analysis was particularly insightful, as it allowed the identification of activity areas, some of which encompassed the lithic sample areas (*Appendix 1*). These activity areas specifically related to the Late Mesolithic encampment (*'Mesolithic encampment I'* and *'Mesolithic encampment II'* phases; *Ch 4*), though they have also been used as a framework to discuss earlier worked stone and features from this part of the site. They were defined by the technological and functional character of the flaked lithics, the spatial patterning of the worked stone, the archaeological remains, and the results of the microwear analysis.

In total, eight areas were identified: a Habitation Area; a Tool-production Area; a Hide-working Area; a Butchery Area; a Midden Area; an Axe-working Area; a Peripheral Area; and a Lithic-free Activity Area (Fig 480). The Midden Area, Butchery Area, and Peripheral Area also contained Late Mesolithic features that pre-dated the establishment of the main Mesolithic encampment (*Ch 3*). It should be stressed, however, that the use of the activity area nomenclature is merely designed to present a general impression of the potential zoning of activities across the site. In reality, a range of activities may have occurred across different parts of the site during the life of the encampment. Moreover, it is worth emphasising that the microwear analysis, which has identified different activities in specific parts of the site, only considered a comparatively small sample of the total lithic assemblage (*Appendix 7*). Given this, additional microwear analysis would undoubtedly allow for an enhanced interpretation of the activities and their spatial patterning.

Details relating to the working of pitchstone and polished-stone implements were also analysed. Although these raw-material and implement types are often considered to relate to Neolithic stone-working technologies (Bradley and Edmonds 1993; Ballin 2015a), there is strong evidence from Stainton West that the working of these materials formed an integral element of Late Mesolithic occupation activity. Indeed,

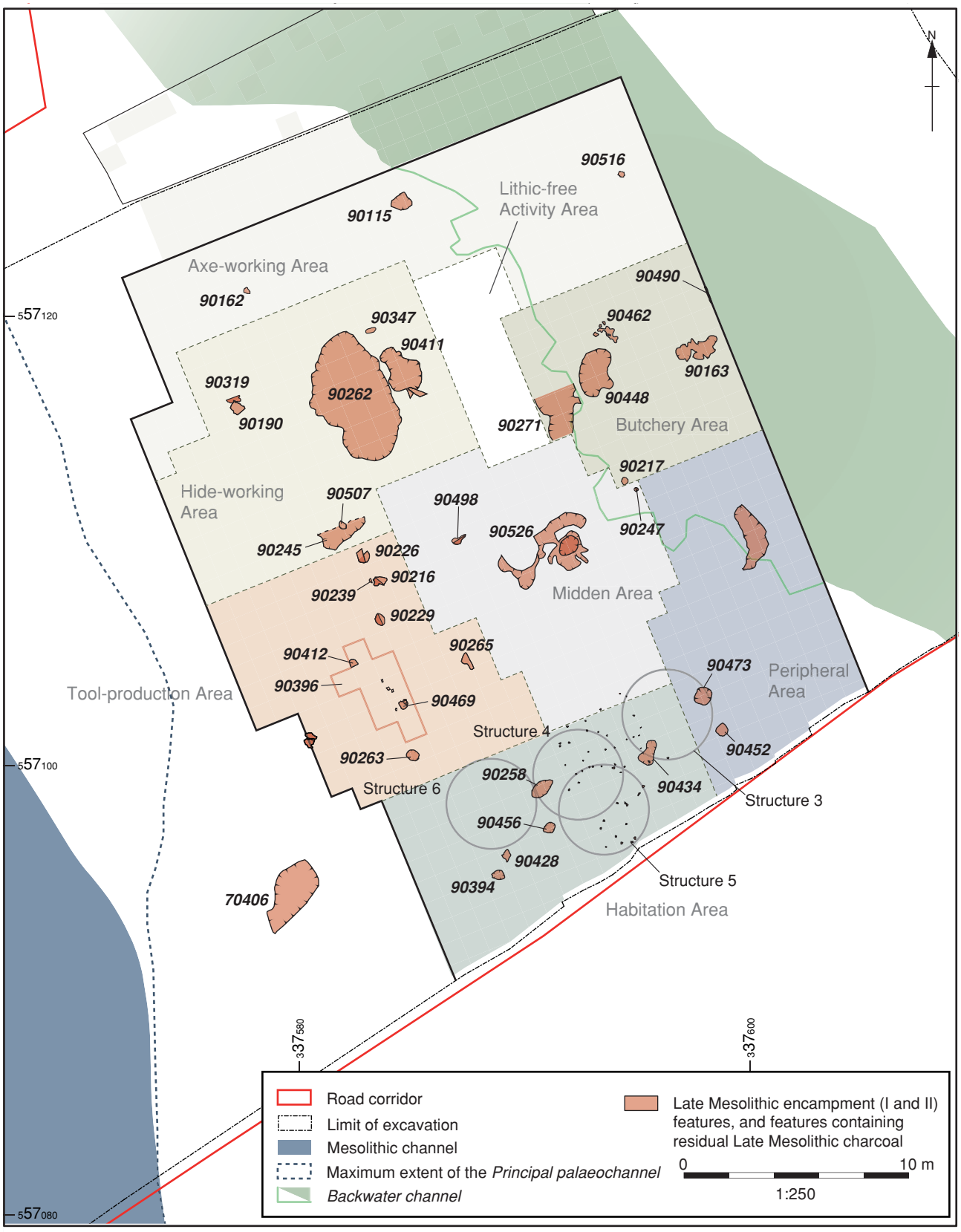

Figure 480: Late Mesolithic activity areas in the Grid-square area

in the case of pitchstone, there is also now an emerging body of evidence for the use, even trading, of this material across mainland northern Britain during the Late Mesolithic period (*cf* Ballin *et al* 2018).

Habitation Area

The area interpreted as being for habitation lay in the south-western part of the *Grid-square area* and contained several circular structures (Table 236).

Features/ Sample Areas	Late Mesolithic flaked lithics				Coarse-stone, ochre, and stone implements	Dating evidence
	Assemblage	Knapping groups (KG)	Sourcing studies	Microwear		
Structure 3 Overlapping Structures 4 and 5 Structure 6 Sample Area 8	Low-density lithic area, suggesting material may have been cleared and dumped elsewhere Pieces from all stages of the reduction sequence, relating to the knapping of brown/grey flint; brown, grey, and black chert; pebble flint; and 'cannot determine' lithology Lithic concentration defined footprint of Structure 6 Pitchstone associated with Late Mesolithic lithic clusters Dispersed collection of worked tuff Lithics with probable hafting residues	Brown/grey flint 20, 47, 64-5, 69, 72-4, and 124; pebble-flint 66-8 and 70-1 and chert 1, 21, and 125;	Chert IG1 sub-group 4 (KG 1) Brown/ grey-flint samples included in the flint-sourcing study	Tools and debitage associated with hide working Pieces have suffered damage from impact-related activities and butchery	Ground stones, a cobble tool, and an anvil, focused around Structures 4 and 5 Several concentrations of ochre. Clusters associated with Structures 4-6, and the south-west corner of the activity area Two polished-axe fragments. One fragment associated with Structure 6	Hearth ***90434*** (Structure 3) dates to *'Mesolithic encampment I'* phase Scottish chert from Structure 6 links this with stone-spread ***90396*** (Tool-production Area) and with the *'Mesolithic encampment II'* phase KG 65 from the *Mesolithic overbank alluvium* may relate to sporadic occupation post-dating Mesolithic encampment

Table 236: Defining characteristics of the Habitation Area

Lithic Entity	Description	Lithic sub-entity	Description
1	Late Mesolithic worked stone associated with Structure 6 (grid-squares 150-4, 178-82, 206-10, and 234-8)	1A	Clusters of microliths, small flakes, blade chips, and cores (grid-squares 237 and 265)
		1B	Collection of brown/grey-flint chunks and blade chips (grid-square 153)
		1C	Cluster of narrow blades (grid-square 178)
		1D	Clusters of microlith fragments (grid-squares 151, 181, 209, and 237)
		1E	Cluster of scalene triangles
		1F	Worked ochre lump and crumbs (grid-square 124)
2	Spread of worked pebble-flint surrounding pit ***90394*** and posthole ***90428*** (grid-squares 94, 95, 121, and 122)	-	-
3	Possible *in situ* pebble-flint working area (grid-squares 155 and 156)	-	-
4	All microliths/ retouched/ debitage subjected to microwear analysis in Sample Area 8 (items from grid-squares 40, 68-72, 96-103, 124-31, 152-9, 180-7, 208-15, and 236-43)	-	-

Table 237: Lithic entities within the Habitation Area

Structure 3 (*Ch 4*) was defined by an arcing indentation in the Midden Area, associated with a pit and hearth, and there was also a spread of stakeholes forming elements of two overlapping structures (Structures 4 and 5; *Ch 4*), also associated with cooking pits/hearths. These structures were probably shelters within the Mesolithic encampment, one hearth (***90434***; Structures 3) being radiocarbon dated to the second quarter of the fifth millennium cal BC (*'Mesolithic encampment I'* phase; *Appendix 20*).

In addition, this area contained a concentration of lithics in a horseshoe-shape (Lithic Entity 1), composed of debitage, microliths, and ochre (Table 237; Fig 481). This reflects the footprint of another Mesolithic structure (Structure 6), possibly associated with a pit and posthole, and seemingly an element of the *'Mesolithic encampment II'* phase of activity (*Ch 4*). The Habitation Area also contained three other lithic entities, including one (Lithic Entity 4) that corresponded to Sample Area 8, which covered Structures 4 and 5, and parts of Structures 3 and 6 (*Appendix 1*).

Brown/grey flint

There was a large spread of brown/grey flint, probably associated with either Structure 4/5 or 6. This was linear, with a north/south orientation, mainly confined to grid-squares 153, 181, 209, 237, 238, and 266 (Fig 482); it is possible that it relates to several episodes of stone-working. The cluster was principally composed of debitage, including small chunky irregular shatter, which was common in grid-square 153, where it formed a major component of knapping group 64 (*Appendix 3*). It also contained several other knapping groups (69 and 72-4), all associated with grid-square 237, while knapping group 47 was located in adjacent grid-square 266. Elements of knapping group 69 were also recorded in grid-square 298, which was associated with

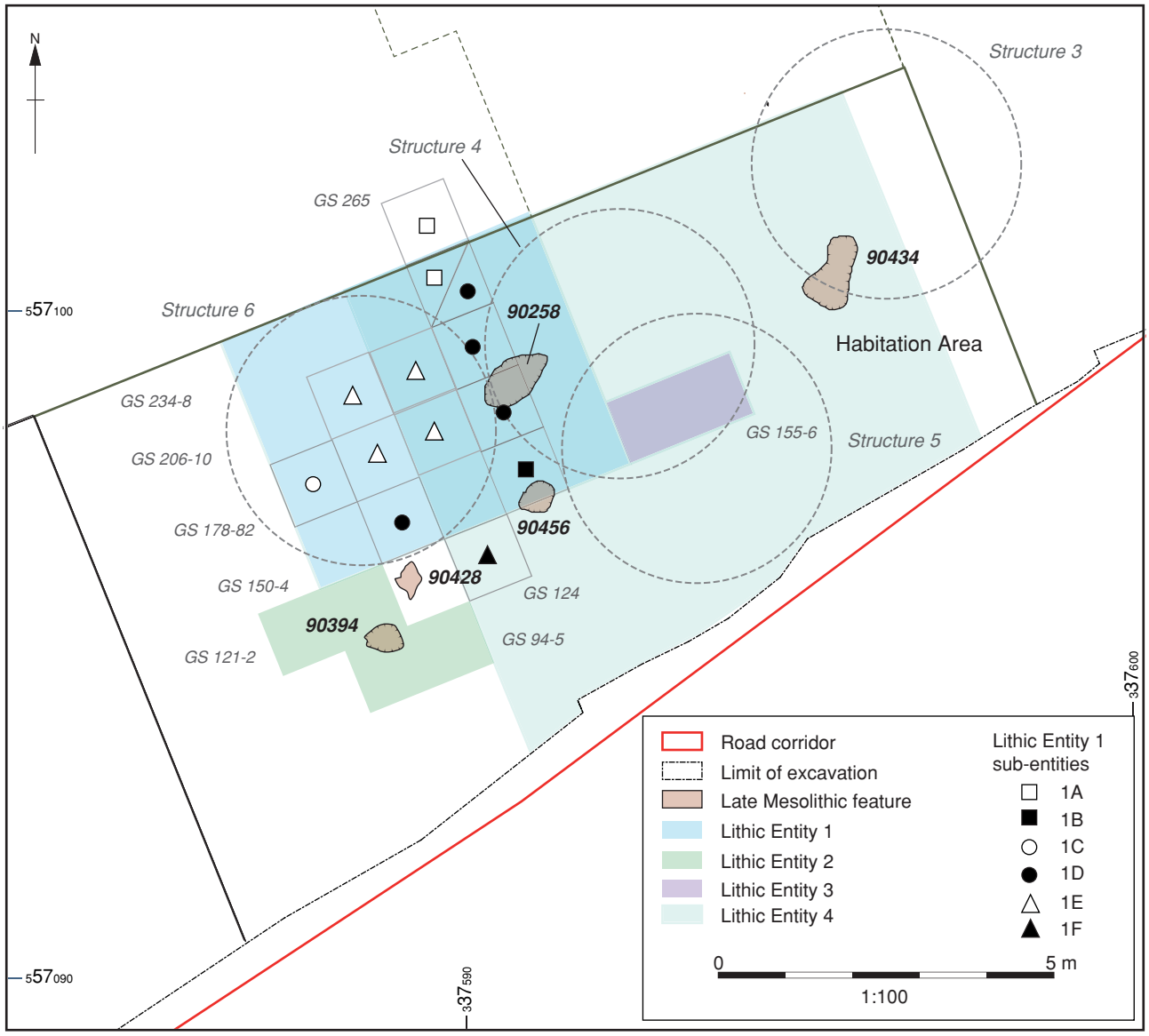

Figure 481: The extents of Lithic Entities 1-4 in the Habitation Area

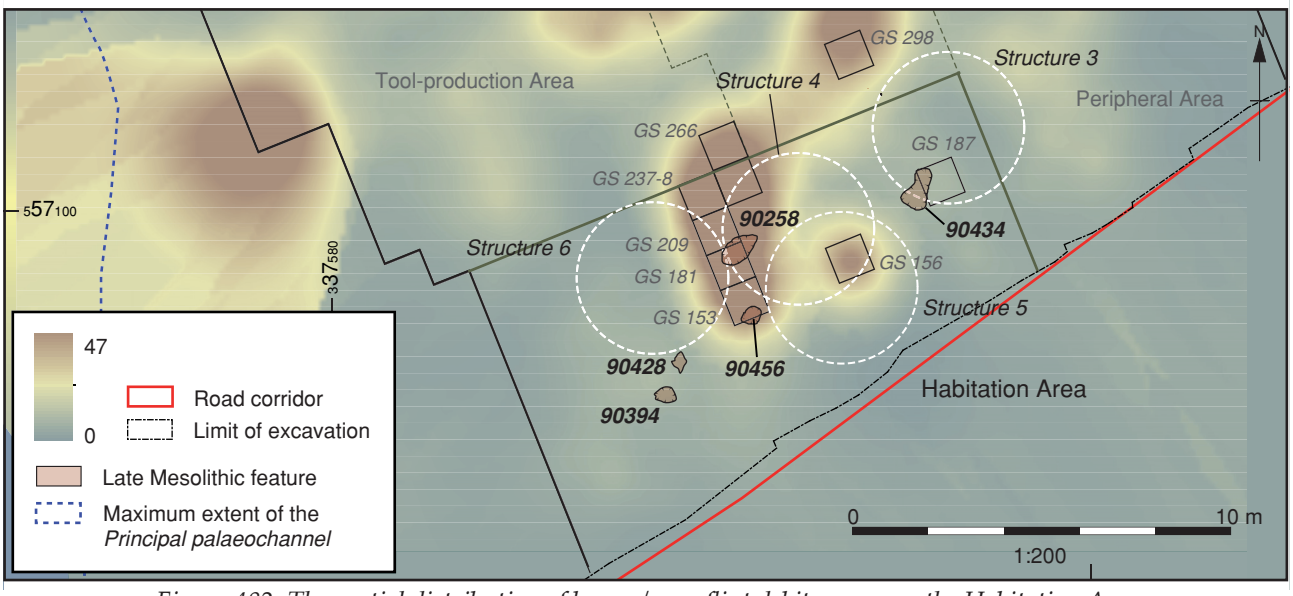

Figure 482: The spatial distribution of brown/grey-flint debitage across the Habitation Area

the southern end of the midden, this knapping group connecting activity from the two different occupation zones.

Another smaller cluster of brown/grey flint was located to the east, centred on grid-square 156. This includes material from all stages of the reduction sequence, particularly blade chips, irregular chunky shatter, and small flakes, most of the pieces being associated with knapping group 65 (*Appendix 3*), suggesting that the cluster had some integrity. Furthermore, all the material from this knapping group was derived from the *Mesolithic overbank alluvium*, which could imply that the cluster was associated with sporadic occupation later than that associated with the *Stabilised land surface*. A second small cluster was situated in grid-square 187, most of which was assigned to knapping group 20. This was adjacent to hearth ***90434***, an element of Structure 3, which has been dated to the second quarter of the fifth millennium cal BC (*above*; *Ch 4*). It should be noted that it comprised a small amount of flaked lithics and is unlikely to represent a full-reduction sequence. In this respect, it could have been the remnants of stone-working activity, with the rest of the debitage having been removed.

Pebble flint

A general spread of pebble-flint flaked lithics in grid-squares 94, 95, 121, and 122 (Lithic Entity 2; Fig 483), in the western part of the Habitation Area, was potentially focused on pit ***90394*** and posthole ***90428***, seemingly related with Structure 6. While all stages of the reduction sequence were represented, it is not clear whether the material related to *in-situ* knapping or the secondary deposition of material from elsewhere. There were ten microliths contained

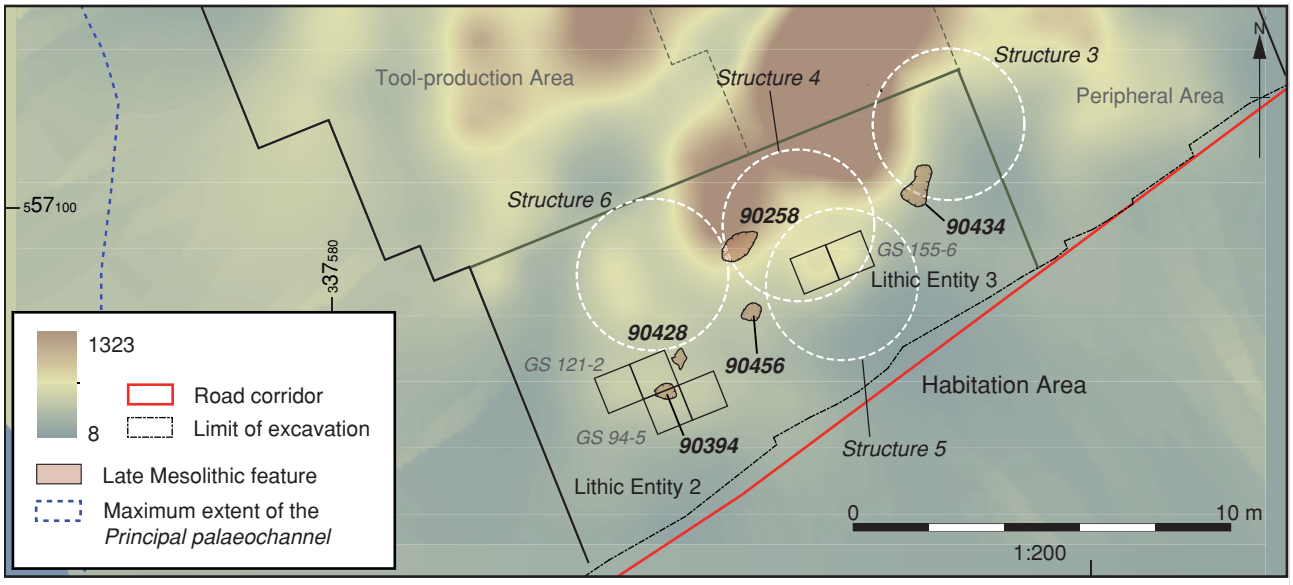

Figure 483: The spatial distribution of all pebble-flint flaked lithics across the Habitation Area

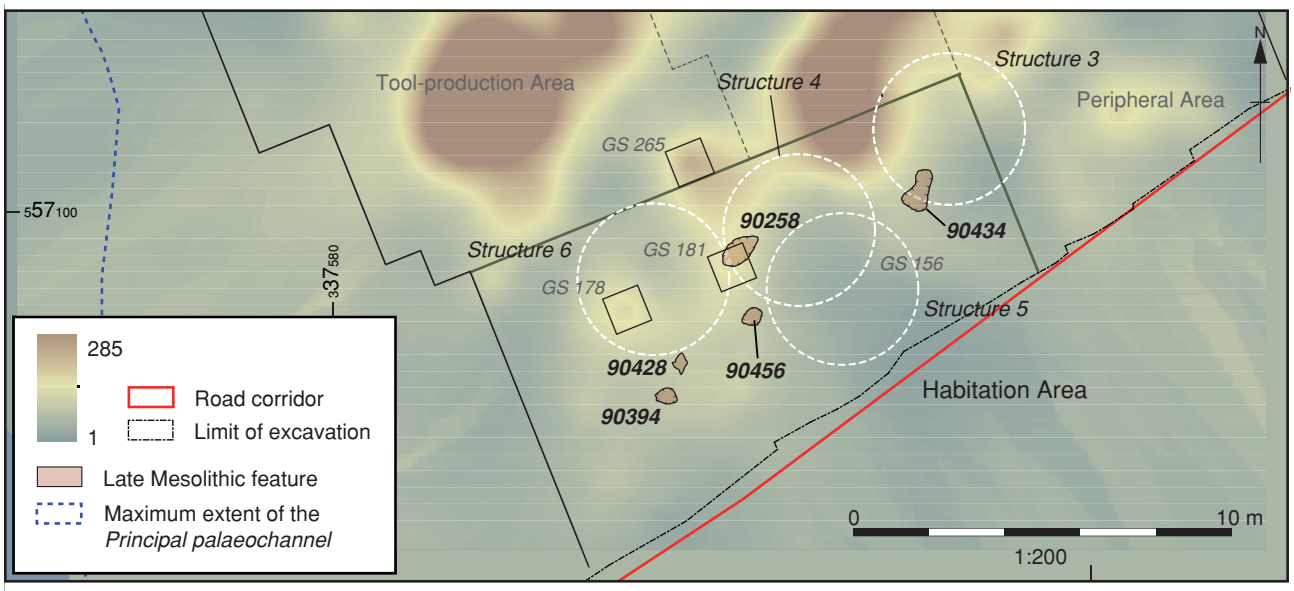

Figure 484: The spatial distribution of chert cores and debitage across the Habitation Area

within the spread, mainly fragments. A larger quantity of pebble-flint flaked lithics was associated with the horseshoe-shaped setting of lithics which defined the footprint of Structure 6.

In addition, there was a small spread of pebble flint in grid-squares 155 and 156, with core technology and debitage clustered in the former (Lithic Entity 3), while grid-square 156 mainly contained small-flake debitage. A few microliths and other edge-retouched tools were also present, and it is possible that this spread represents an episode of *in-situ* stone-working.

Chert

A cluster of flaked chert in grid-square 265 (Fig 484) could have formed the focus of knapping activity/ secondary dumping, which continued into the grid-squares to the south and east (Lithic Entity 1), as the chert from this area included material from all stages of the reduction process. This material, along with smaller concentrations in grid-squares 178 and 181, was perhaps associated with Structure 6.

SSUC

Relatively large numbers of microliths on Scottish Southern Uplands chert were also associated with Structures 4-6 (Fig 485). These were distributed around hearth ***90258***, and a cluster was also located in grid-square 237 to the north (which, together with grid-square 265, formed Lithic Entity 1A). The collection of microliths (23 items) comprised 11 backed bladelets and 11 microlith fragments, along with a single microburin.

Tuff and pitchstone

Dispersed spreads of flaked tuff were associated with Structures 4/5, suggesting the possible working of

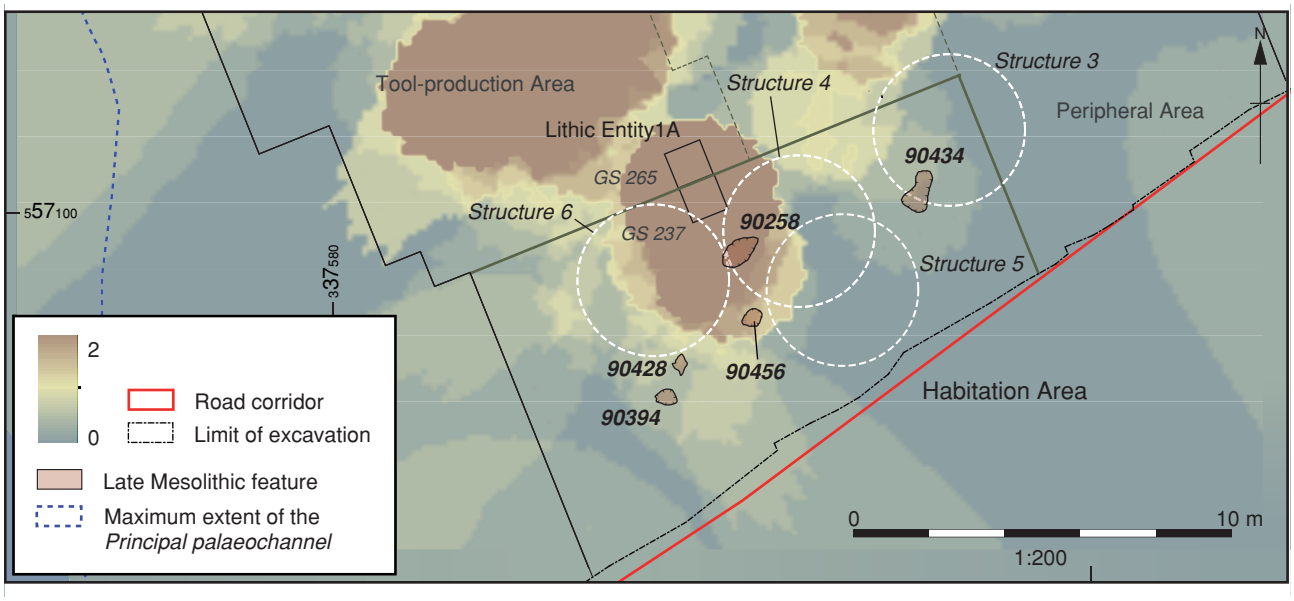

Figure 485: The spatial distribution of SSUC microliths across the Habitation Area

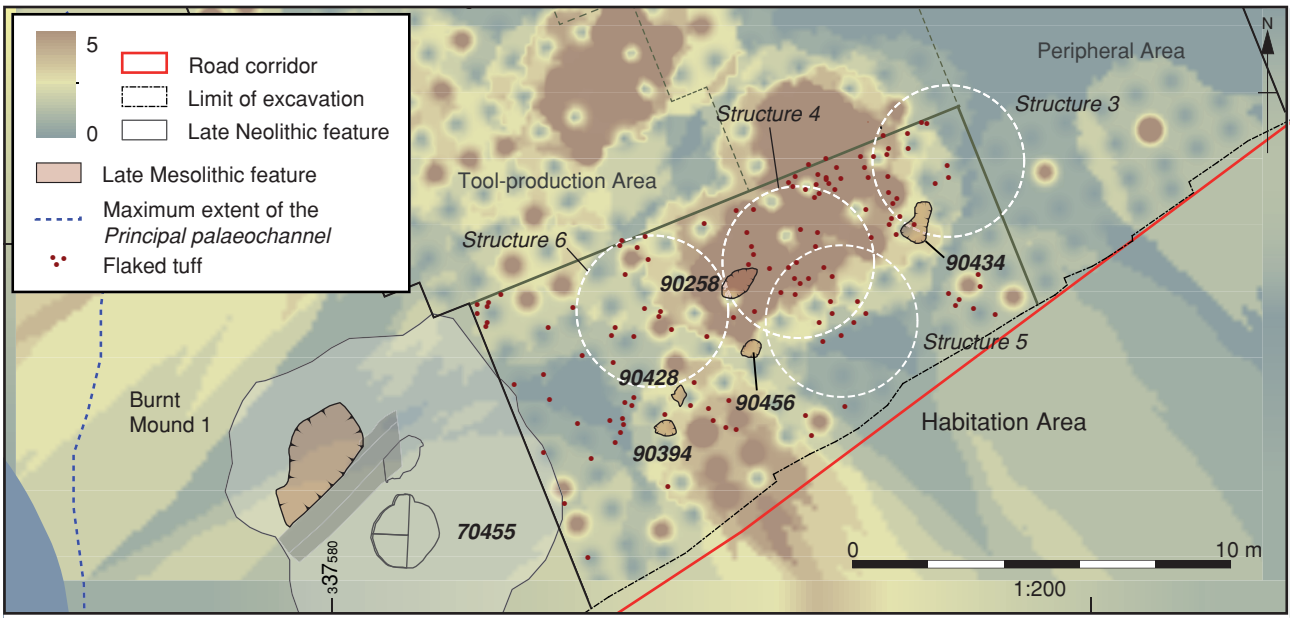

Figure 486: The spatial distributions of pitchstone debitage and flaked tuff across the Habitation Area

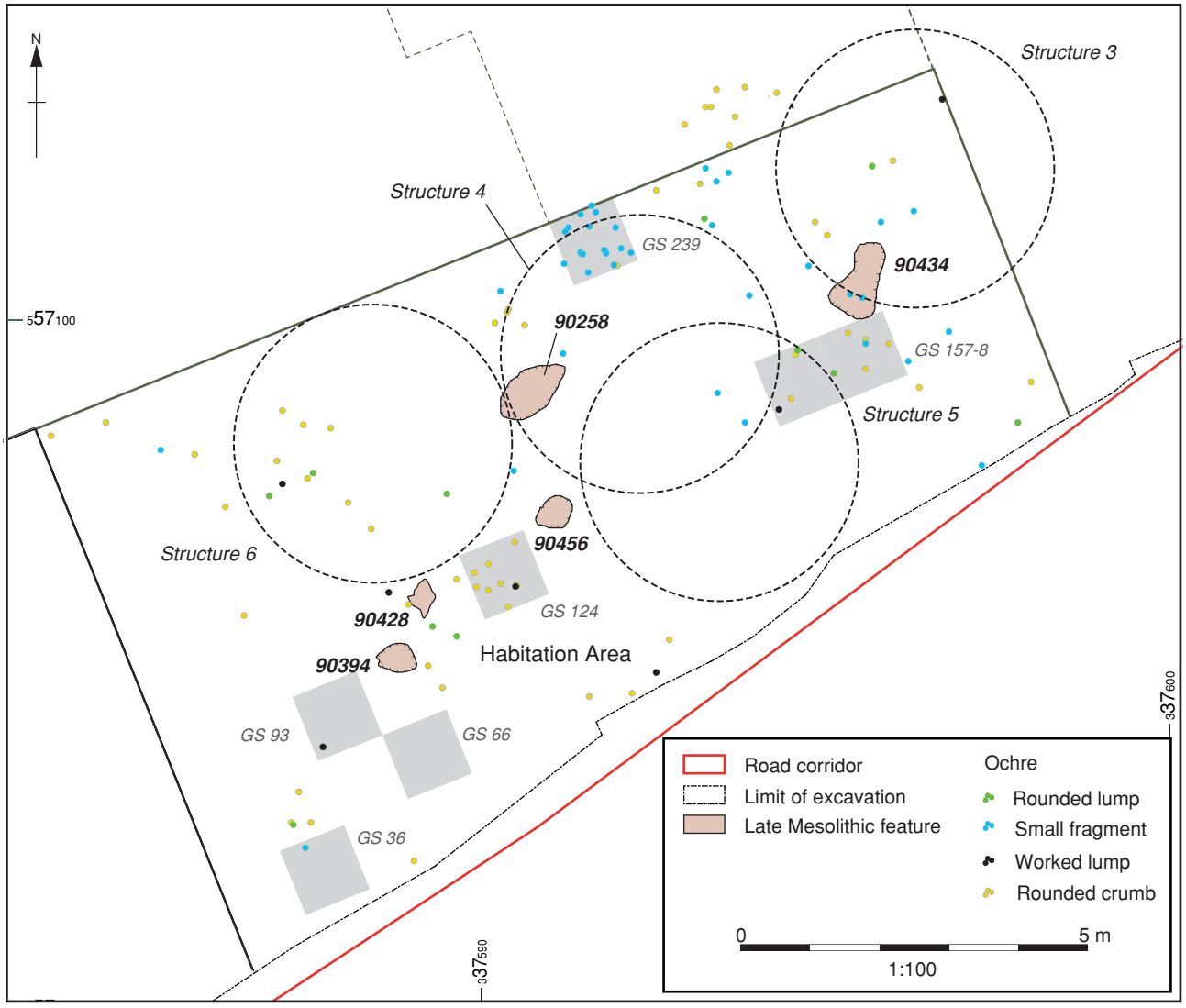

Figure 487: Distribution of ochre across the Habitation Area

this material, whilst the pitchstone associated with Structures 4-6 seems to indicate that this material was worked during the Late Mesolithic period (Fig 486). Some of the material from Structure 4 could, however, have been associated with the southern part of the Midden Area. Immediately to the west, pitchstone was also present in a deposit (***70455***) beneath Burnt Mound 1, which has been dated to the later Neolithic period (*Ch 10*). This was comparable to the *Stabilised land surface,* providing further confirmation that pitchstone was associated with Late Mesolithic activity.

Ochre

There was a wide scatter of ochre/haematite across the Habitation Area, with a dispersed distribution, through one or two small clusters were evident (Fig 487). These included a worked lump and several rounded crumbs in grid-square 124, possibly associated with Structure 6 (Lithic Entity 1F); and a worked lump, and several smaller pieces, spread through grid-squares 157 and 158, which may have been associated with cooking pit/hearth ***90434*** and thus Structure 3. Additionally, there was a linear spread of four worked lumps, several fragments, and a few rounded lumps centred on grid-squares 239, 267, and 295. This concentration could have been associated with domestic activity in this area, although the material also occupied a position to the south-west of the midden, and, as such, could conceivably relate to discrete dumps of material on the periphery of this feature.

Several refitting pieces of ochre/haematite were also recovered, suggesting that some of this stayed within discrete areas, which may reflect specific working positions. These include a piece of hard ochre from grid-square 36, which joins with another piece from grid-square 66. Furthermore, another fragment from the same nodule may have come from grid-square 93.

Structure 6

The lithics connected with Structure 6 created a horseshoe-shape (Fig 488), being associated with the reduction of all the main raw-material groups (Lithic Entity 1), and all stages of the reduction sequence. It is, however, also possible that some of the material on the eastern side of Structure 6 was potentially associated with two adjacent structures (Structures 4 and 5; *Ch 4*).

Within this area, a relatively large amount of brown/grey-flint flaked lithics was identified, mainly clustered on the eastern side, where they were associated with knapping groups 47, 64, 69, and 72-4 (*Appendix 3*). In addition, there were clusters of specific types in certain grid squares, for example, a collection of brown/grey-flint chunks and blade chips in grid-square 153 (Lithic Entity 1B), and a small cluster of microliths in grid-square 237 (part of Lithic Entity 1A). Of the 18 brown/grey-flint microliths, nine are backed bladelets, with seven fragments. There was also a small collection of other retouched tools, including an awl, knives, and scrapers.

Chert-flaked lithics were more ubiquitous in the structure and, while they were spread throughout, there were also clusters of specific types in certain grid squares. Specifically, a group of flaked pebbles

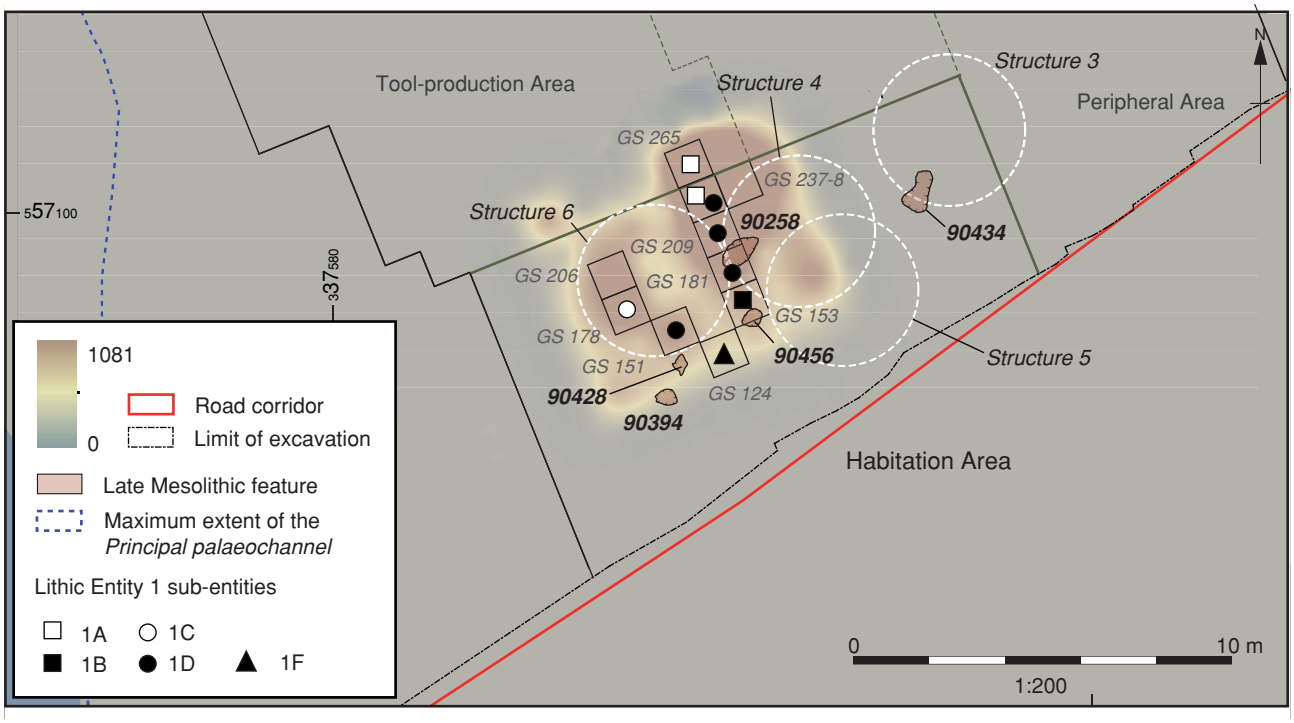

Figure 488: The spatial distribution of all flaked-lithic types associated with Structure 6 and its immediate environs

was found in grid-square 238, which was assigned to knapping group 21; a cluster of small flakes, blade chips, and cores was in grid-squares 237 and 265 (Lithic Entity 1A); and a cluster of narrow blades in grid-square 178 (Lithic Entity 1C). This suggests that stone-working activity may have taken place in the north-east part of the structure, while the secondary dumping of material was taking place elsewhere. Furthermore, a relatively large collection of microliths (39 items) was recovered from the footprint of Structure 6 and the area immediately to its east, dominated by microlith fragments (15 items; Fig 489) and backed bladelets (12). Interestingly, other chert retouched tools were few in number, with only an awl and a scraper from this area.

The majority of the flaked lithics within the structure were, however, made from pebble flint, concentrated in the eastern part of the setting, and also on in its western side. Flaked lithics from all stages of the reduction sequence were present in knapping groups 66-8, 70, and 71 located in grid-square 237, in the east (Fig 488). These groups comprised small numbers of flaked lithics, including cores and debitage, although two microliths were associated with knapping group 70, and formed partial reduction sequences. Large numbers of pebble-flint microliths were also recorded that may have been associated with the structure, microlith fragments and backed bladelets again being present in significant numbers, mainly distributed along the northern arc of the lithics defining the footprint of Structure 6 (Fig 489?) Clusters of microlith fragments were also present in grid-squares 151, 181, 209, and 237 (Lithic Entity 1D), with the largest collection from grid-square 181. This grid-square also contained hearth ***90258***, on the extreme eastern edge of Structure 6, which appears to have formed an element of Structures 4/5, it being equally possible that these derived from activity associated with these structures. Scalene triangles were fewer in number, being prevalent in the central part of Structure 6 (Lithic Entity 1E). The combined microlith assemblage therefore suggests that there was some structure to the disposal of flaked lithics, or that certain tasks were carried out in specific areas. In addition, there were 17 pebble-flint non-microlithic retouched tools, which were dispersed throughout the footprint of the structure. They included several awls, knives, scrapers, and related pieces.

Small amounts of flaked lithics associated with the use of other raw-material groups were also seemingly associated with Structure 6, including pitchstone, Scottish Southern Uplands chert, and tuff. Apart from the identifiable raw-material groups, there was also a significant amount of lithics, the lithology of which could not be determined. The majority of these were burnt, and concentrated in the north-western and eastern arcs, in grid squares 178, 181, 206, 209, and 237 (Fig 488).

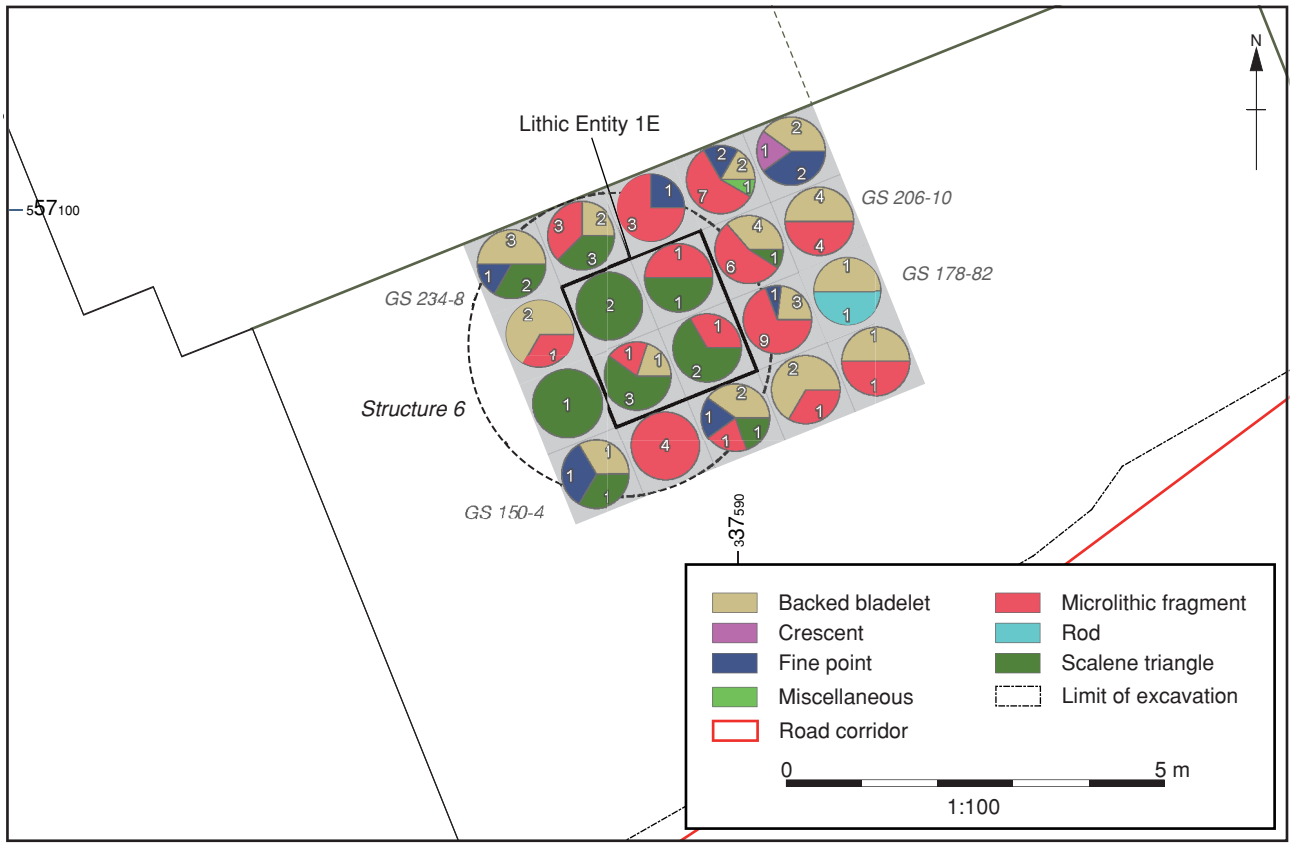

Figure 489: The distribution of microliths associated with Structure 6 and its immediate environs

Tasks and activities

Spatial analysis of those items that were analysed for microwear (Lithic Entity 4) indicates that a fairly restricted range of tasks was undertaken in Sample Area 8 (*Appendix 7*), which covered Structures 4 and 5, and portions of Structures 3 and 6 (Fig 490). It appears that the main activity associated with this area related to hide working, with wear traces from piercing, scraping, cutting, and mixed actions. Tools used for hide working include microliths, awl/borers, a burin, knife forms, simple edge-retouched pieces, scrapers and related pieces, and a notch. Given the range of actions and tool types, tasks such as clothing and equipment manufacture and maintenance can be envisaged. Although the evidence is tentative, it is possible that hide working was more common in Sample Area 8, and that other retouched tools were more often used over microliths. When the tools types with evidence for hide working from the Habitation Area are compared with those from the Hide-working Area, however, it suggests that, in the latter, microliths were preferred over other retouched tools. This could suggest that different tasks involved in working and preparing hide were undertaken in different parts of the site. Tools exhibiting evidence for impact damage were also relatively common in the Habitation Area, all but one being microliths; however, no crescents and rods were present. There is also a collection of tools exhibiting microwear associated with butchery tasks, which could be associated with food preparation. Overall, it is of note that the majority of the identified tasks would not be out of place within a domestic context, supporting the interpretation that this part of the site formed the main domestic focus of the Mesolithic encampment.

Coarse-stone tools and stone implements

Surprisingly, given the evidence for settlement in this area, coarse-stone tools were comparatively rare (Fig 491), perhaps indicating that such objects were not used in domestic contexts, or that heavy-duty tasks were undertaken in other parts of the site. Those that were present were at the peripheries of Structures 4 and 5, and may have been associated with activities that were carried out in and around these. The items included a ground stone, a cobble tool, an anvil, and a ground stone with square cross-section. In addition, a few unworn cobbles were present in the south-western half of the Habitation Area.

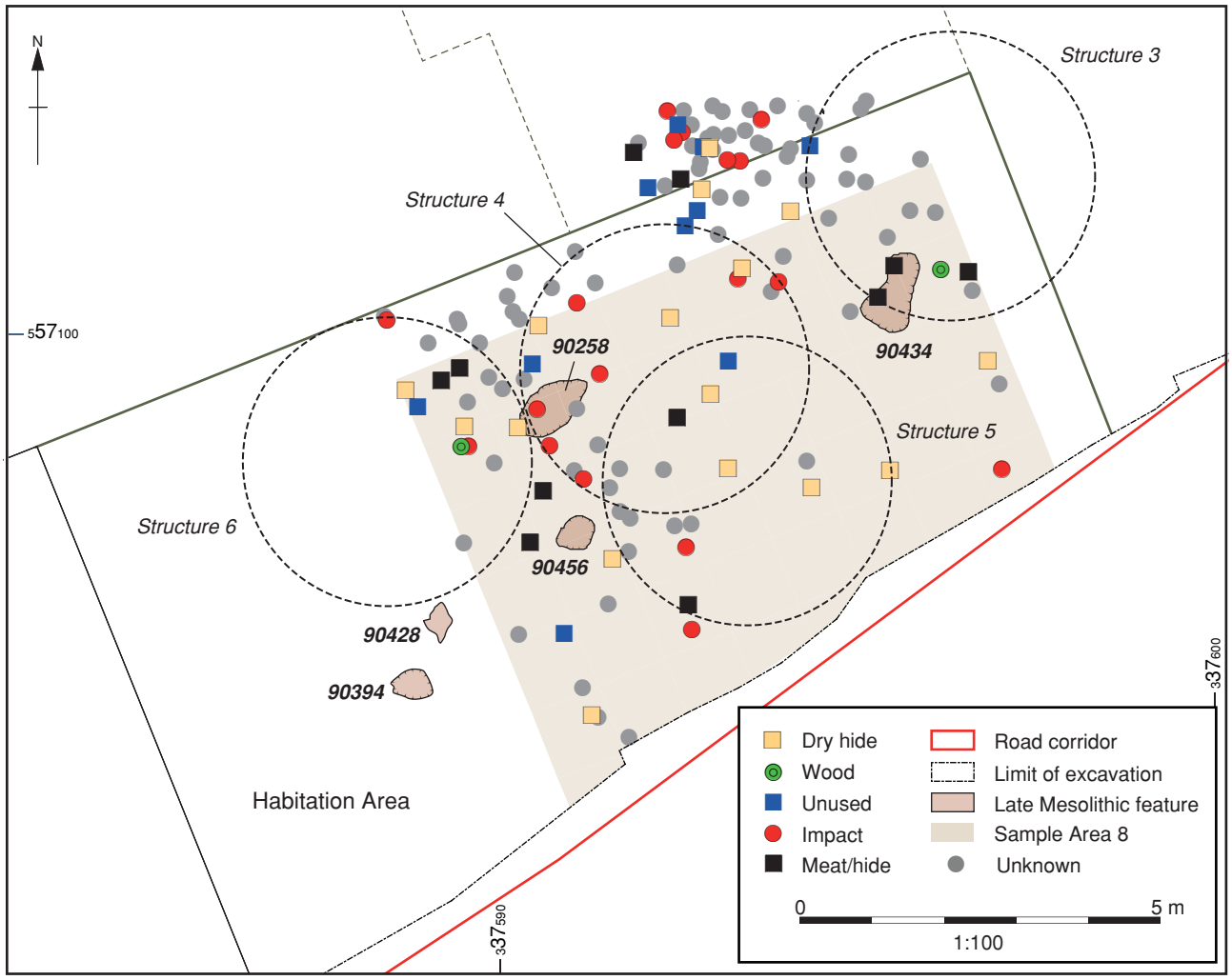

Figure 490: Flaked lithics from the Habitation Area exhibiting different types of microwear

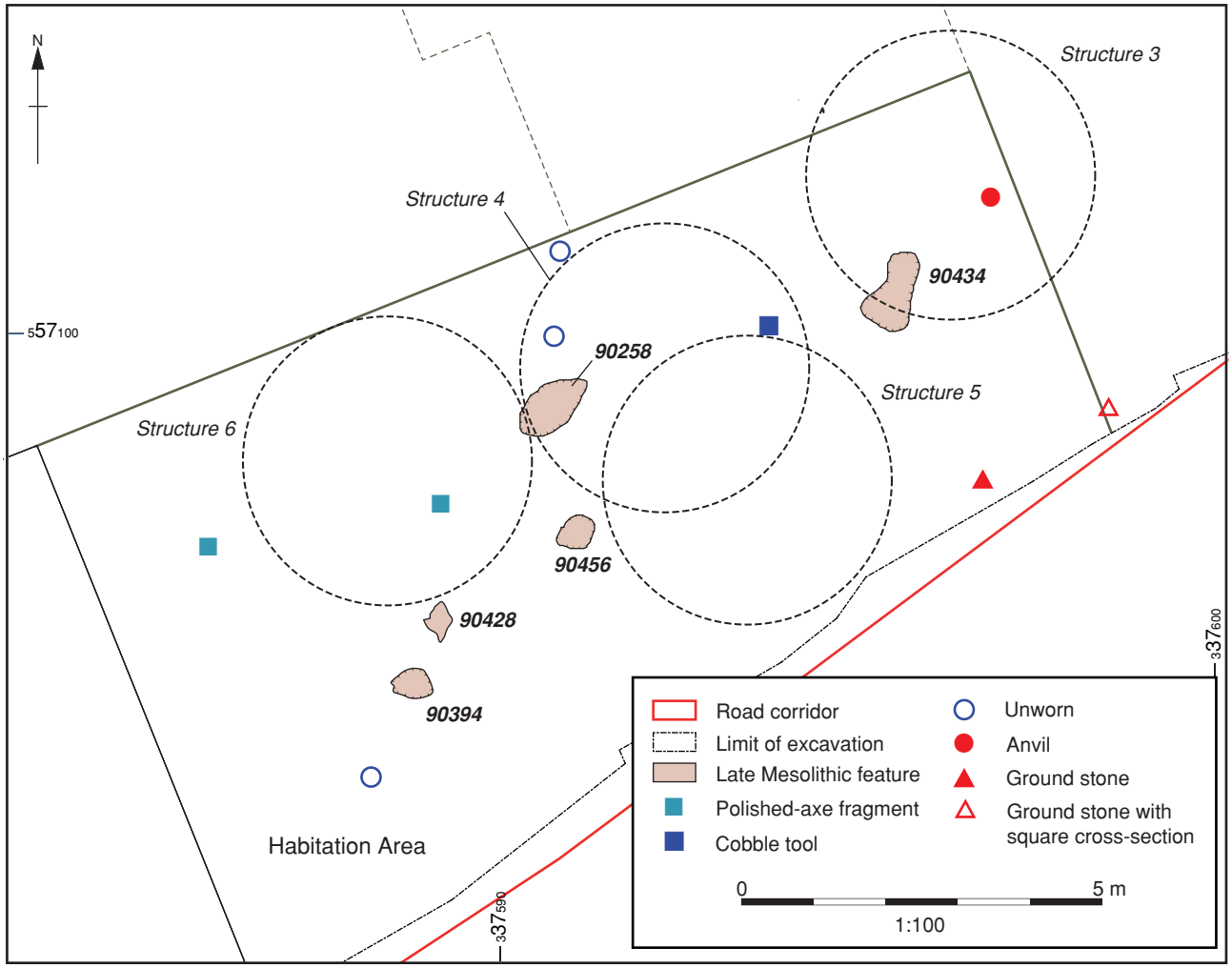

Figure 491: Distribution of coarse-stone tools and stone implements across the Habitation Area

Two fragments from ground-stone tuff axes were also present in this area. One was within Structure 6, associated with a very small scatter of flaked tuff, which included two microliths. The other piece was located near to the palaeochannel and could relate to later occupation.

Discussion: flaked lithics

The largest collection of flaked lithics within the Habitation Area came from Structure 6 and its immediate environs (Lithic Entity 1). These were not seemingly representative of *in-situ* knapping, but instead probably reflect stone-working undertaken in and around the structure. For instance, a partial pebble-flint reduction sequence was focused on pit ***90394*** and posthole ***90428***, which may have formed elements of the structure. Although not associated with a dense spread of flaked lithics, several clusters of material were recognised around the three other structures (3-5) to the east.

Although there are fewer microliths and retouched tools in the Habitation Area, when compared with those from other parts of the site, some interesting patterns are evident. For instance, although very little core technology and debitage in Scottish Southern Uplands chert was recovered from Structure 6 and its environs, there is a significant collection, comprising backed bladelets and microlith fragments (Lithic Entities 1A and 1D). Significantly, a generally similar repertoire in the same material was recorded from the stone-working spread (***90396***) in the Tool-production Area. It is therefore possible that these microliths from Structure 6 were produced in the stone-working area to the north, which in turn implies that the structure dates to the mid-fifth millennium cal BC and was part of the '*Mesolithic encampment II*' phase of occupation (*Ch 4*; *Appendix 20*).

The dominant microlith type associated with Structures 4/5 was the scalene triangle, which almost outnumbered the backed bladelets by 2:1. Significantly, this phenomenon is not recorded in any other part of the site. It appears that Structure 6 was associated with a larger collection of macro-tools than Structures 4/5, including awl/borers, scrapers and related pieces, simple edge-retouched pieces,

and, significantly, the largest number of knife forms recorded. Together, these varied tool types suggest that a range of activities weas probably undertaken within Structure 6 and its immediate environs.

Tool-production Area

Evidence for possible tool production was found on the western side of the *Grid-square area*, where there were numerous archaeological features (Table 238; Fig 492).

Features/ Sample Areas	Late Mesolithic flaked lithics				Coarse-stone, ochre, and stone implements	Dating evidence
	Assemblage	Knapping groups (KG)	Sourcing studies	Microwear		
Stone-spread ***90396***; hearth ***90263*** Stakeholes ***90421***, ***90423***, ***90425***, ***90474***, and ***90476***; Posthole ***90469*** Natural features ***90226***, ***90229***, ***90239***, ***90265***, ***90412***, ***90365***, and ***90367*** Tree-throw ***90216*** Sample Area 1	Stone-spread ***90396*** was a stone-working area containing large amounts of flaked brown, grey, black and Scottish cherts representing the *in-situ* reduction of at least 17 nodules Outside stone-working area, clusters of chert present, which represent additional zones of *in-situ* reduction Clusters of brown/ grey flint represent *in-situ* stone working, dispersed by later stone working associated with stone-spread ***90396*** Flaked pebble flint formed a reversed C-shaped lithic setting Discrete pebble-flint clusters relate to *in-situ* reduction Pitchstone associated with the stone-working area Tuff and small collections of the smaller raw-material groups dispersed throughout the area; these reflect activity disturbed by later stone working associated with stone-spread ***90396*** Lithics with probable hafting residues present	Brown/grey flint 53, 93, and 122; pebble-flint 79, 86; chert 1, 18, 23, 29, 36, 42, 49, 50-2, 54-7, 77, 78, 97, 99, 102, 104-6, and 121; chalcedony/ agate 94; SSUC 117-1; and other 109 9	Chert IG1 sub-group 1 (KG 42, 97, 104, and 105); IG1 sub-group 2 (KG 99 and 102); IG1 sub-group 3 (KG 49 and 121); IG1 sub-group 4 (KG 1); IG1 sub-group 5 (KG 29 and 36, and 51; and IG2 (KG 117-19). Brown/ grey-flint samples included in the flint-sourcing study	Microliths, other retouched tools, and debitage with impact damage dominate Lesser amounts of tools associated with working bone/antler, wood/plant, meat/hide, and dry hide Tools may have been brought to this area to be repaired	Cobble tools (anvils, hammerstones, and an incised stone) probably associated with knapping in stone-spread ***90396*** Possible fishing-line weight Unworn cobbles were spatially associated with collections of ochre and could have been used in its processing Concentrations of ochre were associated with stone-spread ***90396***; grid-square 376; and to the east of the reversed C-shaped lithic setting Two polished-axe fragments, one on the western edge of stone-spread ***90396***, the other to the west of the reversed C-shaped lithic setting	Stone-spread ***90396*** dates to the *'Mesolithic encampment II'* phase

Table 238: Defining characteristics of the Tool-production Area

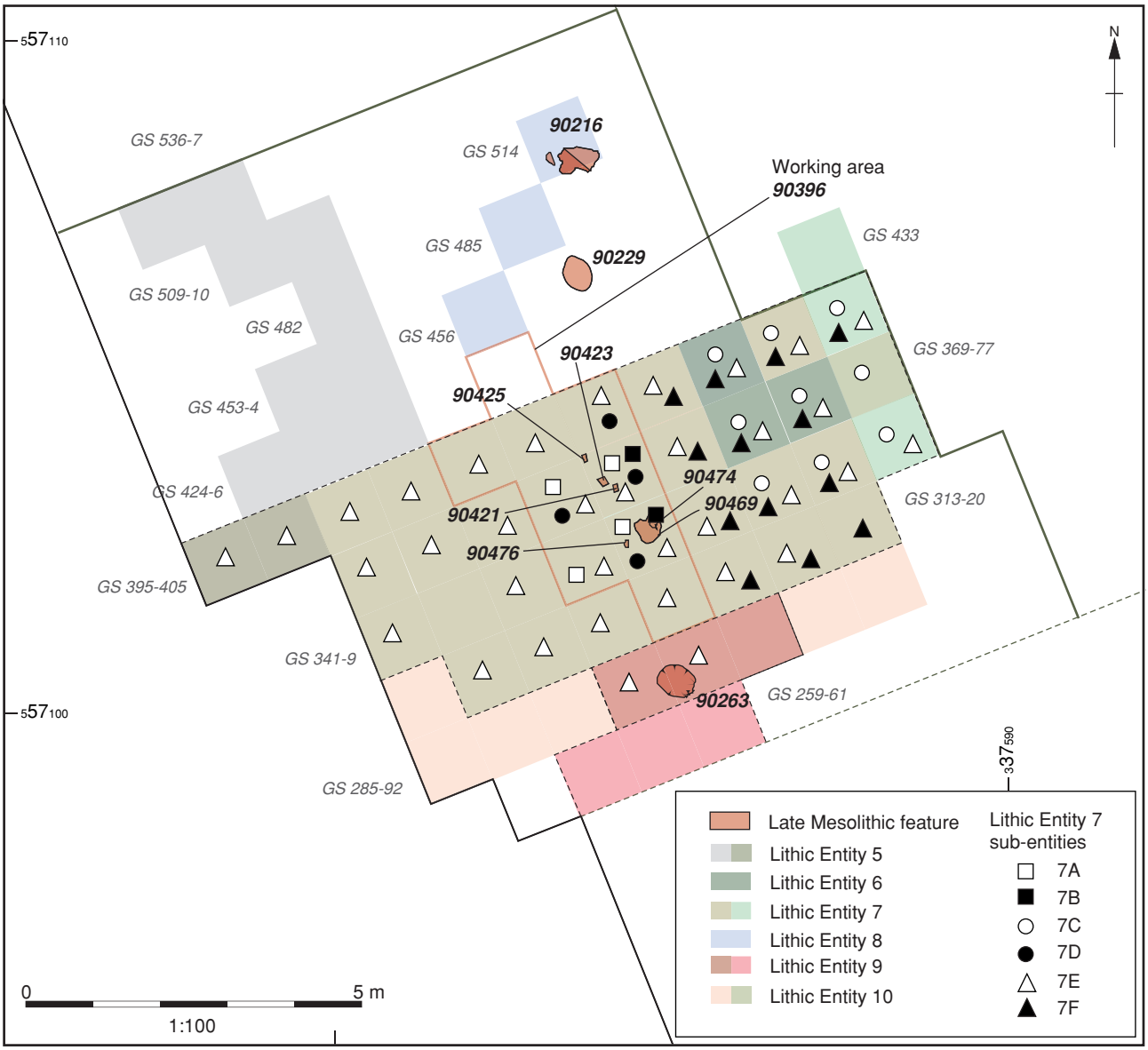

Figure 492: The extents of Lithic Entities 6-10, within the Tool-production Area

These included a stone-working area (***90396***), a hearth (***90263***), a collection of stakeholes (***90421***, ***90423***, ***90425***, ***90474***, and ***90476***), and a posthole (***90469***). Of these, stone-spread ***90396*** has been radiocarbon dated to the mid-fifth millennium cal BC (*'Mesolithic encampment II'* phase; *Ch 4*; *Appendix 20*), and formed the focus for Sample Area 1 (*Appendix 1*), whilst hearth ***90263*** has been dated to the late fifth/early fourth millennium cal BC. However, this date was produced on sediment and, as such, is not considered reliable (*Appendix 20*). This area also contained a collection of natural features including a tree-throw (***90216***).

In addition, spatial analysis identified a reversed C-shaped setting of lithics (Lithic Entity 5; Table 239), which probably denotes the position of a structure, such as a windbreak, with the open side facing the palaeochannel (*Ch 4*). Several other lithic entities (6-10) were also identified in this area, specifically relating to the working of brown flint and chert.

Brown/grey flint

Two discrete clusters of brown/grey flint were present. One, centred on grid-square 395; Fig 493), contained struck lithics from all stages of the reduction sequence, the majority being assigned to knapping group 53, indicating that the worked stone represents *in-situ* reduction (*Appendix 3*). This cluster was on the north-western fringe of the main concentration of chert reduction and appears to have been associated with the reversed C-shaped lithic cluster which extended to the north (Lithic Entity 5; *above*). Another cluster (Lithic Entity 6; *above*) was spread across grid-squares 375, 376, and 403, though this had a different composition, with chunky debitage common to grid-square 403, small flakes more frequently in grid-squares 375 and

Lithic Entity	Description	Lithic sub-entity	Description
5	Late Mesolithic worked stone associated with a reversed C-shaped lithic setting (grid-squares 395, 396, 424-6, 453, 454, 482, 509, 510, 536, and 537)	-	-
6	Cluster of brown-flint material possibly associated with early stone, disturbed by a later stone-working area (Lithic Entity 7; *below*) (grid-squares 375, 376, and 403)	-	-
7	Late Mesolithic flaked lithics from a stone-working area. Includes knapping groups 36, 49, 50, 51, 52, 54-6, 77, 78, 99, 102, 104, 121, and 117-19	7A	Concentrations of chert microlith fragments (grid-squares 344, 345, 372, and 373)
		7B	Concentration of burnt chert (grid-squares 345 and 373)
		7C	Cluster of flaked chert, pebble flint, and ochre (grid-squares 347-9, 375-7, and 403-5; appears to be focused on grid-square 376)
		7D	Cluster of flaked pebble flint (grid-squares 345, 372, 373, and 401)
		7E	Worked SSUC (focused on grid-square 372). Includes material from knapping groups 117, 118, and 119
		7F	Worked SSUC (focused on grid-square 375)
8	Cluster of flaked chert (focused on grid-square 514). Includes knapping groups 18, 105, and 106	-	-
9	Spread of flaked pebble flint (grid-squares 259-61, 288, and 289)	-	-
10	All microliths/retouched/ debitage subjected to microwear analysis in Sample Area 1 (from grid-squares 285-92, 313-20, 341-8, 369-76, and 395-404)	-	-

Table 239: Lithic entities within the Tool-production Area

403, and narrow blades and blade chips in grid-square 376. This suggests that it was composed of discrete dumps of material, or could possibly relate to early stone working, which had been disturbed by activity associated with the *'Mesolithic encampment II'* phase. The cluster also contained five microliths, which were confined to grid-squares 375 and 376, consisting of two fragments and three backed bladelets.

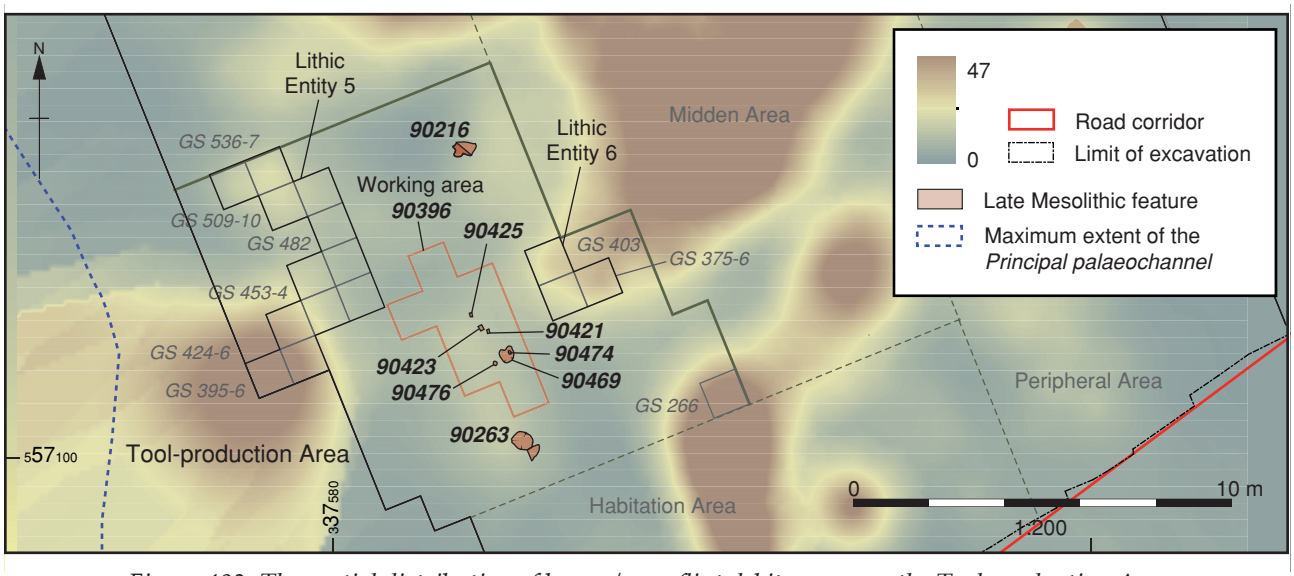

Figure 493: The spatial distribution of brown/grey-flint debitage across the Tool-production Area

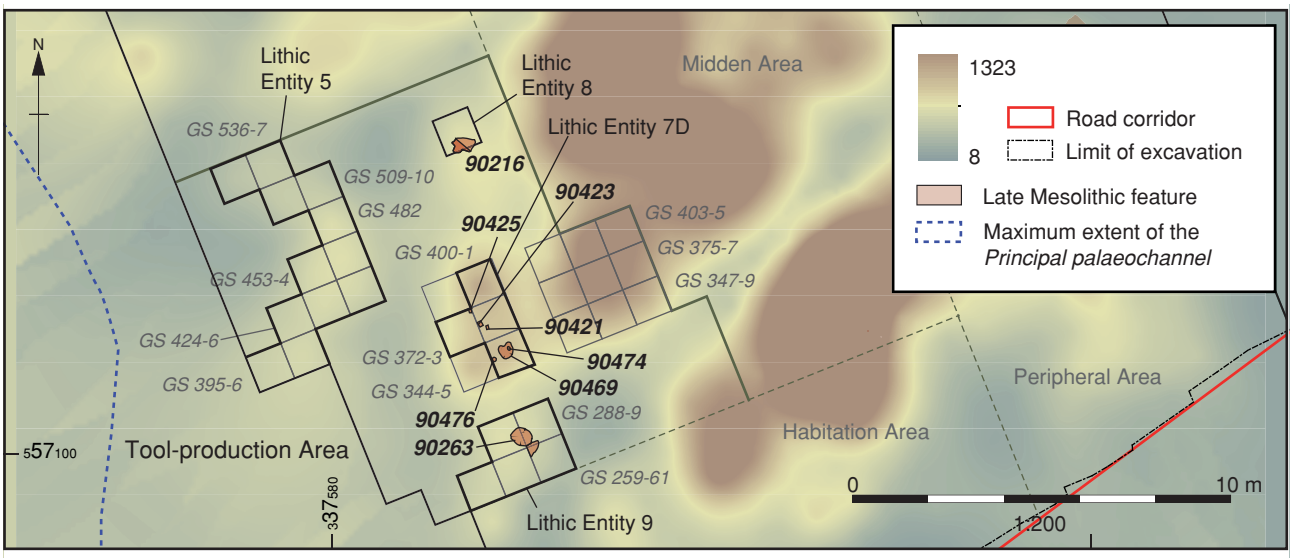

Figure 494: The spatial distribution of pebble-flint cores and debitage across the Tool-production Area

Pebble flint

The area contained worked pebble flint throughout (Fig 494), which was interspersed with more concentrated spreads of flaked lithics, of varying size and density, including denser clusters of specific types. Within the spreads and clusters, flaked lithics from all stages of the reduction sequence were often present. Furthermore, in the majority of cases, the spreads were associated with large collections of pebble-flint microliths and a smaller number of other non-microlithic retouched tools.

The first spread in this area covered grid-squares 395, 396, 424-6, 453, 454, 482, 509, 510, 536, and 537, defining the footprint of the reversed C-shaped structure (Lithic Entity 5). There appeared to be no flaked-lithic clusters within the spread, apart from a continuous distribution of small flakes. The spread also contained a collection of pebble-flint microliths (Fig 495), mainly fragments (17 items), backed bladelets (11), and scalene triangles (eight). Other retouched tools were present, this small collection including a transverse arrowhead. This piece was, however, intrusive within what is ostensibly a collection of flaked lithics with Late Mesolithic technological affinities.

A second spread of pebble flint was present (Fig 494) in grid-squares 344, 345, 372, 373, 400, and 401, and clusters were apparent in grid-squares 345, 372, 373, and 401 (Lithic Entity 7D). The pebble-flint core technology and debitage were, however, less dense in this when compared with the other pebble-flint from the area. This spread also contained 46 microliths, the majority of which were fragments (20 items) and backed bladelets (ten).

A relatively large collection of other retouched tools was also identified within the spread, chiefly comprising simple edge-retouched pieces (six) and awls/borers (three; Fig 496). An invasively retouched

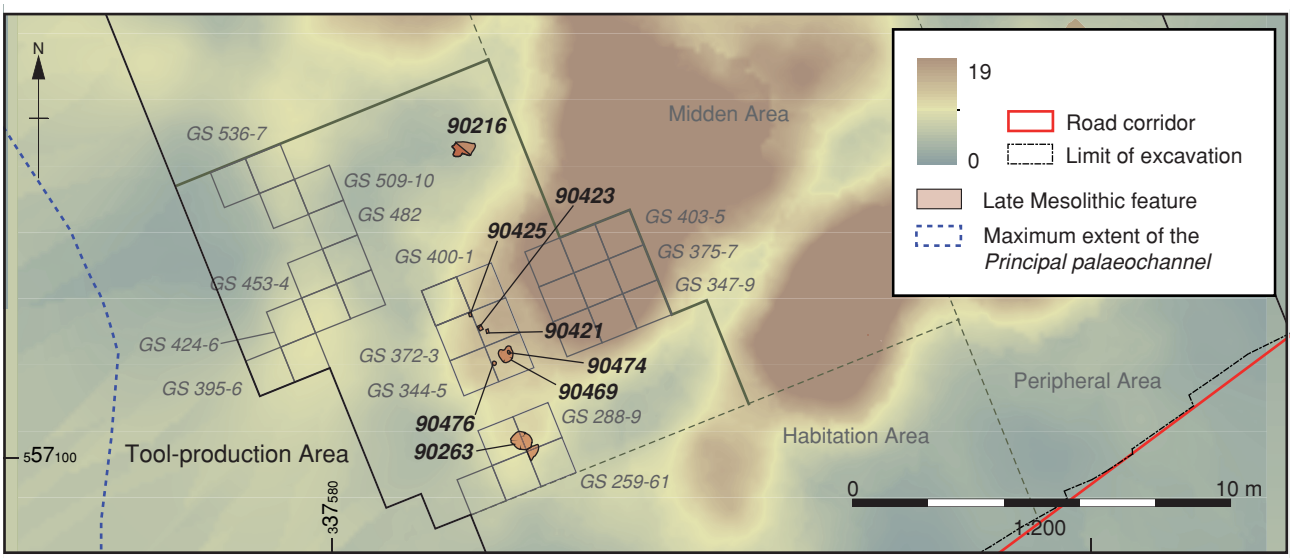

Figure 495: The spatial distribution of pebble-flint microliths across the Tool-production Area

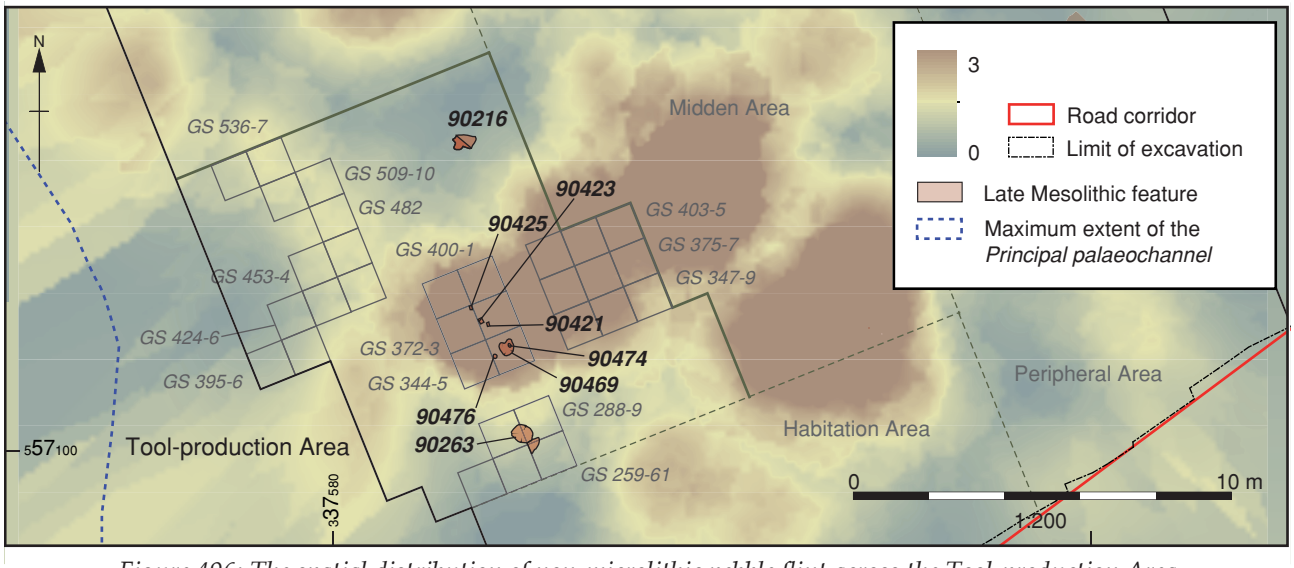

Figure 496: The spatial distribution of non-microlithic pebble flint across the Tool-production Area

fragment was also recorded in grid-square 404, which could be a bifacial trimming flake, or part of a small biface such as an arrowhead.

Another spread of flaked pebble flint was focused on grid-squares 347-9, 375-7, and 403-5 (Lithic Entity 7C), a cluster of core technology and debitage being focused in the centre of these grid squares. Knapping group 79 was identified in the centre of the cluster, in grid-square 376, comprising debitage and a core-dressing piece (*Appendix 3*). A large collection of pebble-flint microliths was also associated with the cluster, mainly consisting of fragments and backed bladelets, although relatively large numbers of fine points were also present. The microlith fragments were common to grid-squares 376, 377, and 404, and suggest that manufacture, use, and/or the retooling of equipment was a significant activity within this part of the site. The other retouched tools from this spread mainly consist of simple edge-retouched blades and flakes.

A small and relatively less dense spread of pebble flint (Lithic Entity 9) was situated on the southern edge of this area, which covered grid-squares 259-61, 288, and 289 (Fig 494). Core technology and debitage were clustered in grid-squares 260 and 288, where significant numbers of narrow blades (43) were present. Given this, the spread could represent a dump of material rather than being related to stone-working activity, although there was a small collection of retouched tools, the microliths including equal amounts of fragments, backed blades, and scalene triangles (nine of each), while the modified blades and flakes consist of three edge-retouched pieces. The spread was also spatially associated with hearth ***90263***.

Chert

Strong evidence for the *in-situ* reduction of chert raw materials was found in this area (Fig 497). A significant quantity of chert was focused on grid-squares 343-5, 372, 373, and 401, which covered or were adjacent to

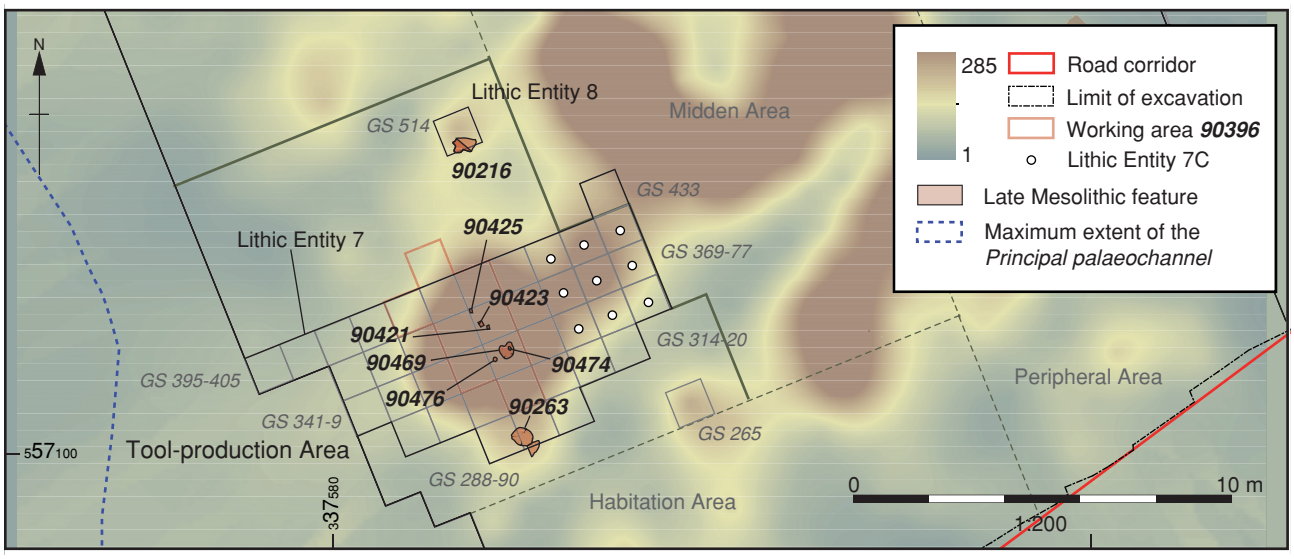

Figure 497: The spatial distribution of chert cores and debitage across the Tool-production Area

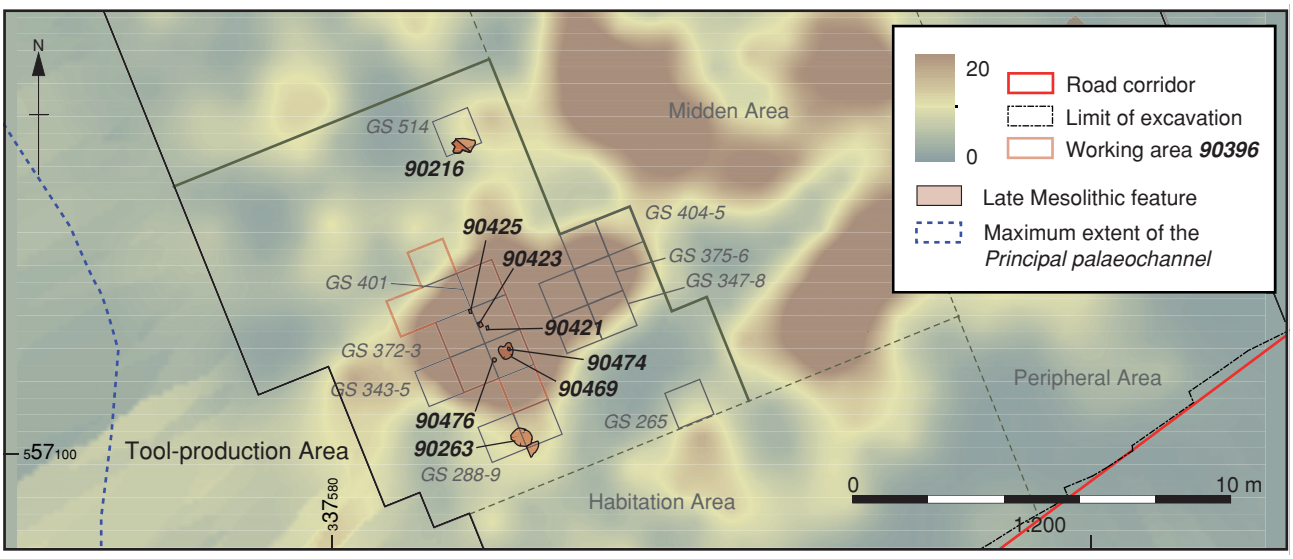

Figure 498: The spatial distribution of chert microliths across the Tool-production Area

stone-spread/working area ***90396*** (Lithic Entity 7). Knapping groups 36, 49-52, 54-6, 77, 78, 99, 102, 104, and 121 (*Appendix 3*) were recorded within and in the near vicinity of this concentration. All stages of the reduction sequence were represented in significant numbers, and, given the large number of knapping groups, the reduction of at least 14 nodules is probably represented.

A large collection of microliths was also recorded within the cluster, and in the grid-squares immediately surrounding it (Fig 498). Of the 119 pieces identified, 69 are microlith fragments and 35 are backed bladelets, significant concentrations of the former being found in grid-squares 344, 345, 372, and 373 (Lithic Entity 7A). The remainder consist of a crescent, six fine points, two *lamelles à cran*/microburins, and six scalene triangles. The relatively small number of scalene triangles is of note, as in the spreads and clusters of chert to the north and west (*below*) they are either approximately equal in number to other forms, or dominate the assemblages. The presence of a large amount of microlith fragments supports the interpretation of this part of the site as a stone-working area, where the manufacture and/or the retooling of composite objects appears to have been a significant feature of stone-working.

A relatively large collection of other, non-microlithic, retouched tools was present alongside the microliths (Fig499). These mainly consist of simple edge-retouched blades and flakes, along with a few awls, notches, scraper forms, and related pieces, and a flake with indeterminate invasive retouch.

Interestingly, there was also a significant quantity of burnt chert in this area (from deposit ***90396***), particularly in grid-squares 345 and 373 (Lithic Entity 7B). The burnt material was mainly associated with grid-square 373 (over 66% of the total burnt chert) principally comprising heat-damaged chunks (17%),

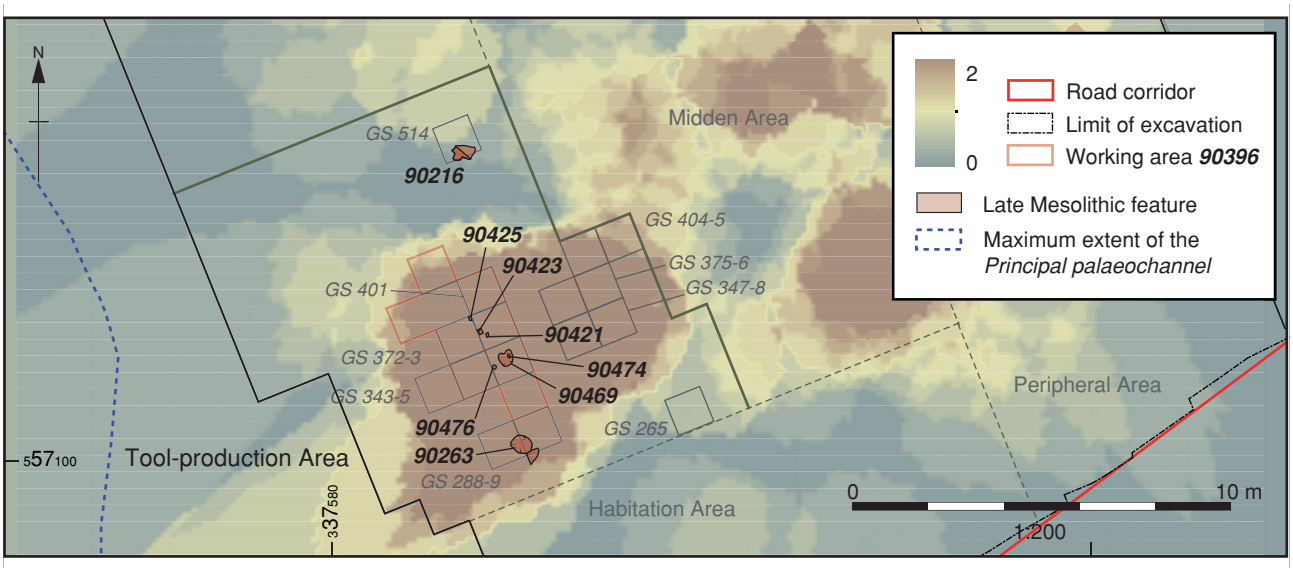

Figure 499: The spatial distribution of non-microlithic chert retouched tools across the Tool-production Area

flakes (18%), and small flakes (43%). Three chert knapping groups (51, 54, and 56) from the same general area contain burnt material, and while two of the groups contain significant amounts of flaked lithics, the burnt material in general makes up an insignificant proportion. Conversely, knapping group 56 is smaller in quantity, but is composed entirely of burnt chert. This indicates the potential secondary deposition of flaked chert, although the lighting of temporary fires in the stone-working area cannot be discounted, and may account for the variable burning of lithic types.

A smaller spread of flaked chert was present immediately to the east, clustered in grid-squares 375, 376, and 404 (Lithic Entity 7C), containing flaked lithics representing all stages of the reduction sequence (Fig 497). Material from this cluster appears to have been spread into the surrounding grid squares, including 347, 348, and possibly 405, and the cluster and associated grid squares also contained a significant number of microliths and non-microlithic retouched tools. The microliths differed slightly in composition from that to the west (*above*), since although fragments are the most common form, backed bladelets and fine points are relatively common, while a solitary scalene triangle is also present. Microlith fragments were clustered in grid-squares 375 and 376, indicating that this area was the focus for tool manufacture and related activities. Flakes and blades exhibiting indiscriminate modification again dominated the non-microlithic retouched tools. More formal tool types include an awl, a burin, a notch, and two pieces with indeterminate invasive retouch. One of the latter could be a fragment from a larger bifacial tool, while the other has pressure flaking on both principal faces and is probably a fragment from a leaf-shaped arrowhead.

To the north, a smaller cluster of flaked chert (Lithic Entity 8) was focused on grid-square 514, which contained material associated with knapping groups 18, 105, and 106 (*Appendix 3*). These all reflect incomplete reduction strategies, mainly in the form of small amounts of debitage, although a microlith was associated with knapping group 105, which also contained two refitting flakes. However, core technology, core-dressing pieces, and further microliths and retouched tools were recorded from the grid squares surrounding grid-square 514, and associated with tree-throw ***90216***, so potential stone-working activity can be postulated.

A less dense spread of flaked chert was also situated at the southern end of the Tool-production Area, although notable clusters were present in several grid-squares. For example, a cluster was focused on grid square 289, which appeared to extend into adjacent grid-squares to the south and north, and contained material assigned to knapping group 50 (*Appendix 3*). It is of note that hearth ***90263*** was also in grid-squares 288 and 289. Within this cluster, flaked lithics from all stages of the reduction sequence were recorded, including a small number of microliths and other retouched tools. The 19 microliths include fragments (nine items) and to a lesser extent backed bladelets (four) and scalene triangles (three), while the other tools comprise an end scraper and related pieces, two truncations, and a simple edge-retouched piece.

SSUC

The largest concentration of Scottish Southern Uplands chert in this area was associated with stone-spread/working area ***90396*** (Lithic Entity 7; Sample Area 1, *Appendix 1*), and within the core technology and debitage comprising this, two clusters of this material could be identified (Fig 500). The first (Lithic Entity 7E) was focused on grid-square 372 and the surrounding area, while the second (Lithic Entity 7F) was clustered in grid-square 375, and adjacent squares.

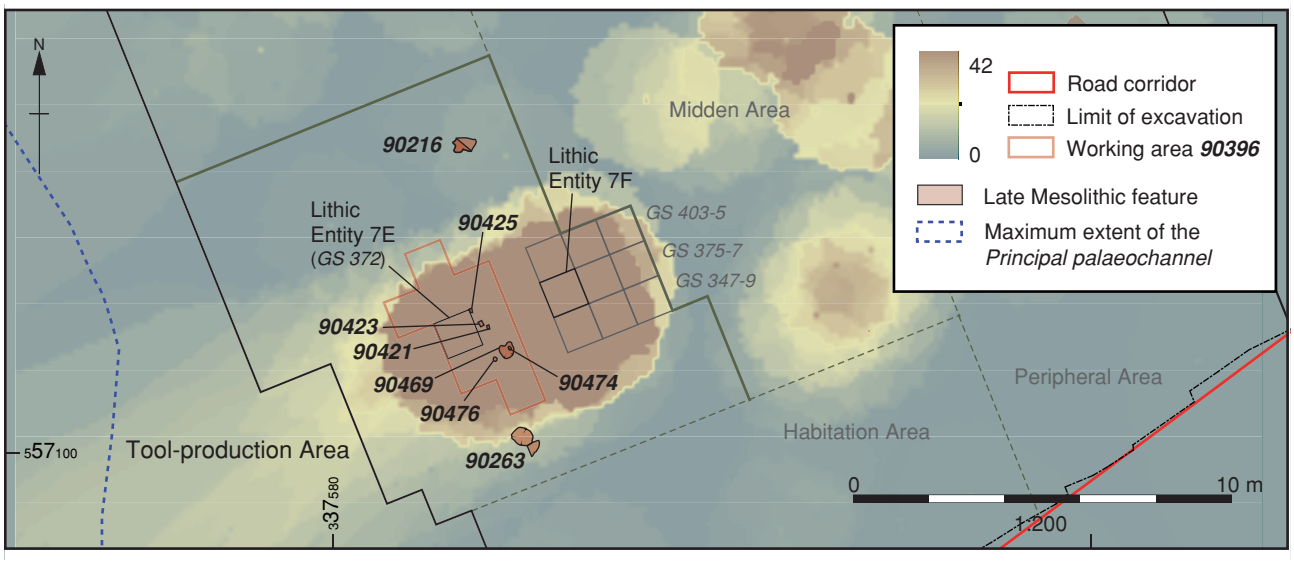

Figure 500: Interpolation plot showing the spatial distribution of SSUC debitage across the Tool-production Area

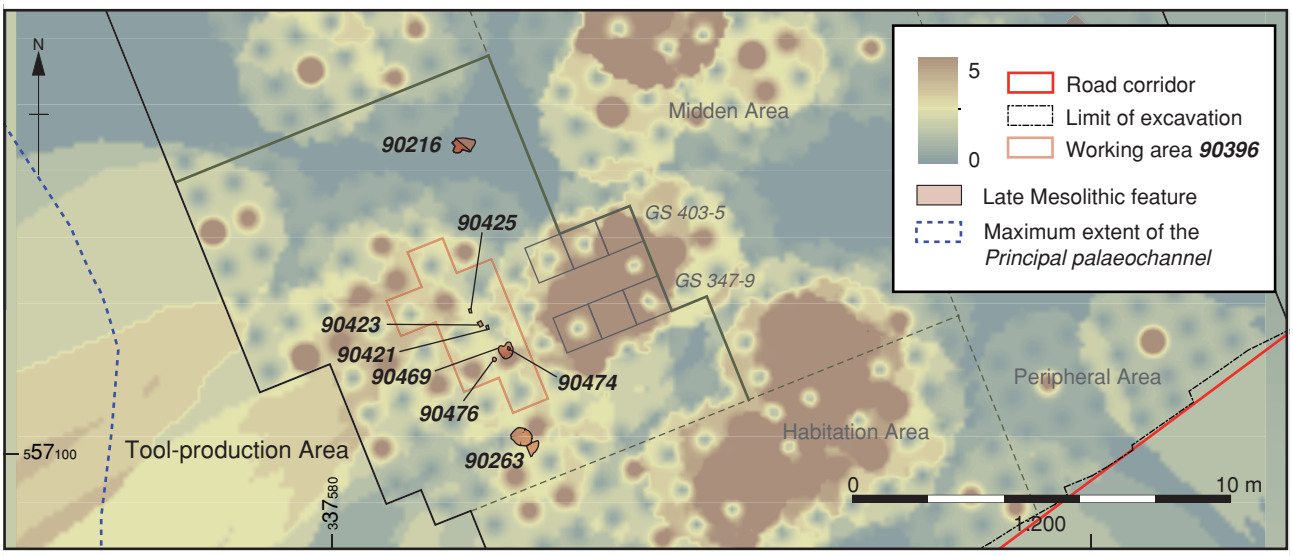

Figure 501: The spatial distribution of pitchstone debitage across the Tool-production Area

Although both concentrations were located in Sample Area 1, the cluster associated with grid-square 375 continued beyond the eastern limits of the sample area into the spread of pebble flint and chert centred on grid squares 347-9, 375-7, and 403-5. The majority of the flaked lithics from these chert clusters were assigned to knapping groups 117, 118, and 119. Knapping groups 117 and 118 were chiefly associated with the cluster centred on grid-square 372, while knapping group 119 was focused on grid-square 375.

Pitchstone

Worked pitchstone in this area (Fig 501) was probably associated with Late Mesolithic activity. Flaked pitchstone was recorded in the stone-working area (***90396***), defined by Sample Area 1 (*Appendix 1*), and within the major concentration of pebble flint and chert to the east, being present in grid-squares 347-9 and 403-5.

Tuff

Flaked tuff had a dispersed distribution across those areas containing significant amounts of chert and pebble flint (Fig 502). These included the stone-working area (***90396***) in Sample Area 1 (*Appendix 1*) and the spread of flaked lithics to the east, in grid-squares 347-9, 375-7, and 403-5 (Lithic Entity 7).

Ochre

One spread of ochre, consisting of fragments and a large collection of worked lumps, was located to the east of the reversed C-shaped lithic cluster (Lithic Entity 5), which was spatially associated with two unworn cobbles (Fig 503). A second spread was spatially associated with hearth ***90263***, whilst another smaller spread was found on the eastern periphery of the knapping area, focused on grid-square 376 (part of Lithic Entity 7C). It is of note that unworn cobbles were found in the vicinity of these two concentrations of ochre.

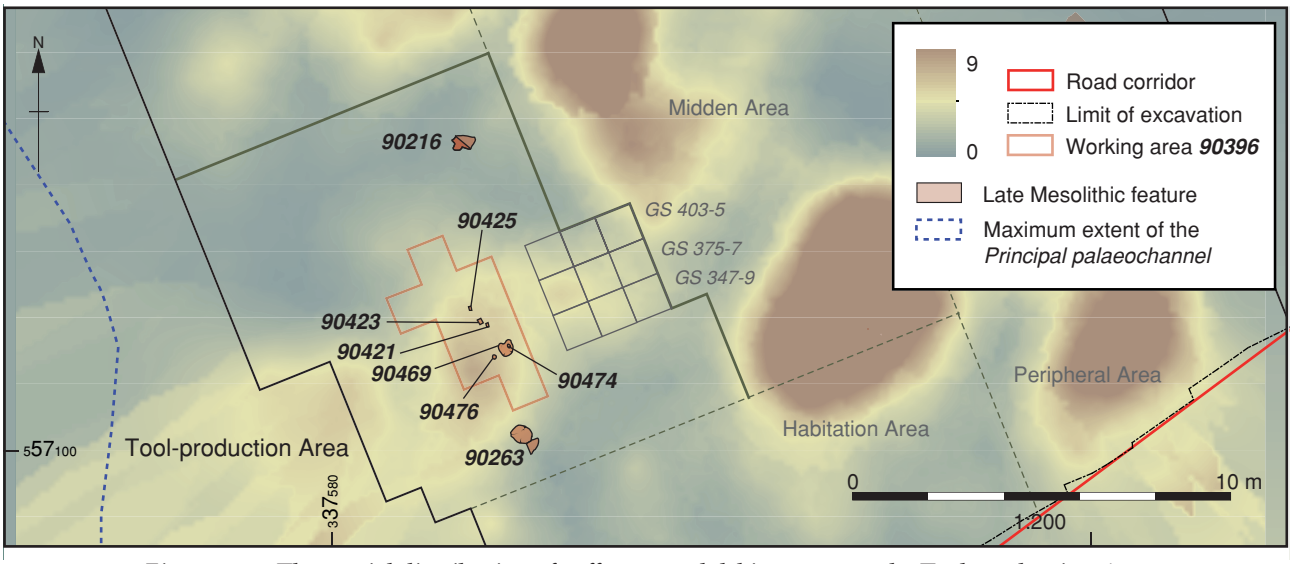

Figure 502: The spatial distribution of tuff cores and debitage across the Tool-production Area

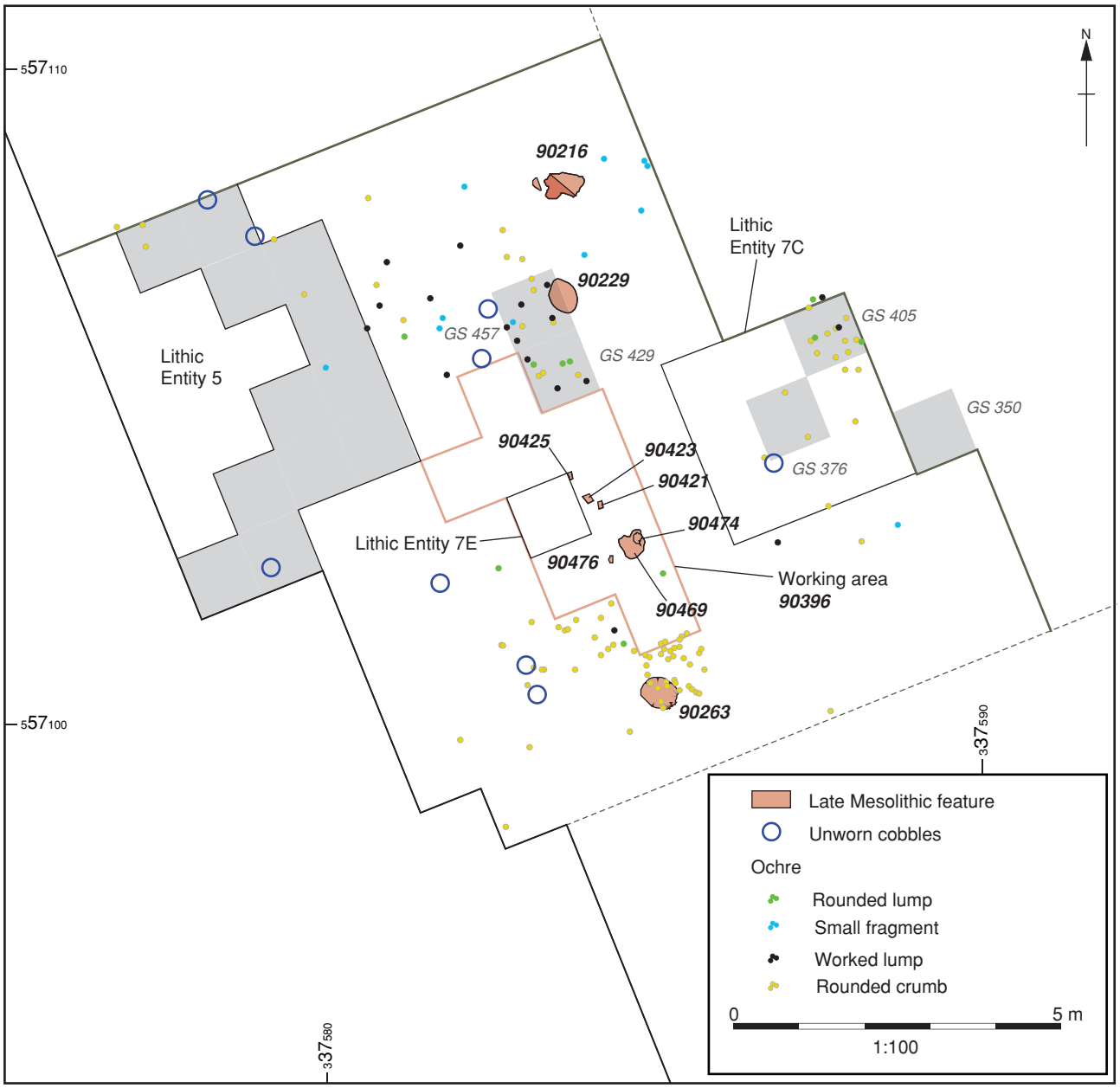

Figure 503: Distribution of ochre across the Tool-production Area, in relation to unworn cobbles

A small and discrete cluster of ochre/haematite, comprising a worked lump and a few rounded crumbs, one of which had a kaolin concretion (*Appendix 2*), was located in grid-square 350. In addition, a second small cluster to the north was concentrated around grid-square 405, which comprised two worked lumps, and several rounded lumps and crumbs. These two clusters could be associated with stone-working activity, which was spread throughout grid-squares 347-9, 375-7, and 403-5 (Lithic Entity 7C). Two refitting worked lumps were also present in grid-square 405, which support the assumption that this group relates to an episode ochre/haematite use. Another relatively tight concentration was clustered in grid-squares 429 and 457, close to an undated pit (***90229***). Additionally, in grid-square 457, there was again a fragment and a worked lump with concentrations of kaolin on their surfaces (*Appendix 2*).

Tasks and activities

Spatial analysis of the items analysed for microwear indicated that, in the knapping area focused on grid-square 344 (Fig 504; Lithic Entity 10), activity involved the working and/or processing of bone/antler, wood/plant, meat/hide, and dry hide. However, butchery and hide-working tools are minimal, which suggests that these activities were not significant. By far the most common form of use-wear is impact damage, which was perhaps associated with the use of projectiles. The majority of pieces exhibiting this type of wear are microliths,

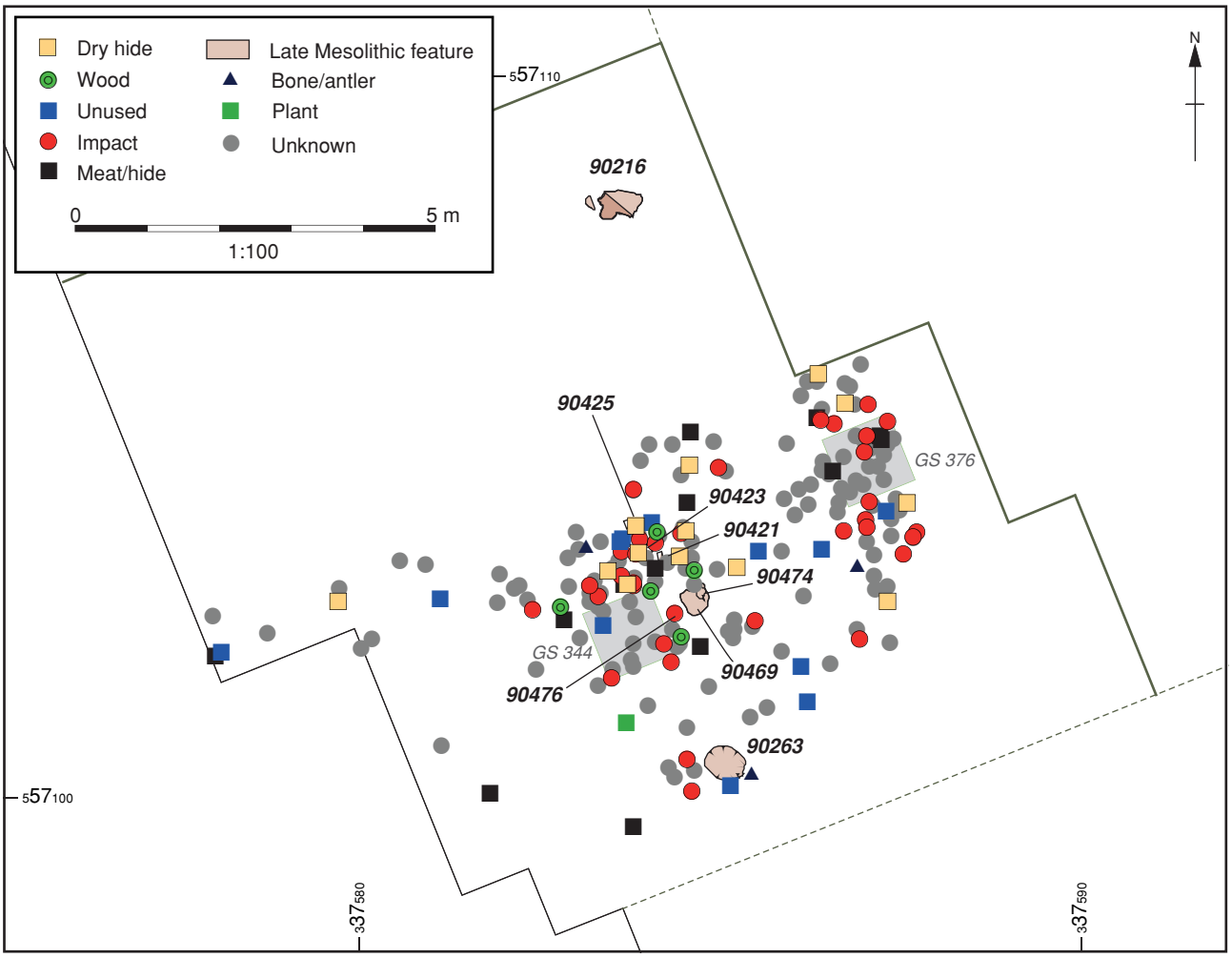

Figure 504: Flaked lithics from the Tool-production Area exhibiting different types of microwear

including backed bladelets, fine points, scalene triangles, a rod, crescents, and microlith fragments. A simple edge-retouched piece and a flake also have impact damage.

The knapping area focused on grid-square 376 also contained a large number of implements with microwear relating to impact. In this instance, these are all microliths with a similar range of classifications as in the knapping area to the west, though only a single crescent was found. Other activity in this area was butchery and possibly bone/antler working. Given that both the knapping areas are predominantly associated with core reduction and tool production, it is surprising that so many tasks are represented, but the large amounts of microlith fragments in both knapping areas suggest that tools used in other parts of the site were brought to this area to be repaired.

Coarse-stone tools and stone implements

Significantly, some of the coarse-stone tools in the Tool-production Area may have been associated with stone working (Lithic Entity 7), such as two anvils/rests, from stone-spread/working-area ***90396*** (Fig 505). It is likely that these were used in knapping, probably as supports during bipolar reduction. However, one has the remnants of possible mastic on a principal surface, so the piece could have been used in the hafting process. A hammerstone was also located within the reversed C-shaped spread (Lithic Entity 3) in the north-west part of this area. A notched cobble came from grid-square 343. This has no signs of wear or pecking and it is possible that it was used for fishing, acting as a weight or line sinker. In addition, an incised cobble was recovered from the stone spread/working area, which has smooth groves on its surface and is unlikely to have been directly associated with stone-working.

In addition, a polished-axe fragment was located on the western side of stone-spread ***90396*** (Lithic Entity 7). A dispersed distribution of flaked tuff within the same area contained several microliths, probably representing dispersed knapped material. A second polished-axe fragment was found to the east of the reversed C-shaped flaked-lithic spread, though this was not associated with any flaked tuff.

Figure 505: The coarse-stone tools, stone implements, and flaked tuff from the Tool-production Area

Discussion: flaked lithics

The flaked lithics from the Tool-production Area indicated that the reduction of all the main raw-material types at the site had occurred there (Fig 506). In nearly all cases, they were associated with a Late Mesolithic narrow blade, microlithic technology, and most of the reduction episodes contained all stages of a generalised reduction sequence. This therefore indicates that *in situ* knapping was taking place, which may also explain the presence of the large number of knapping groups in the area (*above*).

The northern part was largely defined by the reversed C-shaped spread of flaked lithics (Lithic Entity 5). While various raw-material types were present, the reduction of brown/grey and pebble flint was dominant. It produced relatively few microliths and, beyond the ubiquitous fragments testifying to the manufacture, use, and maintenance of possible composite tools, backed bladelets and scalene triangles are the most common classifications within the assemblage. In terms of other retouched tools, awl/borers, scrapers and related pieces, and simple edge-retouched pieces are dominant. A cluster of chert, also in the northern part of the area, was focused on grid-square 514 (Lithic Entity 8), although this appears to represent a partial reduction sequence, and as such may be material that had been disturbed by later activity.

The stone-spread/stone-working area (***90396***) in the south contained a mass of burnt and unburnt stone, and a large amount of flaked lithics, which were covered by at least eight grid squares (Lithic Entity 7). This spread, based on two radiocarbon dates, may date to the third quarter of the fifth

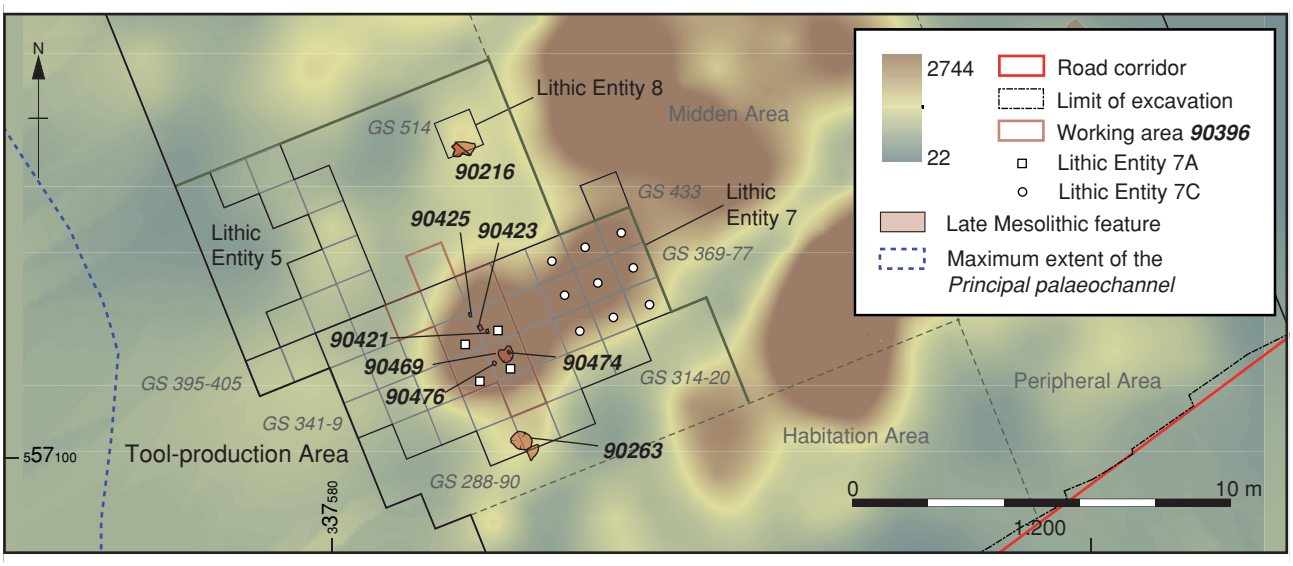

Figure 506: The spatial distribution of all flaked lithics across the Tool-production Area

millennium cal BC (*'Mesolithic encampment II'* phase; *Ch 4*; *Appendix 20*). One area of knapping, focused on grid-square 344, contained pebble flint and brown/grey flint, although the reduction of chert nodules was dominant (Lithic Entity 7A), while a smaller, discrete cluster to the east, centred on grid-square 376, mainly reflected the *in situ* knapping of chert and pebble flint (Lithic Entity 7C). This grid-square also contained brown/grey flint, though this formed an incomplete reduction sequence and may reflect earlier material that had been disturbed by the knapping activity. It is thus possible that the brown/grey flint in this area represents material cleared away from the knapping area focused on grid-square 344, although it should also be noted that the brown/grey flint was recovered from the *Mesolithic overbank alluvium* and therefore some could relate to later sporadic activity during its formation. Aside from cores and debitage, this spread also produced a large collection of microliths and other retouched tools, although there was some variance in the amount of tools recovered from the knapping areas focused on these grid-squares. For example, both areas produced relatively similar numbers of microlith fragments, although backed bladelets were far more frequent in the knapping area focused on grid-square 376 than that to the west. For the other retouched tools, awls, scrapers and related pieces, and simple edge-retouched tools were present in similar quantities in both areas, although there are nearly four times as many notched pieces in the knapping area focused on grid-square 344 than in the other.

Features/ Sample Areas	Late Mesolithic flaked lithics				Coarse-stone, ochre, and stone implements	Dating evidence
	Assemblage	Knapping groups (KG)	Sourcing studies	Microwear		
Hearth/ hollow ***90190/90317*** and hearth/ hollow ***90507/90245*** Natural features ***90319*** and ***90347*** Tree-throw ***90262*** Sample Area 10	Spreads and clusters of brown/grey flint; brown, grey, black, and Scottish chert; and pebble flint. These relate to *in-situ* knapping activity, and dispersed stone working Spreads and clusters of lithics associated with the two hearths Pitchstone associated with Late Mesolithic lithic clusters Lithics with probable hafting residues present	Brown/grey flint 15, 31, 38, 40, 53, 59, 88, and 123; pebble-flint 4 and 63; chert 1-3, 30, 39, 41-3, 60-2, 97, and 111; SSUC 44, 45, and 120; other 100; and cannot determine 90	Chert IG1 sub-group 1 (KG 42 and 97); IG1 sub-group 2 (KG 3); IG1 sub-group 4 (KG 1); IG2 (KG 44, 45, 120); and IG4 (KG 62) A brown/ grey-flint sample included in the flint-sourcing study	Hide working appears to be the dominant task Also tools and debitage used in working bone/ antler and wood, and in butchery Smaller numbers display evidence for impact damage	Small number of coarse-stone tools present. Some may have been used for knapping lithics Unworn cobbles may have been used for processing ochre Concentration in tree-throw ***90262***. Small scatter adjacent to hearth/hollow ***90245/90507*** Three polished-axe fragments	Tree-throw ***90262*** dates to the *'Early Neolithic activity in the Grid-square area'* phase; it contained residual Mesolithic charcoal and flaked lithics

Table 240: Defining characteristics of the Hide-working Area

To the south-west of the stone-spread/stone-working area, another knapping area was focused on hearth ***90263***, where the reduction of chert nodules was a dominant feature. A cluster of pebble flint was also associated with this hearth, though this represented an incomplete reduction sequence and may therefore represent material that had been disturbed by later activity.

Hide-working Area

An area where hide-working apparently took place was identified in the western part of the *Grid-square area*, where there were several features (Table 240). These principally comprised hearths ***90190*** (set in hollow ***90317***) and ***90507*** (within hollow ***90245***), natural features ***90319*** and ***90347***, and large tree-throw ***90262*** (Fig 507). The majority of these features probably date to the Late Mesolithic period, although ***90262*** has been radiocarbon dated to the earlier Neolithic (*'Early Neolithic activity in the Grid-square area'* phase; *Ch 8*; *Appendix 20*). However, it contained residual Mesolithic-age charcoal dating to the late sixth/early fifth millennium cal BC to the second quarter of the fifth millennium cal BC, along with an assemblage of Late Mesolithic flaked lithics (*Ch 4*).

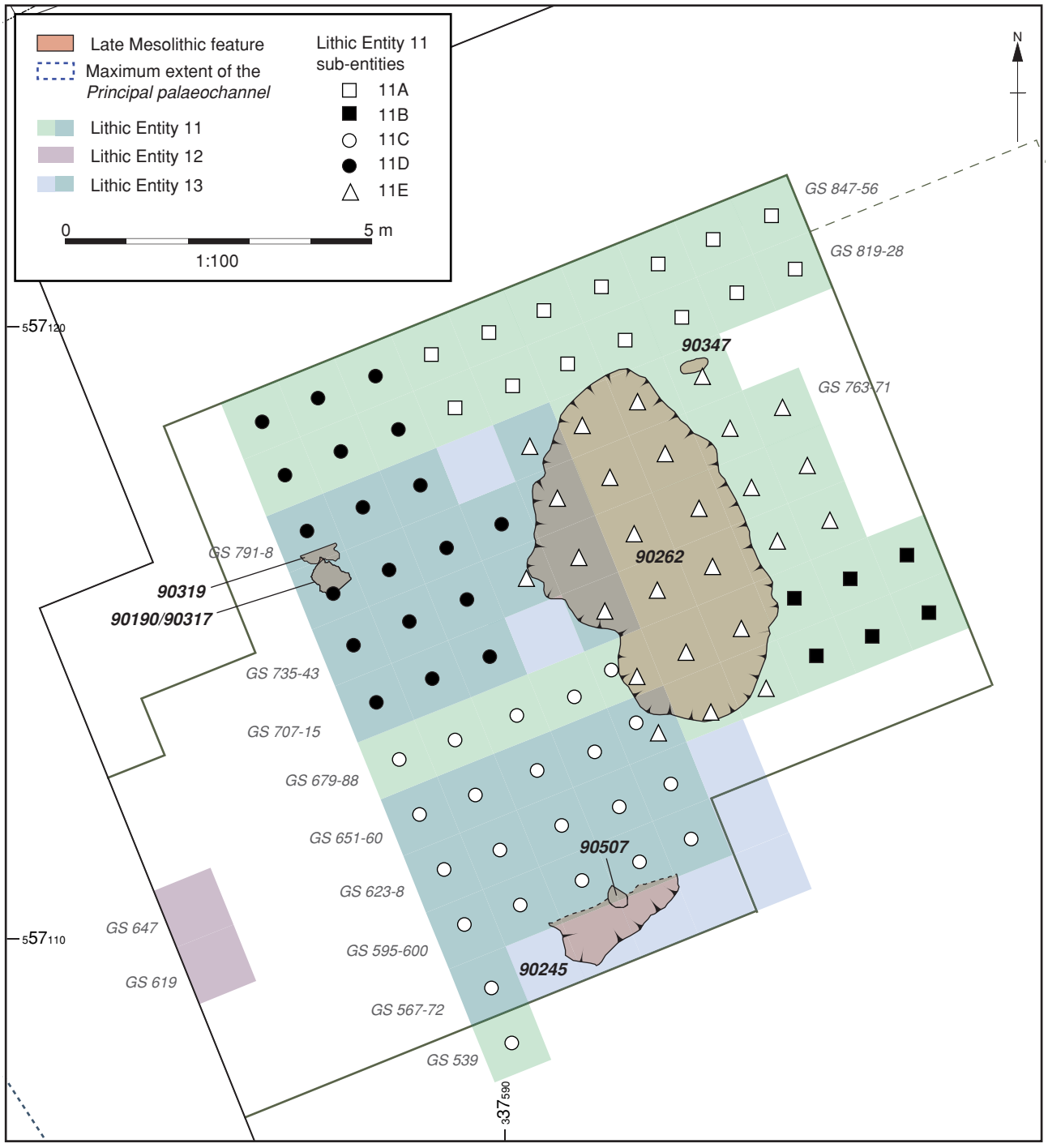

Figure 507: Archaeological and natural features, and Lithic Entities 11-13, in the Hide-working Area

Lithic Entity	Description	Lithic sub-entity	Description
11	Late Mesolithic worked stone, comprising spreads and clusters in he immediate vicinity of tree-throw ***90262*** and hearth/hollow ***90507***/ ***90245***	11A	Possible knapping area (grid-squares 850-6 and 822-8) including clusters of flaked brown/grey flint, pebble flint, and chert knapping waste focused in grid-squares 824-6; and clusters of pebble flint relating to *in situ* reduction in grid-squares 825, 826, and 828, along with flaked pitchstone
		11B	Possible knapping area (grid-squares 658-60 and 686-8) defined by cluster of flaked brown/grey flint and pebble flint, along with scatter flaked pitchstone
		11C	Possible knapping area (grid-squares 679-83, 651-5, 623-7, 595-9, 567, and 539) including cluster of flaked brown/grey flint focused on grid-square 626; spread of chert flaked lithics (all stages of reduction sequence present) in grid-squares 599, 625-7, 653-5, and 681-3; spread of chert flaked lithics in grid-squares 539, 567, and 595 (includes material from knapping groups 2 and 3); palimpsest of pebble-flint reduction activity in grid-squares 595-9, 623-7, 651-5, and 679-83; and cluster of flaked brown/grey flint focused on grid-squares 680 and 681
		11D	Possible knapping area (grid-squares 847-9, 819-21, 791-3, 763-6, 735-7, and 707-9) including spread of chert flaked lithics (all stages of reduction sequence present) in grid-squares 707-9, 735-7, 763, and 764; spread of worked pebble flint in grid-squares 791-3, 819-21, and 847-9; and cluster of SSUC in grid-squares 737, 766, and 793
		11E	All worked stone associated with tree-throw ***90262*** (grid-squares 655-7, 683-6, 711-15, 738-43, 767-71, and 795-8)
12	Possible *in situ* pebble-flint working area (grid-squares 619 and 647)	-	-
13	All microliths/retouched/ debitage subjected to microwear analysis in Sample Area 10 (items from grid-squares 567-72, 595-600, 623-8, 651-5, 707-11, 735-9, 763-7, and 791-5)	-	-

Table 241: Lithic entities within the Hide-working Area

The area contained three lithic entities (Table 241), one of which (Lithic Entity 11) comprised the lithics in and surrounding tree-throw ***90262***, split into several lithic sub-entities. Another (Lithic Entity 12) was located to the west, whilst the third (Lithic Entity 13) in effect formed Sample Area 10 (*Appendix 1*).

Brown/grey flint

Spatial analysis of the brown/grey flint indicates potential stone-working activity in the vicinity of tree-throw ***90262***, hearth ***90507***, and Sample Area 10 (Lithic Entity 11; Fig 508). Particular clusters of cores, core fragments, core-dressing pieces, core-trimming blades and flakes, blade and flake debitage, chunks, and small flakes were present at four locations surrounding these features.

One cluster (Lithic Entity 11A) was situated to the north of tree-throw ***90262***, centred on grid-squares 822-4. There was a particular concentration of regular flakes in this area, associated with two cores and two core fragments. Much of this material, including a core fragment and 20 regular flakes, forms part of knapping group 15 (*Appendix 3*), suggesting there was integrity to the cluster. Interestingly, no retouched tools and edge-utilised pieces were directly associated with the main cluster, although two microliths were situated within the immediate vicinity.

A second concentration (Lithic Entity 11B) lay to the south-east of the tree-throw (***90262***), focused on grid-square 658, and it is likely that material from this also extended into the surrounding grid squares. This group includes cores, blade and flake debitage, and small flakes, although very few retouched and utilised pieces were associated with the debitage. The group also contains a backed bladelet, two fine points, and a microlith fragment, from grid-square 686 to the north. Grid squares adjacent to the main cluster also contained two notches and an edge-retouched piece. Most of the debitage in grid-square 658 has been assigned to knapping group 59 (*Appendix 3*).

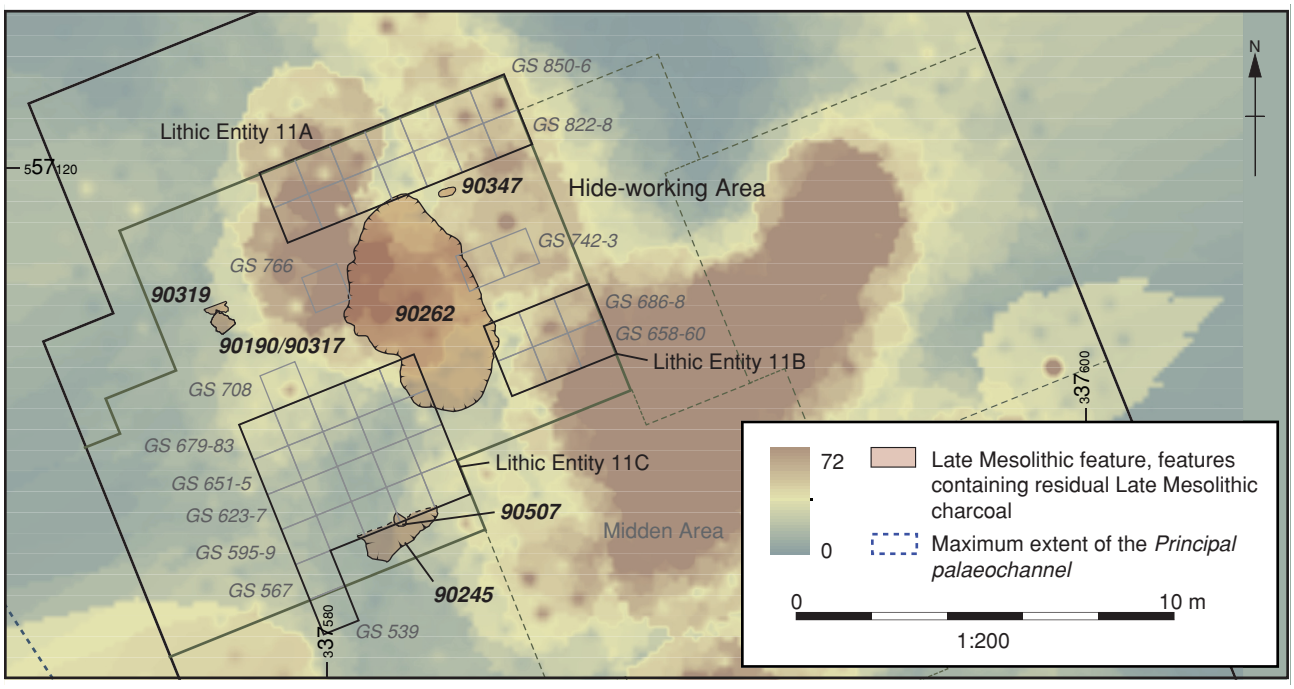

Figure 508: The spatial distribution of brown/grey-flint cores and debitage across the Hide-working Area

The third cluster (Lithic Entity 11C) was focused on grid-square 626, 1 m to the north of hearth ***90507***, and extended into several adjacent grid squares. This group consists of a core, several core-trimming pieces, blade and flake debitage, and small flakes, although, in this instance, several retouched pieces, including microliths and non-microlithic tools, and edge-utilised blades and flakes, were spatially associated with the cluster. These tended to be peripheral to the main concentration of debitage in grid-square 626, and showed a widely dispersed distribution around the hearth. The collection of 21 microliths comprises mainly backed bladelets (ten items) and microlith fragments (six). The other 11 retouched pieces represent a wide range of tools, including a burin, two knife forms, and four notches. The majority of the material from grid-square 626 has been assigned to knapping group 38 (*Appendix 3*). Elements of knapping group 31 were also recorded in the same grid square, although most of this was spread across several grid squares to the north. Knapping group 40 was also found to the north-east in grid-square 655, where the material formed a fairly isolated group of debitage, tools, and utilised pieces. Knapping group 38 suggests some integrity to the cluster of brown/grey flint in grid-square 626, while the other two groups could represent stone-working activity from another phase of occupation, which had been disturbed by later activity.

The final cluster (Lithic Entity 11C) was identified to the west of tree-throw ***90262***, concentrated in grid-squares 680 and 681. The flaked lithics include core-trimming pieces, blade, flake, and chunk debitage, and small flakes. Although no cores were recorded within the main concentration, two were found in adjacent grid-squares 682 and 708. Again, no retouched tools were associated with the main cluster, although a few, and some utilised pieces, were situated within the surrounding grid squares. Several blades from the main concentration have been assigned to knapping group 123, indicating some integrity to the cluster (*Appendix 3*).

Alongside these clearly discrete clusters of brown/grey flint, there was a widespread, dispersed distribution of flaked lithics within the general vicinity of tree-throw ***90262***, in which some more concentrated clusters could be discerned. For example, there was a cluster of small flakes in grid-square 766 and a potential agglomeration of mixed debitage in grid-squares 742 and 743. However, the former could have been a dump of material, while the majority of the latter was associated with deposits filling tree-throw ***90262*** and are likely to represent flaked lithics disturbed by the feature. It should also be noted that, along with the knapping groups, an isolated group was recorded in grid-square 683.

Pebble flint

There was clear evidence for stone-working in the vicinity of tree-throw ***90262***, and two clusters to the north and north-east (both within Lithic Entity 11A) were probably associated with the *in-situ* reduction of pebble flint, within a wider background spread. These were focused on grid-squares 825, 826, and 828 (Fig 509) and contained material from all stages of the reduction sequences; the concentration in grid-squares 825 and 826 did not include cores, however, although fragments and complete cores were recorded in the adjacent grid squares.

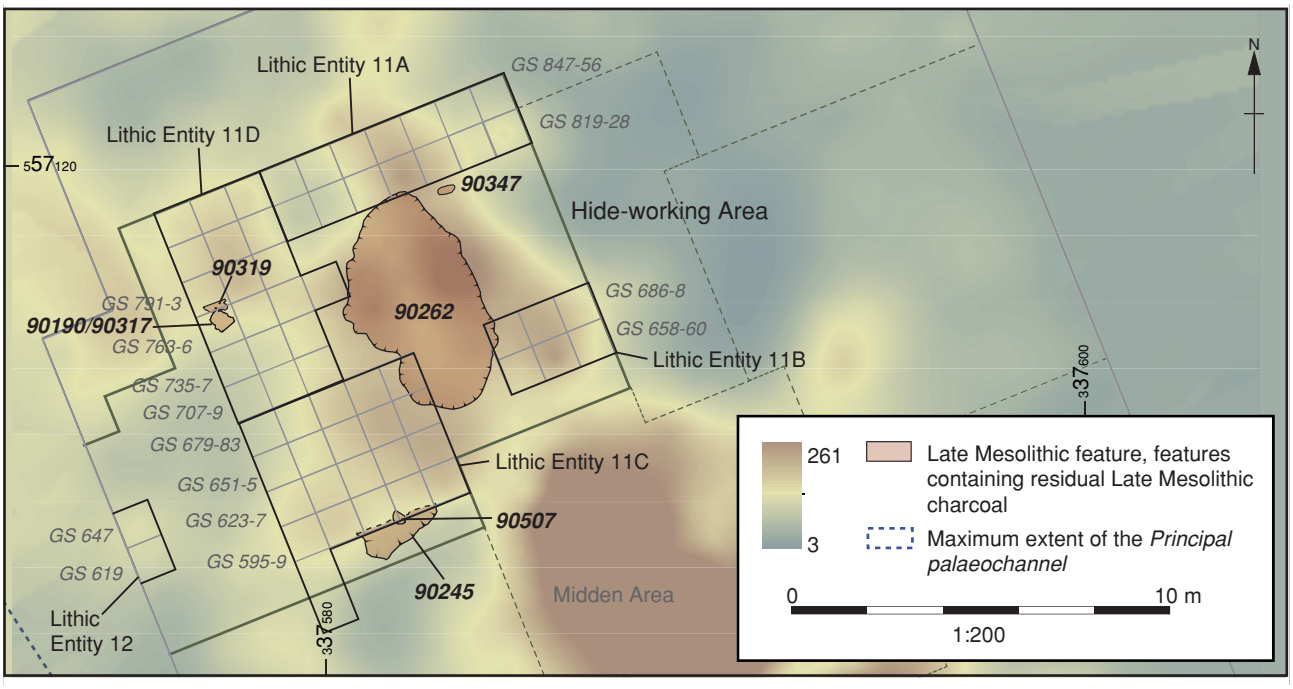

Figure 509: The spatial distribution of pebble-flint cores and debitage across the Hide-working Area

There was another spread of flaked pebble flint to the south-east (Lithic Entity 11B), which had particularly strong clusters in grid-squares 659 and 687. Again, all stages of the reduction sequence were represented and there were relatively dense concentrations of regular flakes, and also microlith forms (*below*).

A large spread of pebble-flint lithics (Lithic Entity 11C) to the south-west of the tree-throw (***90262***) was at its densest in grid-squares 595-9, 623-7, 651-5, and 679-83, becoming more concentrated towards the south-western edge of the tree-throw. It is possible that it continued to the south-east, where it was cut by a later drainage ditch, and perhaps was once connected to a larger spread of pebble flint in the Midden Area. Alternatively, given that all stages of the reduction sequence were represented within the spread, it could have been a palimpsest of reduction activity that was associated with several phases of occupation in this part of the site. Indeed, this seems more likely, as the spread appears to have been spatially associated with hearth ***90507***. There also appears to have been some pattern to the distribution of lithic types within the wider spread of material, with cores and core fragments mainly concentrated in three groups in grid-squares 595, 596, 599, 623, 624, 653, 654, 681, and 682. Moreover, the main concentrations of core-dressing pieces and debitage were also seen in the same grid squares as the core technology.

There was another spread of worked pebble flint (Lithic Entity 11D) to the north-west of tree-throw ***90262***, concentrated in grid-squares 791-3, 819-21, and 847-9, with cores and core fragments clustered in grid-squares 791, 793, and 819. Although core-dressing pieces and debitage were spread throughout the wider area, particular concentrations of small-flake debitage were present in grid-squares 791, 792, and 820. There was also a significant number of flakes in grid-square 792. This spread was to the north and east of hearth ***90190*** and pit ***90319*** and also included knapping group 63 (*Appendix 3*). This knapping group consisted of a small collection of debitage, suggesting there was some integrity to the stone-working activity in this part of the site.

Beyond the main concentrations of pebble flint, a small cluster of material was situated to the west, adjacent to the *Principal palaeochannel*, in grid-squares 619 and 647 (Lithic Entity 12). This was less dense than the others in the Hide-working Area, although it did contain flaked lithics from all stages of the reduction sequence, including a concentration of small flakes in grid-square 647, and could represent an isolated episode of *in-situ* stone-working. Three flaked lithics, of a very distinctive pebble flint, in grid-square 647 were also assigned to knapping group 4 (*Appendix 3*).

A range of microliths was also recovered from the Hide-working area, which were concentrated in several areas (Fig 510). Specifically, Lithic Entity 11B (*above*) contained a comparatively dense concentration of forms, of which 55 were recorded in grid-squares 658-60 and 686-8. The majority are microlith fragments (29 items) and backed bladelets (13), ten microlith fragments being recovered from grid-square 659. This suggests that the manufacture of microliths and/or the possible retooling of composite equipment took place, along with the utilisation of implements. Similarly,

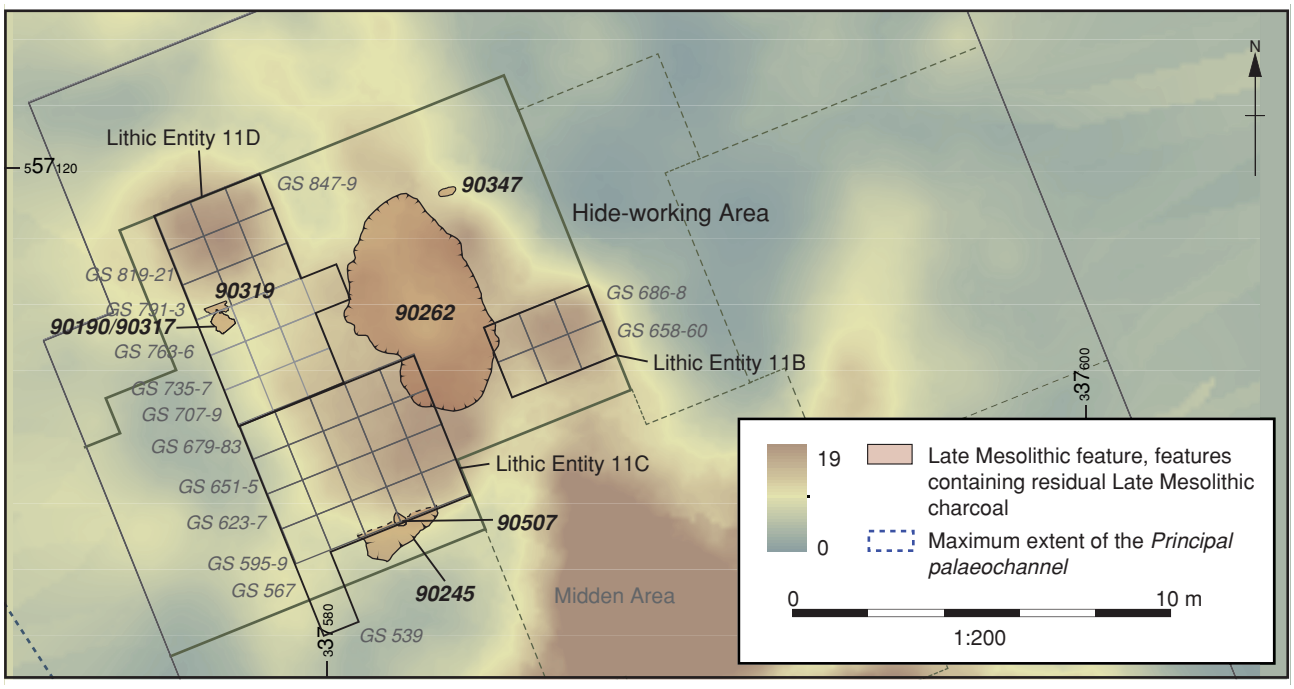

Figure 510: The spatial distribution of pebble-flint microliths across the Hide-working Area

there were many microliths within the general lithic concentration that defined Lithic Entity 11C (*above*), and the spatial distribution of these was highest towards the south-western edge of tree-throw ***90262***, and in grid-squares 623 and 624. These were mainly microlith fragments, backed bladelets, and scalene triangles, the fragments being recorded in greater numbers in the grid squares to the north, east, and west of hearth ***90507***. Finally, microliths appeared to cluster in Lithic Entity 11D (Fig 511), and several other

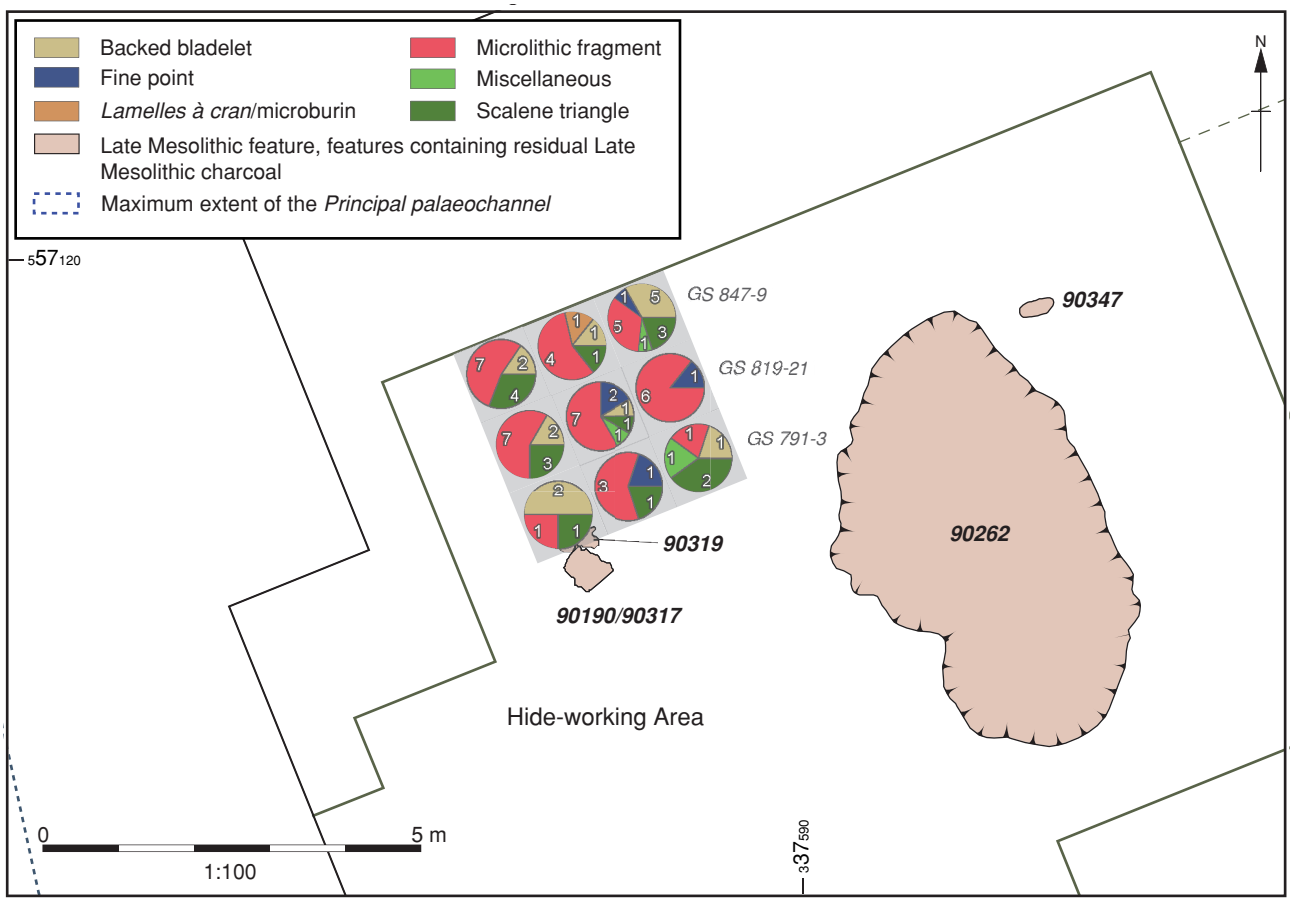

Figure 511: The distribution of microliths in the spread of pebble flint from grid-squares 791-3, 819-21, and 847-9

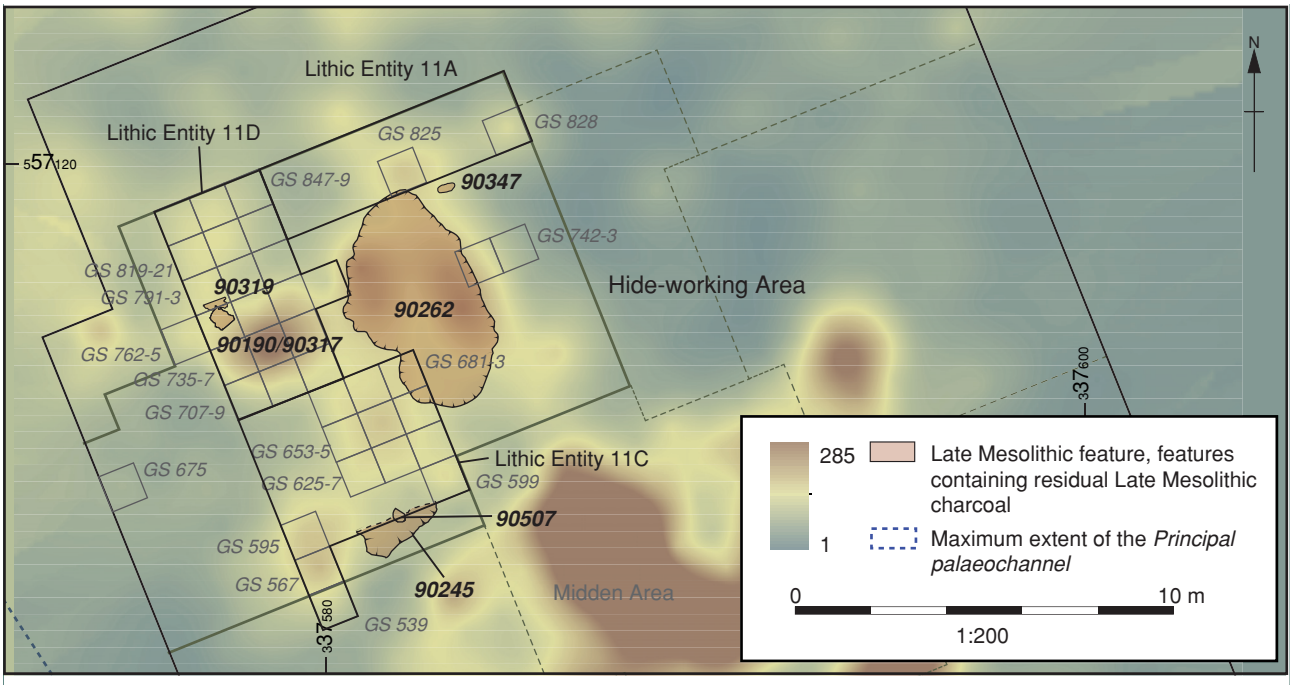

Figure 512: The spatial distribution of chert cores and debitage across the Hide-working Area

retouched tools were also present within the general area covered by the spread of debitage, with microliths (particularly fragments) being more prevalent in the northern part.

Chert

A significant quantity of chert was also present around tree-throw ***90262***, with several discrete clusters of knapping waste, complete and broken microliths, and other tools identified within the general spread (Lithic Entity 11). One (part of Lithic Entity 11A) was to the north of the tree-throw, centred on grid-square 825, containing cores, core-dressing pieces, core fragments, chunks, and all other forms of debitage (Fig 512). The cluster probably relates to *in-situ* knapping activity associated with several phases of occupation in this part of the site, and it was also associated with several microliths (*below*). Chert knapping group 30 was recorded in grid-square 828 (*Appendix 3*), to the east of the cluster, and could represent another knapping spot, although in this instance the collection of flaked chert was less dense than that to the west.

An area of flaked lithics was present to the west and south-west of tree-throw ***90262***, and appears to have included several identifiable spreads. One (part of Lithic Entity 11C) was situated directly to the south-west of the tree-throw and took in grid-squares 599, 625-7, 653-5, and 681-3. There, all stages of the reduction sequence were represented, including a relatively large collection of microliths (*below*). Other retouched tools were limited in number, with a single edge-retouched piece recorded in grid-square 626. There were, however, no discrete clusters identifiable within this spread and thus it could represent stone-working which had been disturbed by later phases of occupation. That said, chert knapping group 39 was associated with grid-square 654 (*Appendix 3*), which may suggest that the spread had some spatial integrity at its centre.

Further to the south-west, another spread of chert (part of Lithic Entity 11C) was focused on grid-squares 539, 567, and 595 and included material from knapping groups 2 and 3 (*Appendix 3*). Knapping group 2 is a small collection of blade and flake debitage, while knapping group 3 is considerably larger in the amount of debitage, although no cores, core fragments, or tools are associated with it. The chert assigned to knapping group 3 has distinctive physical qualities, and the material probably represents a partial reduction sequence. In this respect, it could represent a dump of material derived from stone-working activity elsewhere, or it possibly represents a short-term knapping episode where the core technology and potential tools were retained and removed from the site.

Another spread (part of Lithic Entity 11D) was situated to the west of tree-throw ***90262***, consisting of a small cluster in grid-square 736, accompanied by concentrations of material in surrounding grid-squares 707-9, 735, 737, 763, and 764. All stages of the reduction sequence were recorded, and there was a concentration of flakes in grid-square 736.

The chert microliths from the Hide-working Area were also concentrated in several of the lithic entities associated with this part of the site (Fig 513).

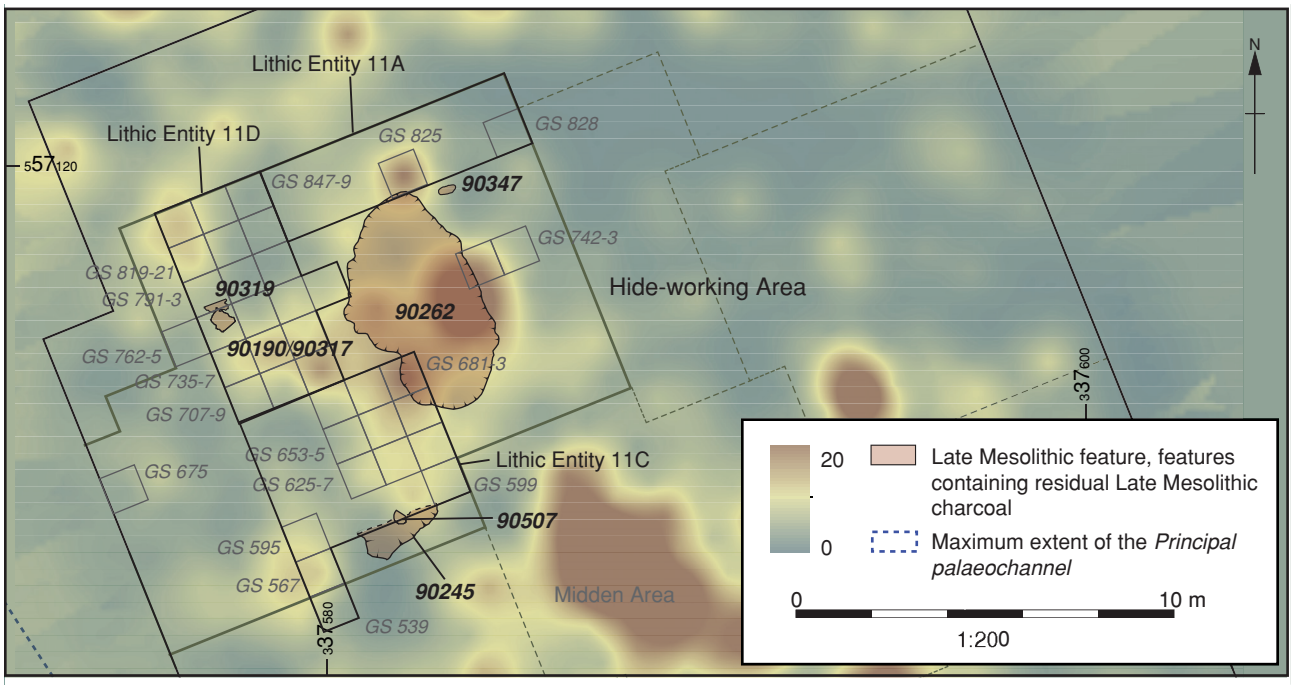

Figure 513: The spatial distribution of chert microliths across the Hide-working Area

For instance, nine microliths were present in grid-square 825, within Lithic Entity 11A (*above*), comprising five fragments, three scalene triangles, and a backed bladelet. Several of the complete microliths are damaged, and it is possible that activities in this area included the production of implements and the re-equipping of composite tools. More (27 items) were associated with grid-squares 599, 625-7, 653-5, and 681-3, within Lithic Entity 11C (*above*), which mainly comprise backed bladelets (seven), microlith fragments (ten), and scalene triangles (eight). Another relatively large collection of microliths (15 items) was also apparent in Lithic Entity 11C, to the west of hearth ***90507***, which could relate to activity associated with this feature. The majority of these were fragments (nine), indicating that tool production, and/or the re-equipping of composite tools, was a feature of the stone-working activity. Alongside the microliths, a single notch was also present in grid-square 567. Similarly, a relatively large collection of microliths was associated with the general spread of lithics focused on grid-square 736 to the west of tree-throw ***90262***, within Lithic Entity 11D (*above*). These items include backed bladelets (six), fine points (two), microlith fragments (eight), and scalene triangles (seven). Other retouched tools were also associated with these, consisting of an awl, an end scraper, and a leaf point.

Knapping groups 1, 41, 42, 43, and 60 were present in grid-squares 709, 735-7, and 765 (*Appendix 3*), suggesting that the reduction of several chert nodules was represented in this spread. Of these, knapping group 42 contains a significant quantity of material, consisting of core-dressing pieces, all forms of debitage, and several implements, presumably a product of sporadic activity associated with the *Mesolithic overbank alluvium*. No cores or core fragments were present in this knapping group, but a few short refitting sequences were identified. To the north and west, further elements of knapping group 1 were recorded in grid-squares 675 and 762, while knapping groups 61 and 62 were associated with grid-square 819.

A thin spread of worked chert was discernible in grid-squares 791-3, 819-21, and 847-9 to the north-west of tree-throw ***90262***, but while flaked lithics from all stages of the reduction sequence were recorded, there were no notable clusters. Therefore, this material could represent stone-working activity which had been disturbed by later occupation, which is confirmed in some measure by a dense spread of pebble flint, also associated with the same area (*below*).

SSUC

Scottish Southern Uplands chert was spatially associated with tree-throw ***90262***, with particular clusters recorded in grid-squares 737, 766, 793, and 796 (Fig 514). That associated with grid-squares 737, 766, and 793 (Lithic Entity 11D) lay on the south-eastern edge of a larger spread and cluster of flaked chert and pebble flint associated with grid squares 791 and 792, 819-21, and 847-9 (part of Lithic Entity 11D). The flaked lithics in grid-square 793 have been assigned to knapping group 120 (*Appendix 3*), and it is likely that this material in the other grid squares was associated with this stone-working activity. However, it does not comprise a full reduction-sequence, chiefly consisting of blade and flake debitage. The flaked lithics could thus represent the deposition of secondary waste, or the partial reduction of a nodule. The material in

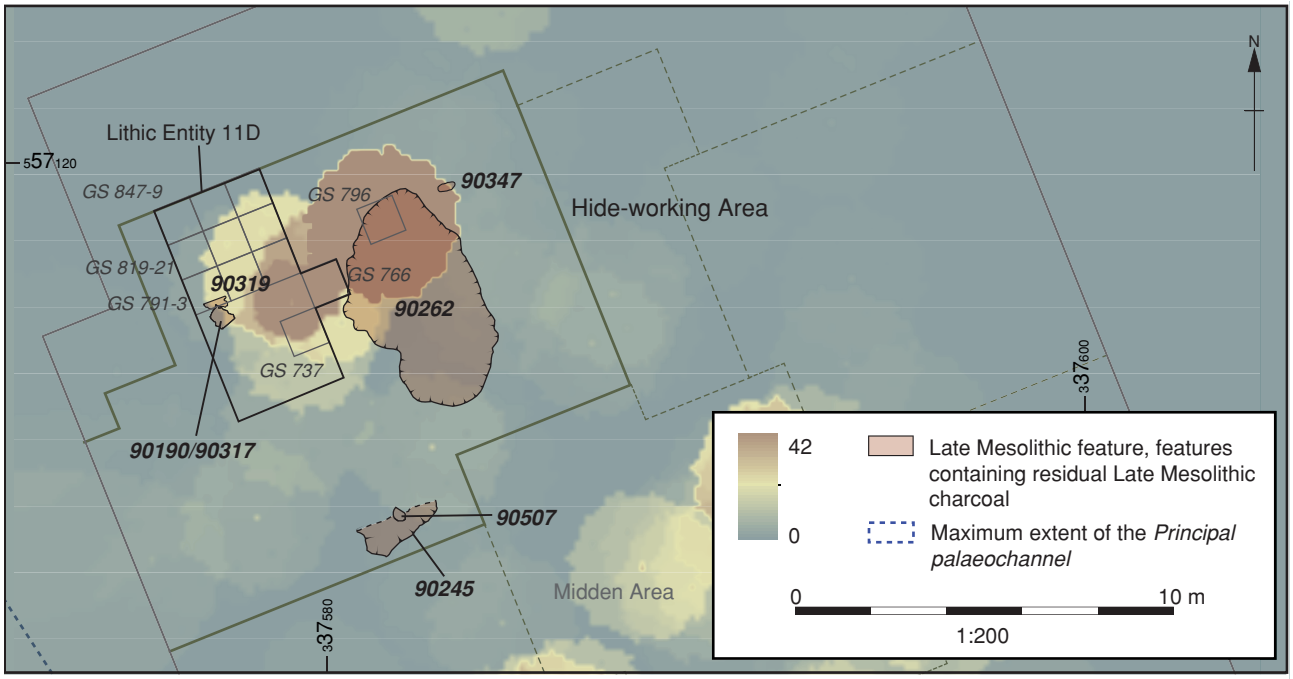

Figure 514: The spatial distribution of SSUC debitage across the Hide-working Area

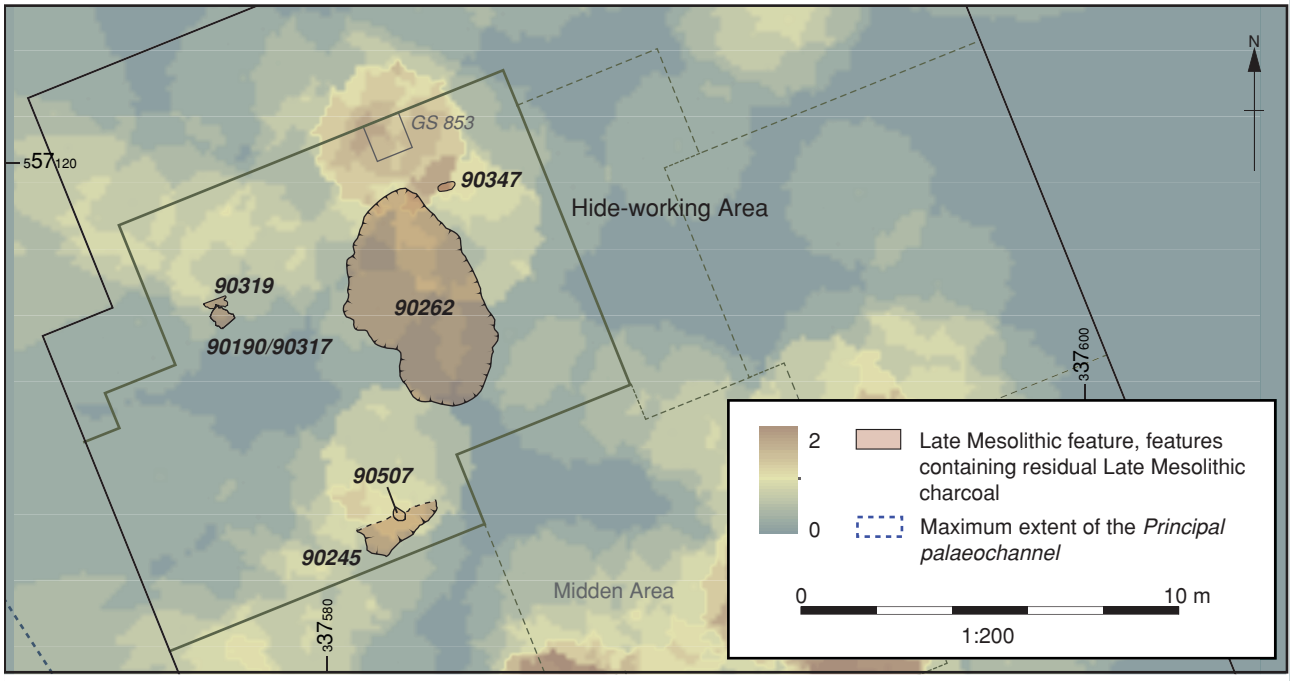

Figure 515: The spatial distribution of SSUC microliths across the Hide-working Area

grid-square 796 was assigned to knapping groups 44 and 45, although it was probably from the reduction of the same nodule (*Appendix 3*). Again, a full reduction-sequence was not recorded, and it is likely that the material represents the secondary deposition of flaked lithics associated with occupation activity disturbed by the formation of the tree-throw. Beyond these clusters, there was a spread of debitage and microliths close to tree-throw ***90262***. The microliths were particularly abundant to the north, west, and south of the tree-throw, although, other than a group of three backed bladelets in grid-square 853, they did not form any significant concentrations (Fig 515).

Pitchstone

Pitchstone items, although sparse, were present in the vicinity of tree-throw ***90262*** (Fig 516), in areas where large spreads containing discrete clusters of worked brown/grey flint, chert, pebble flint, and other raw-material types have been identified. These were to the north, south-east, west, and the north-west of the tree-throw and were associated with several phases of

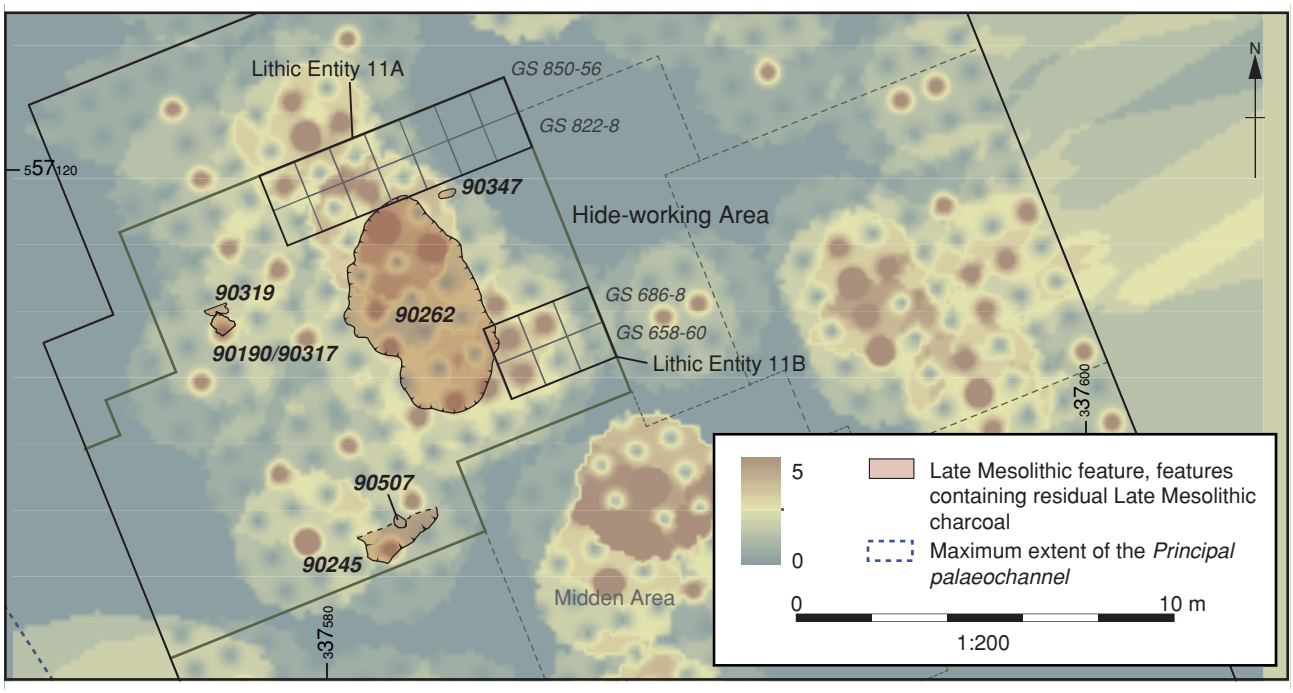

Figure 516: The spatial distribution of pitchstone debitage across the Hide-working Area

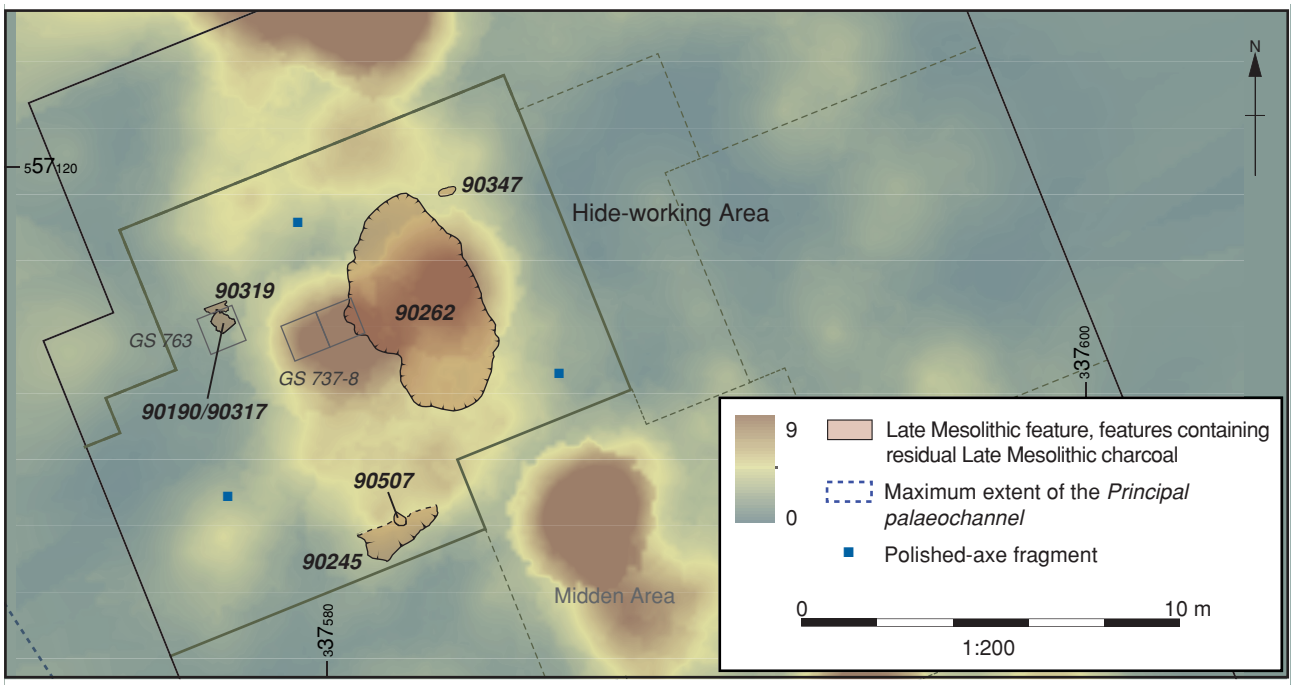

Figure 517: The spatial distribution of tuff cores and debitage, and the polished-axe fragments, across the Hide-working Area

occupation dating to the Late Mesolithic period. The occurrence of retouched pitchstone on the northern and south-eastern edges of the tree-throw is of note (Lithic Entities 11A and 11B).

Tuff and polished-tuff axes

A light spread of flaked tuff was identified in the vicinity of tree-throw ***90262*** (Fig 517). Although no meaningful clusters of flaked lithics could be identified, it appears to suggest that that tuff reduction could have been more concentrated in this area prior to it being disturbed by the tree-throw. There was a group of four microliths in grid-square 763 and a small collection of blade and flake debitage in grid-squares 737 and 738, but in both cases artefact numbers were low and were representative of incomplete reduction sequences. Three polished-axe fragments were also found in this area.

Ochre

The working and/or processing of ochre were associated with the northern knapping area, as evidenced by a collection of worked lumps, small

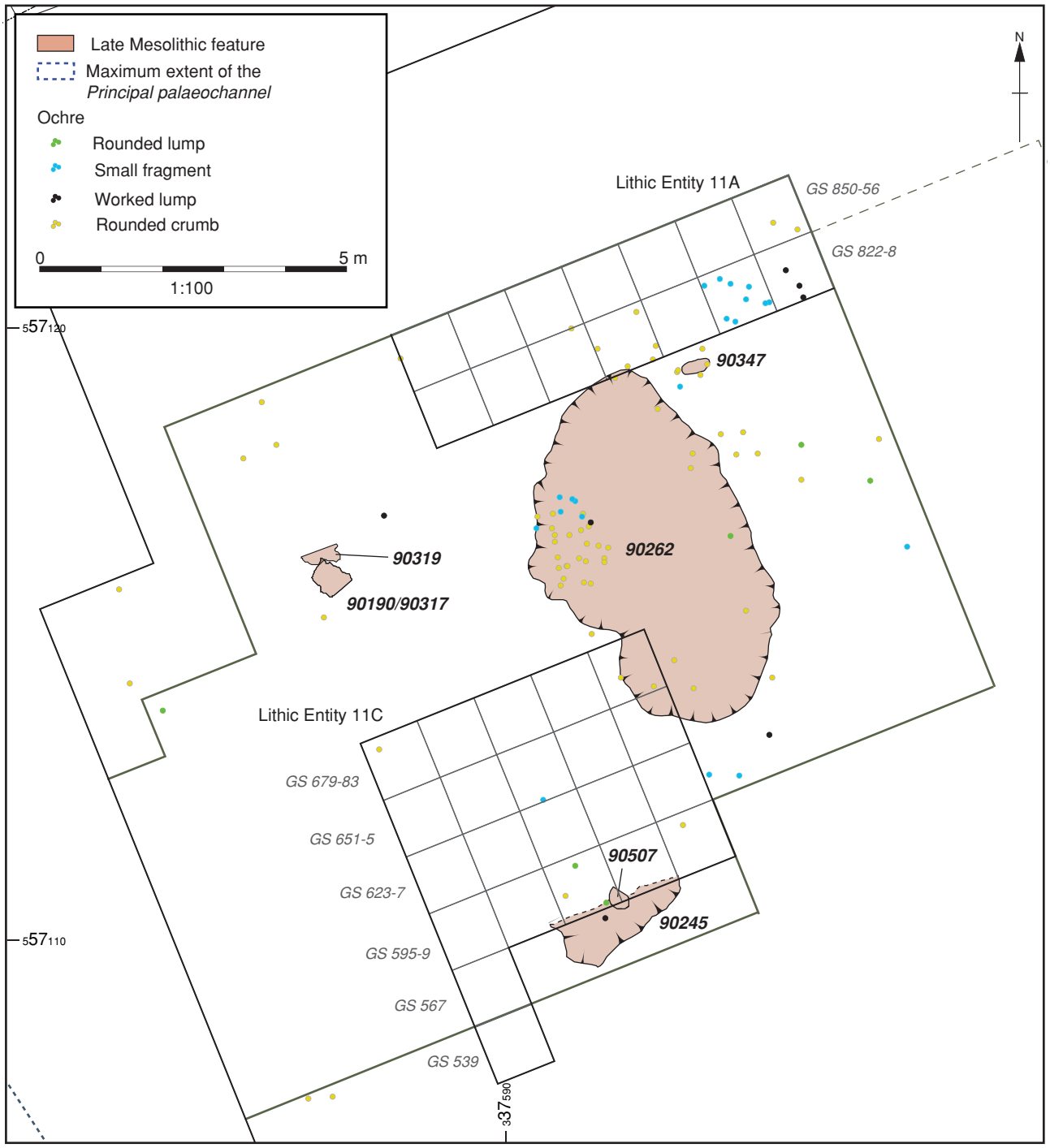

Figure 518: Distribution of ochre across the Hide-working Area

fragments, and rounded crumbs (Fig 518). A further concentration was associated with tree-throw ***90262***, though this could also have ultimately derived from the northern knapping area (Lithic Entity 11A). Beyond these concentrations, ochre was dispersed throughout this activity area, and there was a small collection of pieces, including a worked lump, situated to the north of hollow/hearth ***90245/90507*** (Lithic Entity 11C).

Tree-throw **90262**

The earlier Neolithic tree-throw (***90262***) in grid-squares 655-7, 683-6, 711-15, 738-43, 767-71, and 795-8 (Lithic Entity 11E) provided four radiocarbon dates. The earliest date (SUERC-42591; *Appendix 20*), from charcoal in a probable roothole in the base of the tree-throw, indicates occupation in the vicinity in the late sixth/early fifth millennium cal BC, whilst material from basal fill ***87675*** was dated to the second quarter of the fifth millennium cal BC (SUERC-32637; *Appendix 20*). These two dates can be reconciled with the wider phases of activity recorded in several other parts of the site (*Ch 3; Ch 4*). The other two dates (SUERC-41994 and SUERC-59307; *Appendix 20*) were obtained from material in deposits (***90238*** and ***90326***)

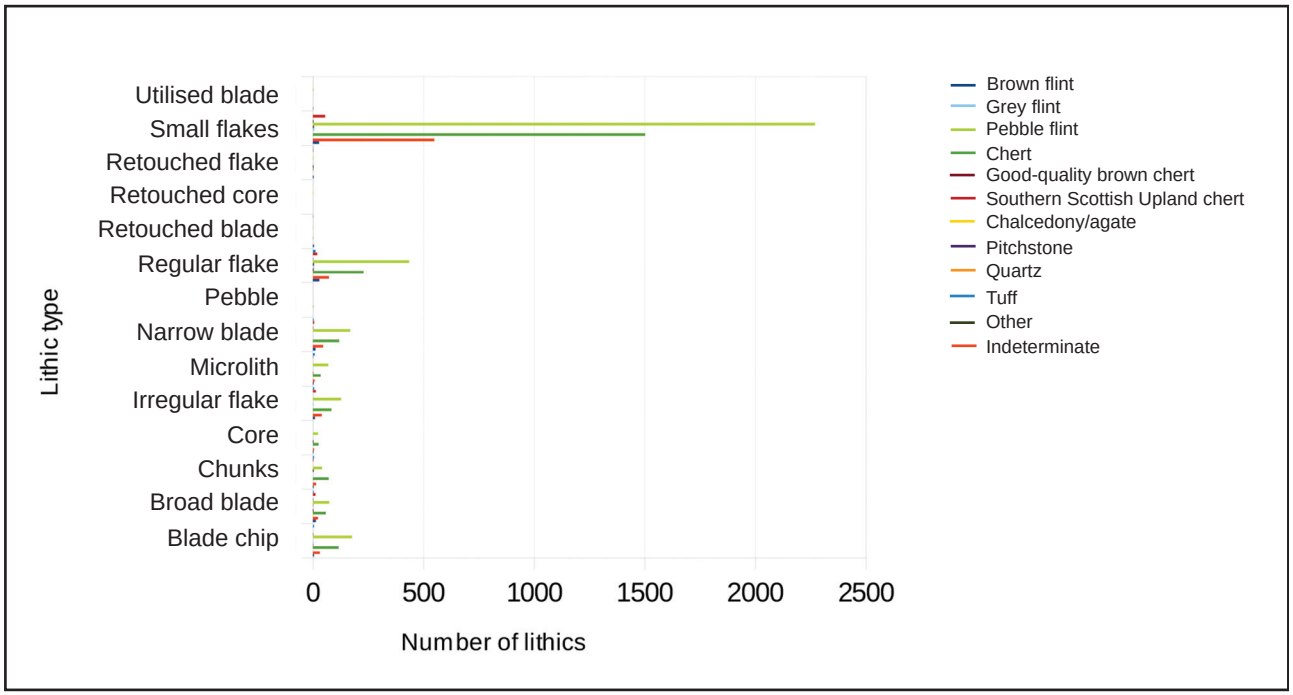

Figure 519: The flaked-lithic types from tree-throw **90262**, *by raw material*

in the base of the tree-throw, both being from the second quarter of the fourth millennium cal BC; it is likely that this material was contemporary with the uprooting of the tree which had created the tree-throw (*Ch 8*).

This tree-throw contained a large assemblage of flaked lithics (Fig 519), and 29 small rounded pieces of ochre. The technological character of the majority can be reconciled with those from the immediate vicinity of the feature, which related to Late Mesolithic occupation. In terms of raw materials, there is a relatively large amount of 'cannot determine' lithology, which reflects a concentration of burnt material, and Scottish Southern Uplands chert, consisting of knapping groups 44 and 45 (*Appendix 3*). The distribution of the raw materials is of interest as this was a secondary depositional environment. For instance, the greatest amount of flaked lithics, including all raw-material types, but mainly chert and pebble flint, and knapping groups 44 and 45, was situated along the eastern, northern, and north-western edges of the tree-throw, while relatively less material was recovered from the centre of the feature. This distribution suggests that when the tree went over (*above*), the surrounding stratigraphy and the flaked lithics were disturbed, large clods of soil probably being inverted and remained largely *in situ*, while some also adhered to the root bole and then also slumped back into the hole created. Thus, the spatial distribution, and to some extent the shape of the tree-throw in plan, indicate that the tree fell to the west, towards the palaeochannel.

Tasks and activities

Of the microliths and other retouched tools from this area showing evidence for microwear, 51.2% exhibited evidence for working hide (*Appendix 7*; Lithic Entity 13). These pieces were mainly confined to the knapping zone situated in the vicinity of hollow/hearth ***90245/90507*** and comprised both microliths and macro-tools (Fig 520). The latter consist of scrapers, simple edge-retouched blade and flakes, and a notch, although by their very nature the large number of awl/borers in this area suggests that they may have been used in the same activity. The overwhelming evidence for hide working indicates that this was probably an activity that was intimately associated with the Mesolithic encampment, and involved piercing, scraping, and cutting hide. Other tasks associated with microlith and retouched tool use in this area included bone/antler working, woodworking, and butchery. Several pieces also exhibited impact damage. These may have been used as projectile points, although this damage might also have been created by other forms of activity (*Appendix 7*).

Coarse-stone tools

The use of coarse-stone tools in the Hide-working area was limited to a cobble tool, a core, a faceted hammerstone, and a hollowed stone (Fig 521). Of these, the hollowed stone could have been related to knapping activity, in the vicinity of hollow/hearth ***90245/90507***, and, similarly, the cobble tool could also have been associated with an isolated episode of pebble-flint knapping on the western edge of the *Grid-square area*. Two unworn cobbles from the

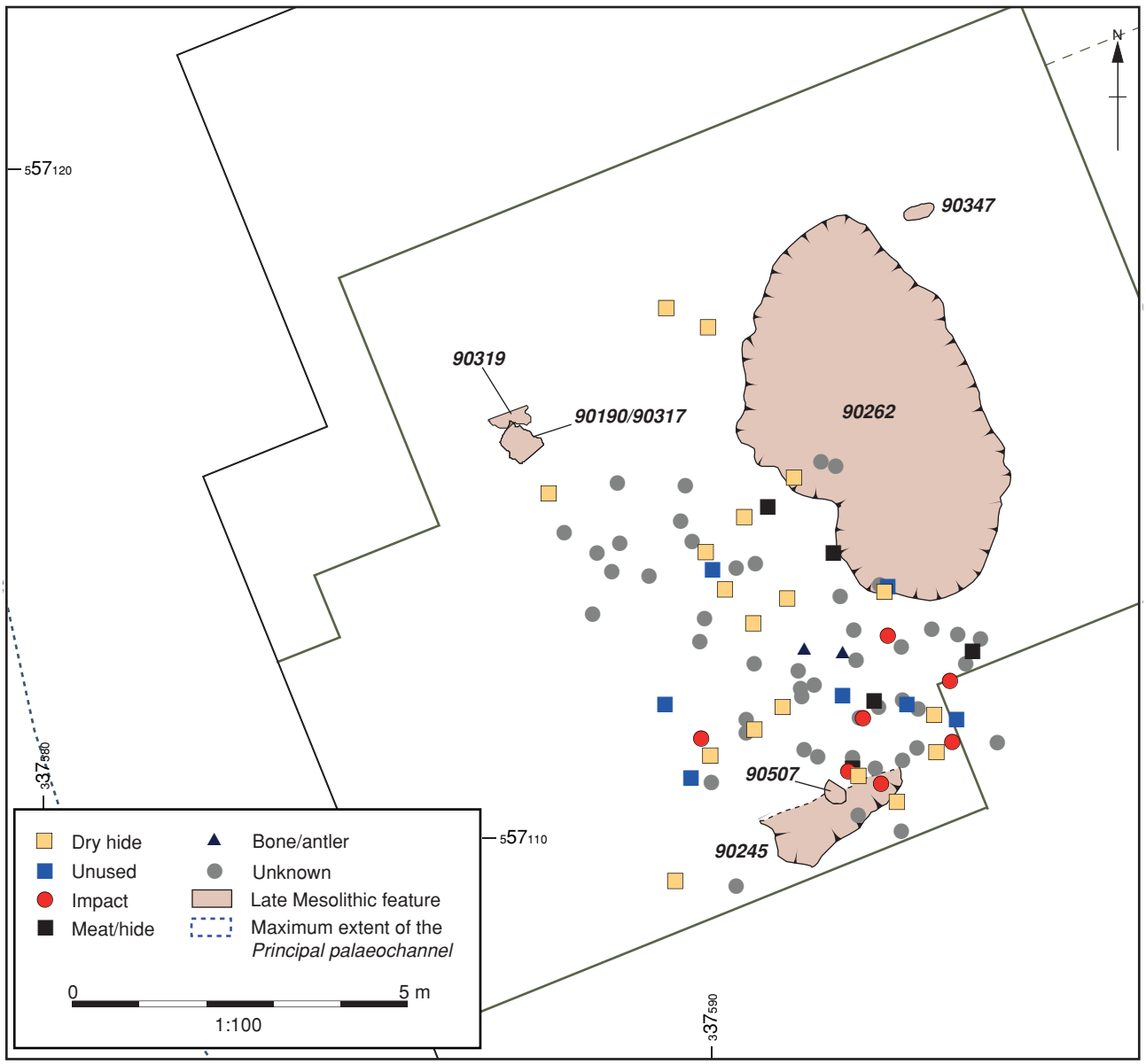

Figure 520: Distribution of the flaked lithics from the Hide-working Area exhibiting different types of microwear

vicinity of hollow/hearth ***90245***/***90507*** could have been associated with the processing of ochre.

Discussion: flaked lithics

The spread of flaked lithics within this area (Lithic Entity 11) was interspersed with denser clusters containing pieces from all stages of a generalised reduction sequence. Significantly, many of these clusters also contained elements of a knapping group, or groups, indicating that they had some integrity. Generally, the clusters were formed of flaked lithics derived from a variety of raw-material types, although the reduction of pebble flint and chert was more prominent.

Four main knapping areas were probably present, evident as lithic concentrations. One of these (Lithic Entity 11A) lay in the northern part (focused on grid-square 825) where brown/grey flint, chert, and pebble flint were worked. A small dispersed spread of pitchstone blades and retouched tools was also probably associated with this activity. A second knapping area was centred on grid-squares 658 and 659 and was associated with the reduction of brown/grey flint and pebble flint, but also included a small scatter of pitchstone blades and retouched pieces (Lithic Entity 11B). A third knapping area was focused around hollow/hearth ***90245***/***90507*** and was defined by a large spread of flaked lithics, comprising clusters of brown/grey flint, chert, and pebble flint (Lithic Entities 11C). The final knapping area was centred on grid-square 820 (Lithic Entity 11D), and was dominated by pebble-flint reduction, though it was also associated with a variety of cherts, including Scottish material. However, the cherts tended to be less dense and, particularly in the case of the latter,

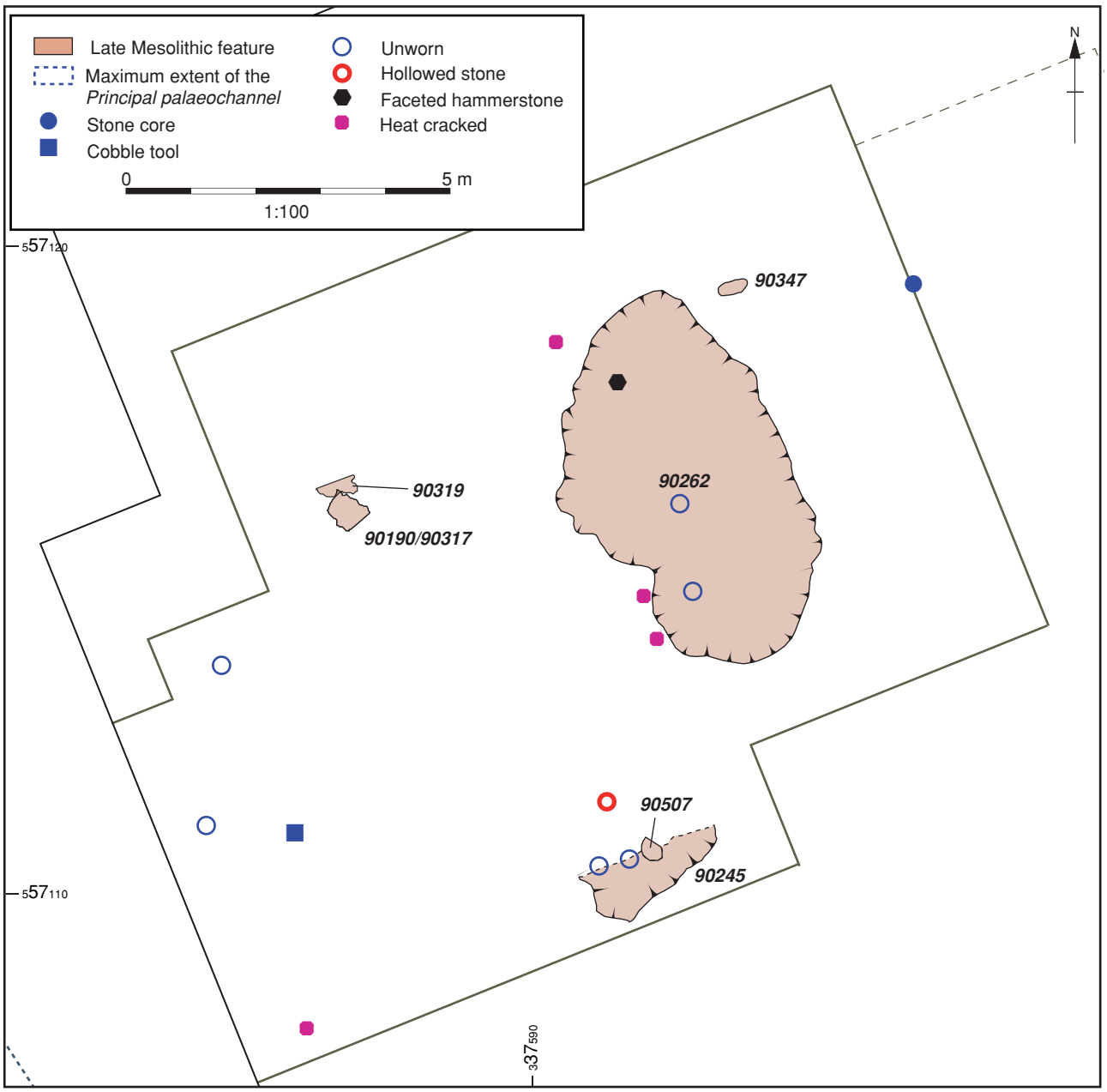

Figure 521: Distribution of coarse-stone tools from the Hide-working Area

from the Southern Uplands, found on the periphery of the knapping area. It is also of interest that in some of the knapping areas specific raw materials clustered in different grid squares, seeming to imply multiple phases of stone-working. While some of this material could relate to episodic and sporadic occupation, associated with the late sixth/early fifth-millennium date derived from tree-throw ***90262***, the variety of raw materials and radiocarbon evidence suggests that they were probably associated with the *'Mesolithic encampment I'* phase (*Ch 4*).

All of the knapping areas contained varying amounts of microliths and macro-tools. Everywhere, the complete microliths were dominated by backed bladelets and, to a lesser extent, scalene triangles and fine points, although in the area associated with hollow/hearth ***90245/90507*** and the northern knapping area (Lithic Entity 11A), scalene triangles were relatively more frequent than fine points. In addition to the complete microliths, fragmented pieces were the most numerous classification in all knapping areas, indicating the production and use of microliths, and the probable retooling of composite implements. The presence of a microlith fragment and an edge-retouched piece with remnants of a residue, probably a mastic (*Appendix 8*), appear to confirm the hafting/replacement of tools in the northern knapping area. The greatest number of microliths was focused in the vicinity of hollow/hearth ***90245/90507***, being complemented by a large collection of other retouched tools. The latter mainly consists of awl/borers, scrapers and related

Features/ Sample Areas	Late Mesolithic flaked lithics				Coarse-stone, ochre, and stone implements	Dating evidence
	Assemblage	Knapping groups (KG)	Sourcing studies	Microwear		
Backwater channel Hearth ***90217*** Tree-throws ***90163***, ***90271***, ***90448***, and ***90462*** Sample Area 11	Clusters and spreads of brown/ grey flint; brown, grey, and black chert; and pebble flint. These relate to *in-situ* knapping, and stone working disturbed by successive phases of occupation Smaller collections of pitchstone, Scottish chert, and flaked tuff	Brown/grey flint 25-8, 32, and 83; pebble-flint 33; chert 1, 34, 35, 37, 42, and 95; SSUC 98; and cannot determine 13	Chert IG1 sub-group 1 (KG 42 and 95); IG1 sub-group 3 (KG 37); and IG1 sub-group 4 (KG 1) A brown/ grey-flint sample included in the flint-sourcing study	Items associated with butchery common Tools with impact damage also present, although perhaps not directly representative of hunting weaponry Tools and debitage used in bone/antler working	Tools include an anvil, ground stones, a hollowed stone, and a core The ground stones in the northern part of the activity area could be associated with those in the Axe-working Area A tight cluster of ochre adjacent to tree-throw ***90163*** is possibly associated with a ground-stone cobble tool Single polished-axe fragment in the northern part of the area	Tree-throw ***90163*** dates to the *'Mesolithic tree-throws/ activity'* phase Tree-throw ***90448*** dates to the *'Mesolithic encampment I'* phase

Table 242: Defining characteristics of the Butchery Area

forms, simple edge-retouched pieces, and notched blades and flakes. In the other knapping areas, much smaller collections of retouched tools reflect a more restricted range of tool types. This could imply that an intensive phase of occupation activity was centred on the hearth.

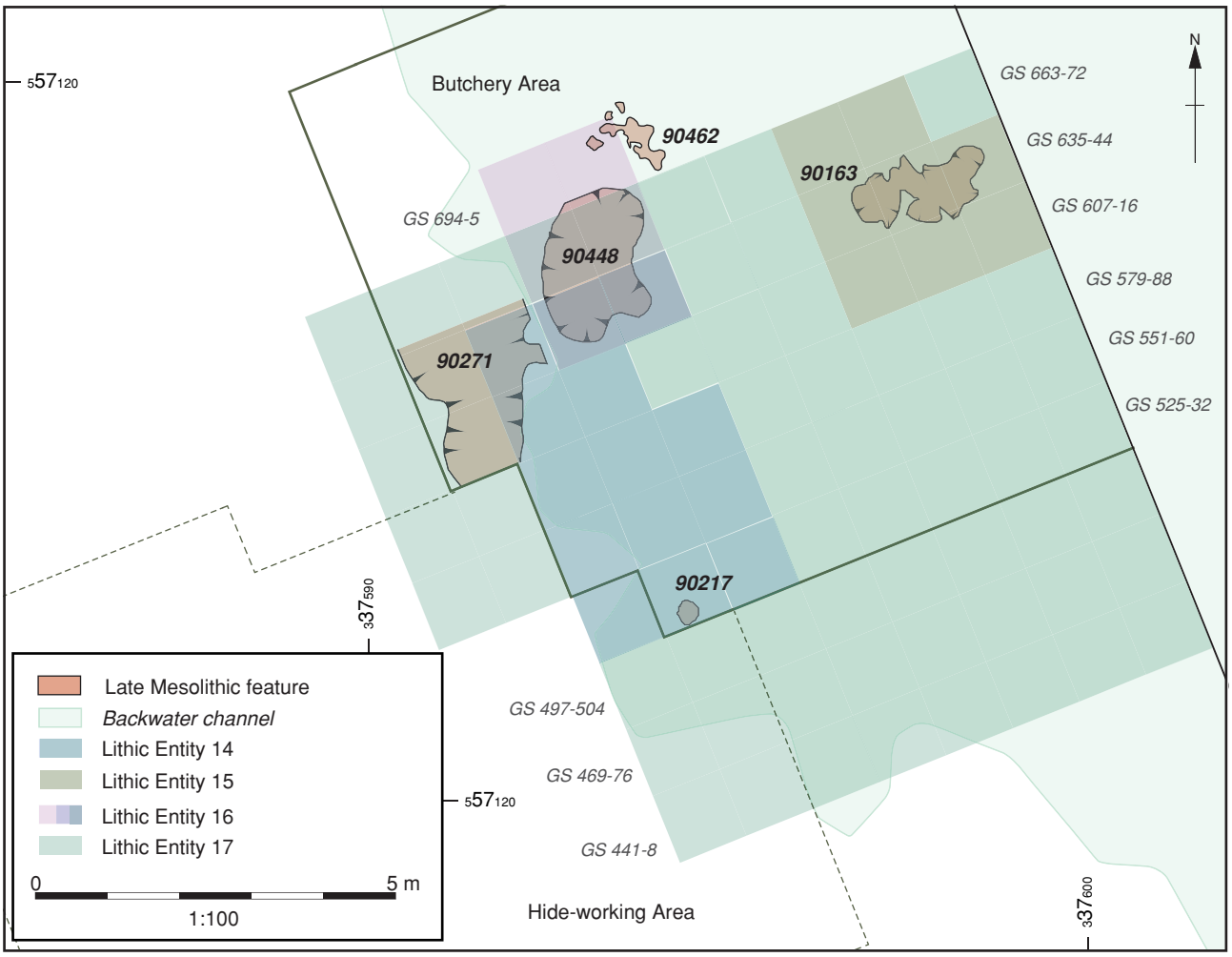

Figure 522: Archaeological and natural features, and Lithic Entities 14-17, in the Butchery Area

Lithic Entity	Description
14	Late Mesolithic worked stone associated with a possible knapping area (grid squares 525-7, 553-5, 581-3, 609, 610, and 637-9)
15	Late Mesolithic worked stone from tree-throw ***90163*** and its immediate vicinity (grid-squares 614-16, 642-4, 670, and 671)
16	Late Mesolithic worked stone from tree-throw ***90448*** (grid-squares 638, 639, 666, 667, 694, and 695)
17	All microliths/retouched/ debitage analysed for microwear in Sample Area 11 (items from grid-squares 441-8, 469-76, 497-504, 525-32, 551-60, 579-88, 607-16, 635-44, and 663-72)

Table 243: Lithic entities within the Butchery Area

Butchery Area

An area of different potential use, the Butchery Area, was identified in the eastern part of the *Grid square area* (Table 242; *Appendix 1*), which covered part of the *Backwater Channel*, hearth ***90217*** (*Ch 11*), and tree-throws ***90163***, ***90271***, ***90448***, and ***90462*** (Fig 522). Two of these tree-throws have been dated (*Appendix 20*): ***90163***, at the base of the *Backwater channel*, to the early fifth millennium cal BC (*'Mesolithic tree-throws/ activity'* phase; *Ch 3*), whilst tree-throw ***90448*** dates to the second quarter of the fifth millennium cal BC (*'Mesolithic encampment I'* phase; *Ch 4*). This area was also associated with four lithic entities (Table 243). These defined a knapping area (Lithic Entity 14), which encompassed the two dated tree-throws (*above*; Lithic Entities 15 and 16), and corresponded to Sample Area 11 (*Appendix 1*).

Brown/grey flint

A large spread of brown/grey flint was present in Sample Area 11, representing the main knapping area, with debitage clustered in grid-squares 554 and 582 (part of Lithic Entity 14; Fig 523). All stages of the reduction sequence were represented and knapping groups 25 and 26 were recognised within the main cluster, as were groups 27 and 28, although elements of these were also dispersed across the wider spread (*Appendix 3*). Knapping groups 32 and 83 also exhibited a dispersed distribution throughout the wider area. This suggests that the overall spread formed a discrete episode, or episodes, of stone-working, which could have disturbed earlier activity. Tree-throw ***90448*** was immediately to the north of this spread.

Pebble flint

There was a general spread of pebble-flint flaked lithics within and beyond the boundaries of Sample Area 11. Within this spread, there was a notable cluster focused on grid-square 582 and adjacent squares (Fig 524; Lithic Entity 14), comprising items from all stages of the reduction sequence, although there were

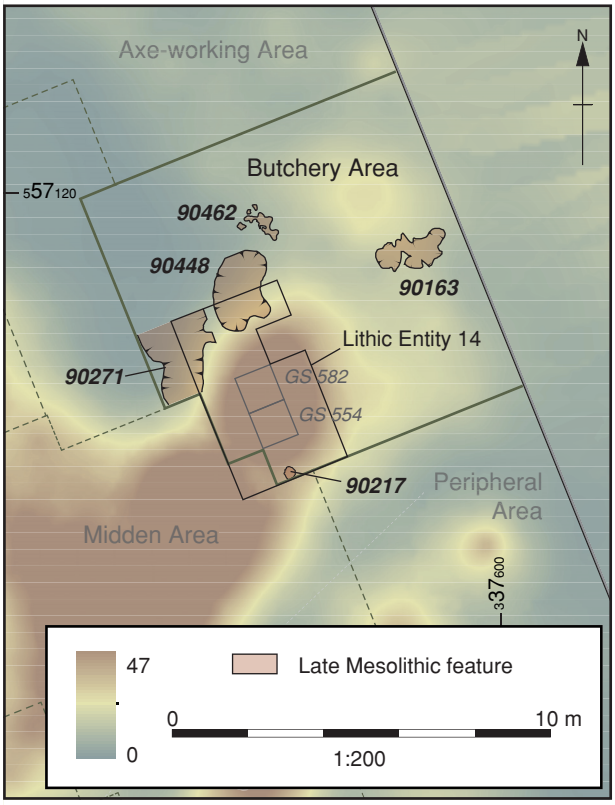

Figure 523: The spatial distribution of brown/grey-flint debitage across the Butchery Area

comparatively fewer retouched pieces. Knapping group 33 was recorded in grid-square 638 to the north

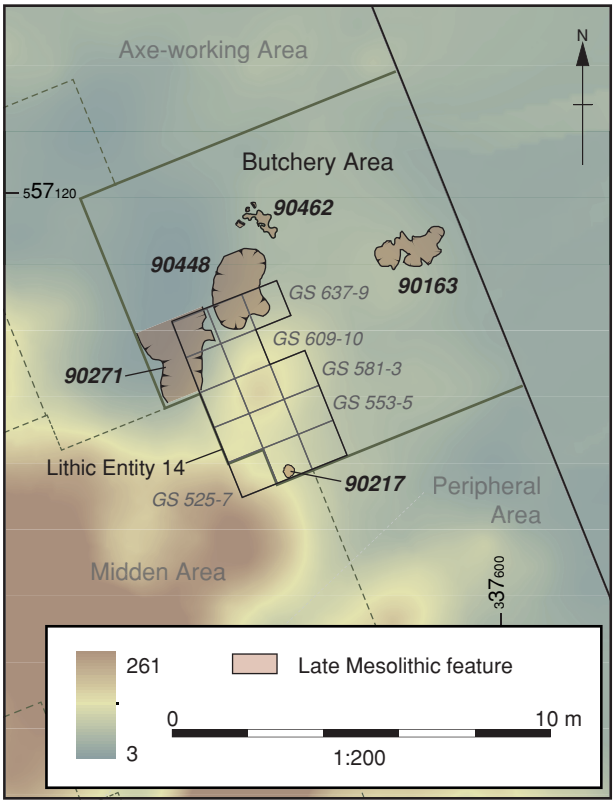

Figure 524: The spatial distribution of pebble-flint cores and debitage across the Butchery Area

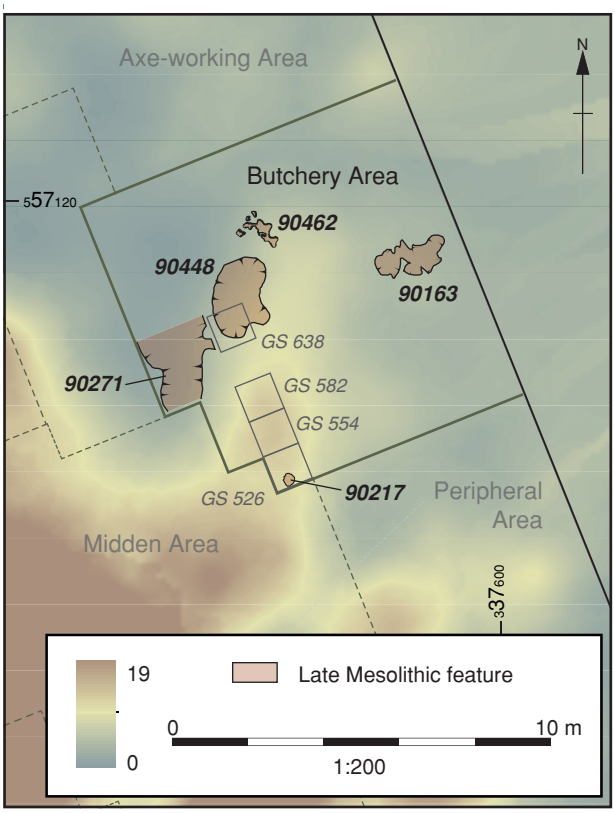

Figure 525: The spatial distribution of pebble-flint microliths across the Butchery Area

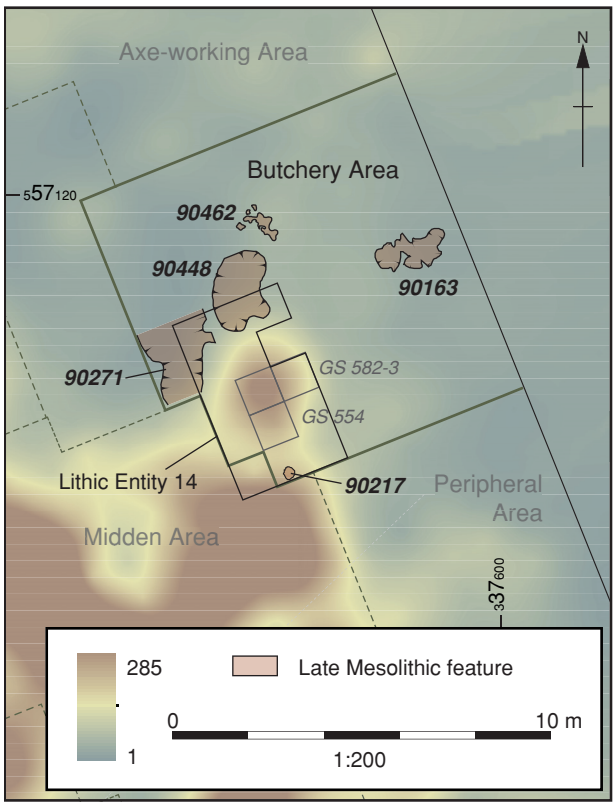

Figure 526: The spatial distribution of chert cores and debitage across the Butchery Area

and consists of a burnt core and two burnt flakes, one of which refits with the core.

Five backed blades, four microlith fragments, and a fine point were recorded in grid-square 582, while to the south, grid-squares 526 and 554 (Fig 525) contained further examples of backed bladelets, microlith fragments, and scalene triangles. Beyond these, a dispersed distribution of similar implements was present in the wider spread of pebble flint, amounting to well over 100 pieces. Relatively large numbers of non-microlithic retouched pieces were also present, comprising six awls, five simple edge-retouched pieces, and four notches. Also present was a small number of scraper forms (four items) and a resharpening flake. These had a dispersed distribution within the spread.

Chert

Discrete clusters of chert were recorded in the western half of Sample Area 11. This material was focused on the same grid squares (554 and 582; Fig 526) as the brown/grey flint (*above*) and, similarly, included items from all stages of the reduction sequence (Lithic Entity 14). It was associated with a relatively large collection of microliths (Fig 527), dominated by scalene triangles (31) and microlith fragments (18), with only a small number of backed bladelets (five), and a small range of other forms (four items), grid-square 554 containing ten of the scalene triangles and five of the microlith fragments. Within the same area, three other retouched tools were a notch, in grid-square 554, and two side scrapers from the

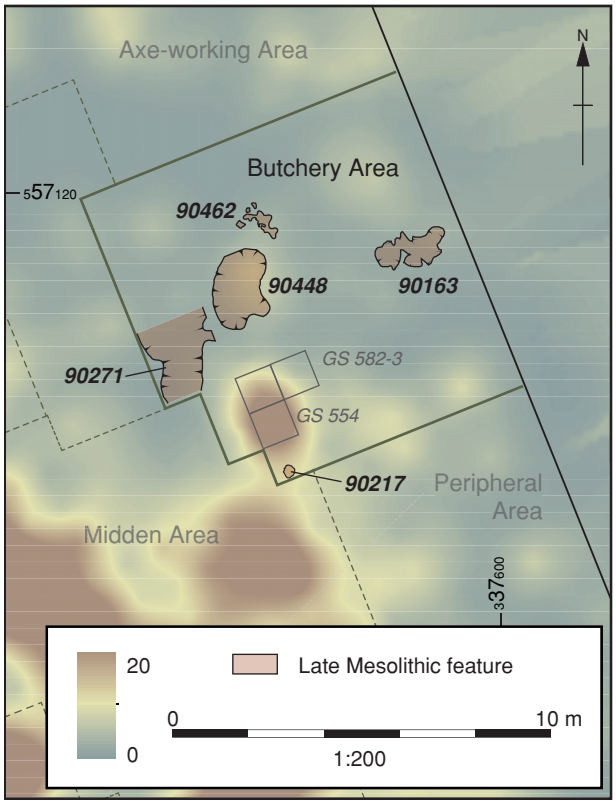

Figure 527: The spatial distribution of chert microliths across the Butchery Area

wider area. Knapping group 37 occupied grid-square 583, immediately to the east of the main cluster. This knapping group represents the partial reduction of a chert nodule, and it is possible that, even though there was sound evidence for reduction activity of various raw-material types in this part of the site, some secondary dumping of waste lithics was also taking place. Conversely, the knapping group may relate to a phase of stone-working activity that was disturbed by later occupation, potentially the intensive phase in the early/mid-fifth millennium cal BC (*'Mesolithic encampment I'* and *'Mesolithic encampment II'* phases; *Ch 4*; *Appendix 20*).

SSUC

There was also a small collection of chunks and core fragments of Scottish Southern Uplands chert in grid-square 527 (part of Lithic Entity 14; Fig 528), which have been assigned to knapping group 98 (*Appendix 3*). Two of the core fragments refit, and another core fragment and a chunk are probably from the same nodule. This material came from the *Mesolithic overbank alluvium* (***90181***) within the *Backwater channel*.

Tuff, polished-tuff axe fragment, and pitchstone

Very little flaked tuff was associated with this area (Lithic Entity 14), although a single fragment from a ground-stone tuff axe was present (Fig 529). In addition, a small amount of pitchstone was found within the spread of flaked lithics (Lithic Entity 14).

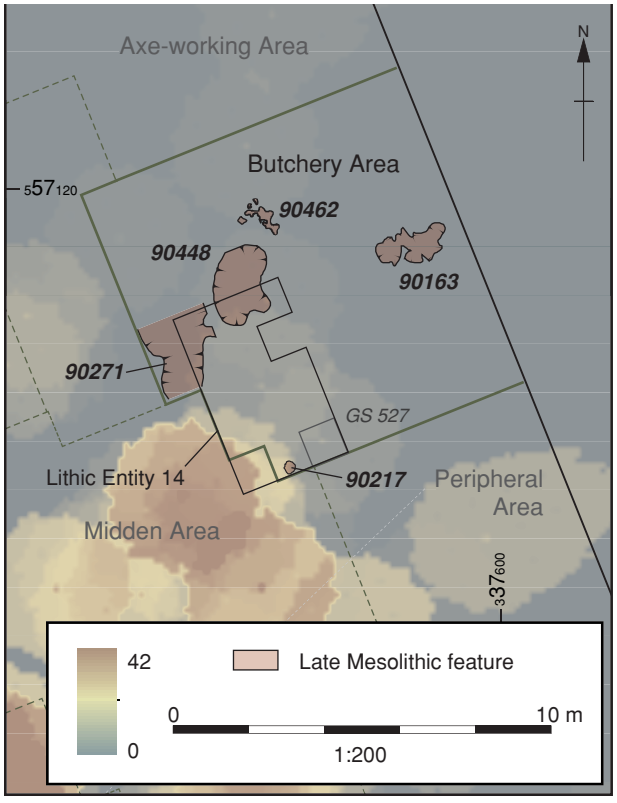

Figure 528: The spatial distribution of SSUC debitage across the Butchery Area

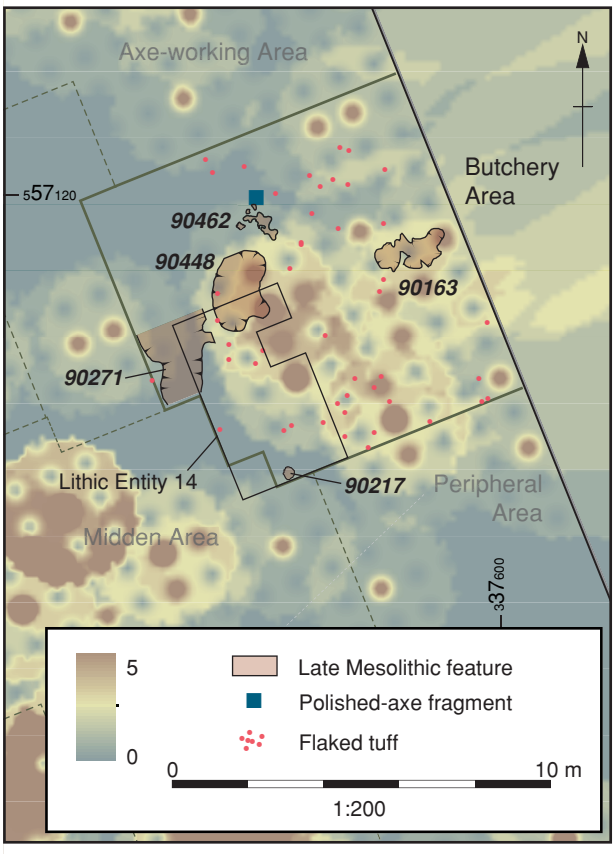

Figure 529: The spatial distribution of pitchstone debitage, flaked tuff, and stone implements in the Butchery Area

Ochre

A large collection of ochre was identified adjacent to tree-throw ***90163*** (Lithic Entity 15), which may be a product of short-term early fifth millennium cal BC occupation (Fig 530). This material was also associated with a ground stone. Other pieces of ochre, including a worked piece and small fragments, were scattered throughout the Butchery Area.

Tree-throw **90163**

Tree-throw ***90163*** (Lithic Entity 15) was within Sample Area 11 (*Appendix 1*), in grid-squares 615, 616, and 642-4 (Fig 531), charcoal from basal fill ***90223*** yielding an early fifth millennium cal BC date (*Ch 3*; *Appendix 20*). The secondary fill contained a small collection of flaked lithics, two chert small flakes, eight pebble-flint small flakes, and two burnt chunks of a lithology that cannot be determined. The tree-throw was at the base of the *Backwater channel* and the material within was probably derived from Late Mesolithic occupation on its edge, partly associated with the spread and clusters of flaked lithics in the immediate vicinity.

Tree-throw **90448**

Tree-throw ***90448*** (Lithic Entity 16) was also in Sample Area 11, and a charcoal fragment from its

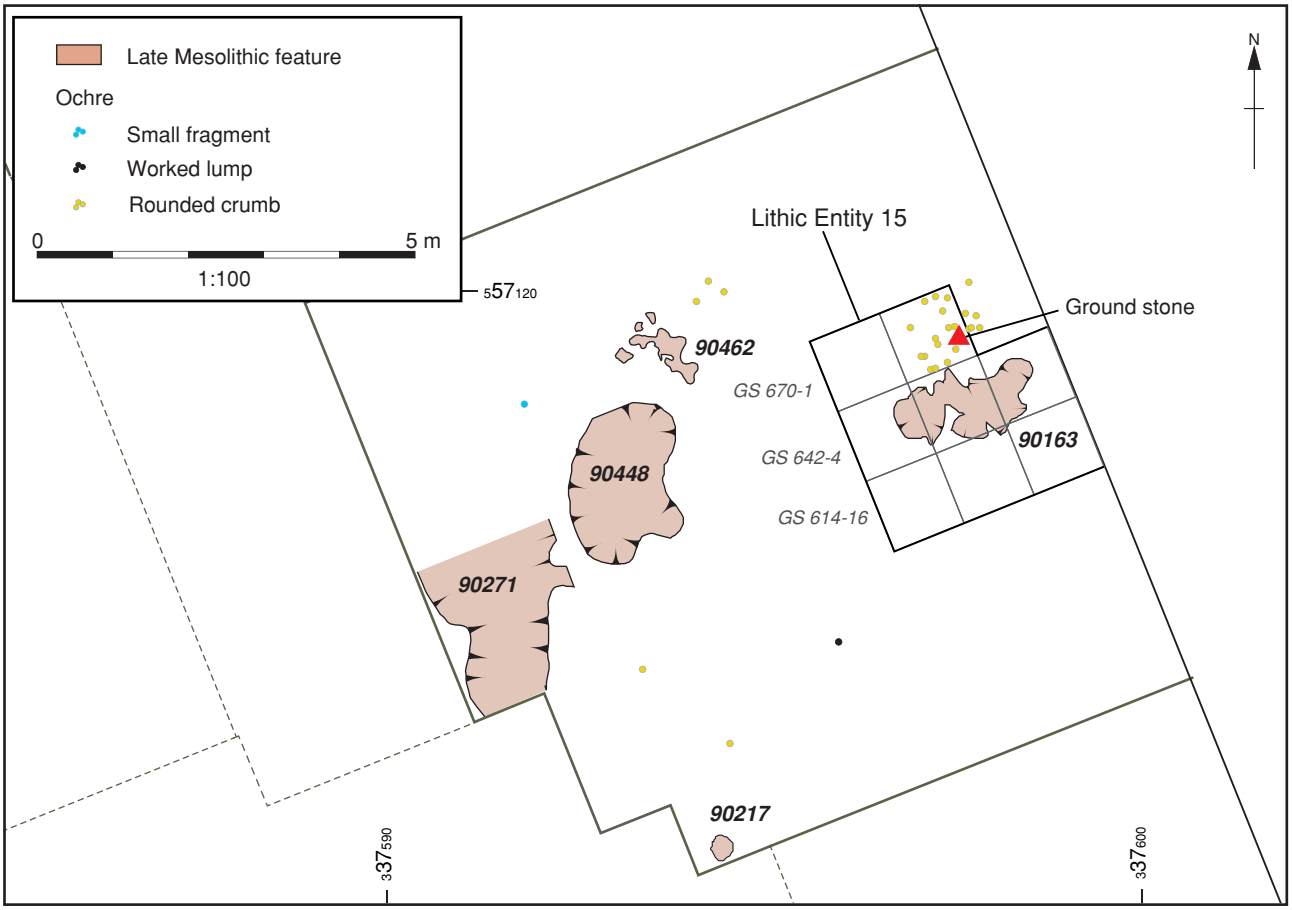

Figure 530: Distribution of ochre in the Butchery Area

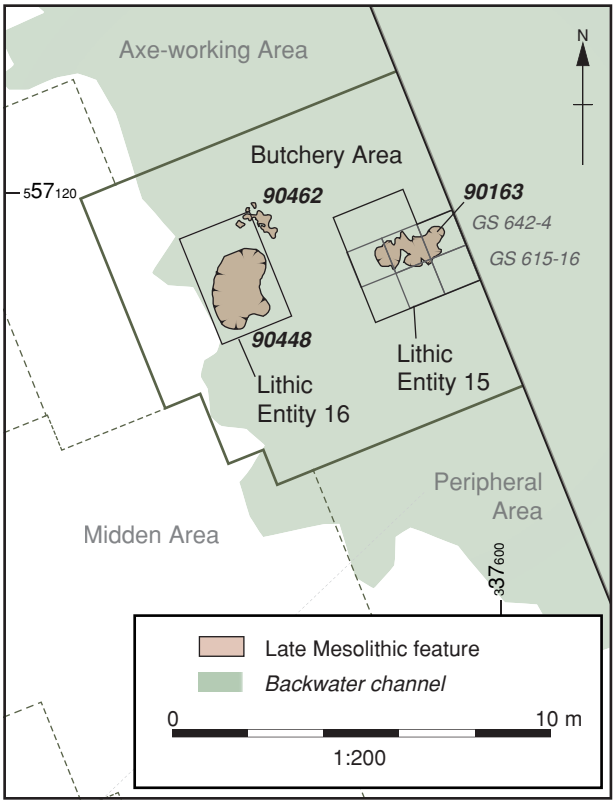

Figure 531: Radiocarbon-dated Late Mesolithic tree-throws from the Butchery Area

lower fill (***90459***) was dated to the second quarter of the fifth millennium cal BC (*Ch 4*; *Appendix 20*). Lithics were more common within its later fills, with the tertiary fill (***90449/86372***) containing 75% of the assemblage. This comprises mainly chert and pebble flint, along with smaller amounts of brown/grey flint, GQB/chert, and material of the 'cannot determine' lithology. There is also a single pitchstone small flake. Core technology includes a burnt-chert single-platform flake core and several core-dressing pieces. The unmodified blade and flake debitage is dominated by small flakes (62%) and pebble-flint blades are also common, while the flakes are dominated by chert pieces. This indicates that complete reduction sequences were not present and the flaked lithics were within a secondary depositional environment. In terms of diagnostic pieces, six microliths (five scalene triangles and one backed bladelet) and two retouched blades were recorded. The latter includes a brown-flint secondary blade, which had been modified on the distal termination.

Tasks and activities

The microwear study recorded a large number of microliths, other retouched tools, and debitage (Fig 532) exhibiting wear traces relating to butchery activity from this area (21.8% of the sample;

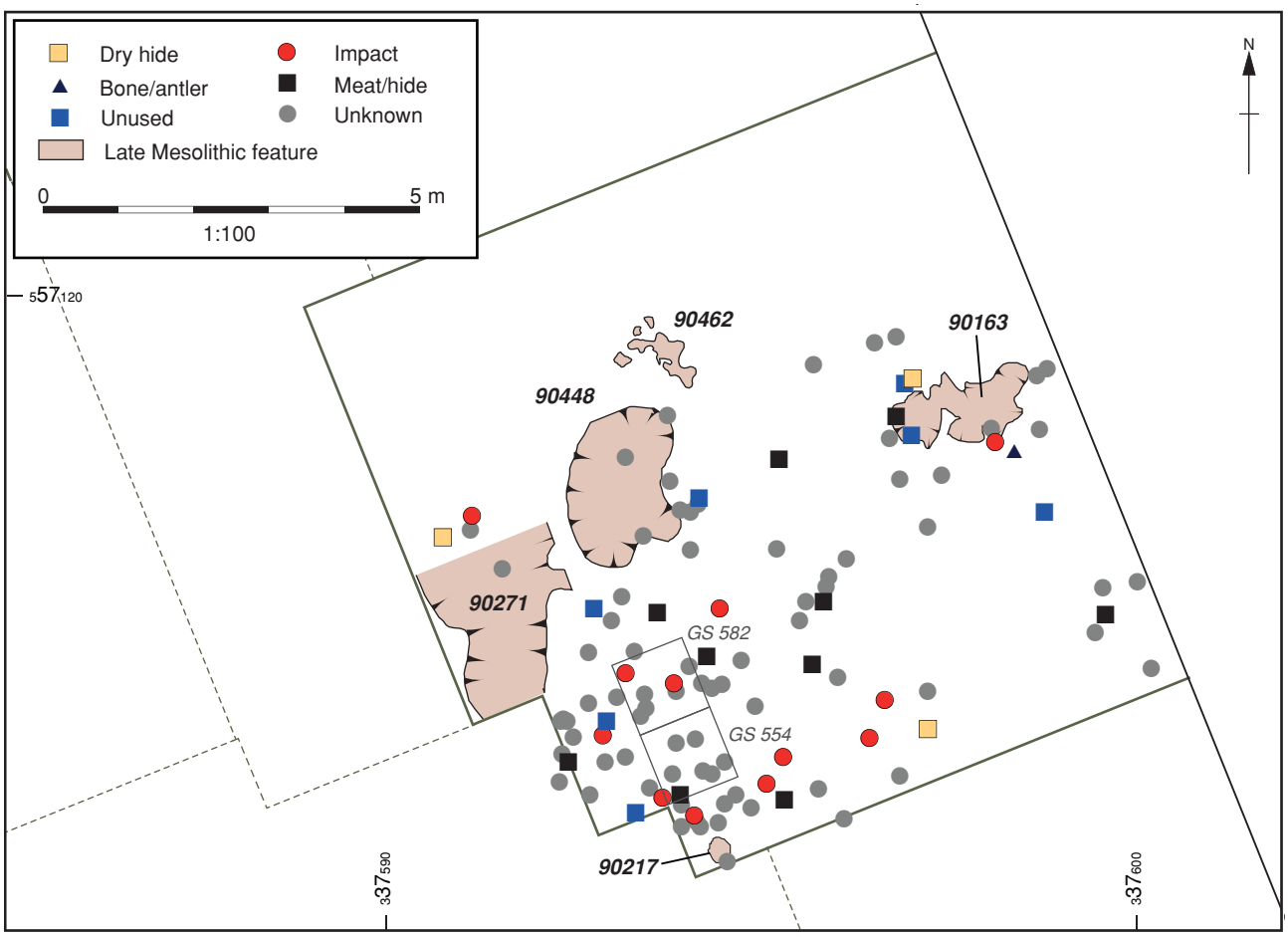

Figure 532: Distribution of the flaked lithics in the Butchery Area exhibiting different types of microwear

Appendix 7; Lithic Entity 17). In addition, a large collection of tools was recovered from the northern end of the Midden Area, and it is possible that these were used in the adjacent Butchery Area that were then discarded onto the midden. Interestingly, debitage, including broad blades, narrow blades, and irregular and regular flakes, accounts for a significant number of butchery tools, most used in cutting activities. Conversely, the microliths and other retouched blades and flakes were used in a variety of tasks, including cutting, scraping, and piercing. This possibly indicates a preference for unmodified debitage when preparing meat, while formal tools were used for the subsequent processing of by-products, such as fresh hides. Nearly all the flaked lithics used in butchery tasks were focused on the main knapping area, which, given the variety of raw materials and mass of flaked lithics, probably relates to the occupation of the Mesolithic encampment. Beyond the flaked lithics used in butchery, the other main activity in this area is represented by tools with impact damage. The majority of these are microliths, although only one is a rod, which can be directly associated with projectile weaponry. The remainder include backed bladelets, scalene triangles, fine points, and fragments of damaged microliths. It is of interest that a broad blade, a regular flake, and a narrow blade also have impact damage, and it is tempting to see them as also having been used in butchery tasks, like the other pieces of debitage. Apart from the flaked lithics with impact damage and those used in butchery, the other main tasks represented are hide working, bone/antler working, and pieces showing microwear from use on hard surfaces, such as bone.

Coarse-stone tools

A small collection of coarse-stone tools was recovered from the Butchery Area (Fig 533). An anvil lay to the east of the main knapping area (Lithic Entity 14) and could have been used as a rest during bipolar reduction, as could a hollowed stone, which is possibly a fragment of another anvil. That piece was also close to the main knapping area, as was a hammerstone, whilst a core was situated in the north-west of the area. However, ground stones represent by far the most common cobble tools from this area. Several were found in the north and can probably be linked to a collection of similar tools in the north-eastern part of Axe-working Area. Two other ground stones were found in, and on the periphery of, the main knapping area (Lithic Entity 14) and they could be associated with tasks undertaken there. Given the nature of the wear traces on these pieces, this is

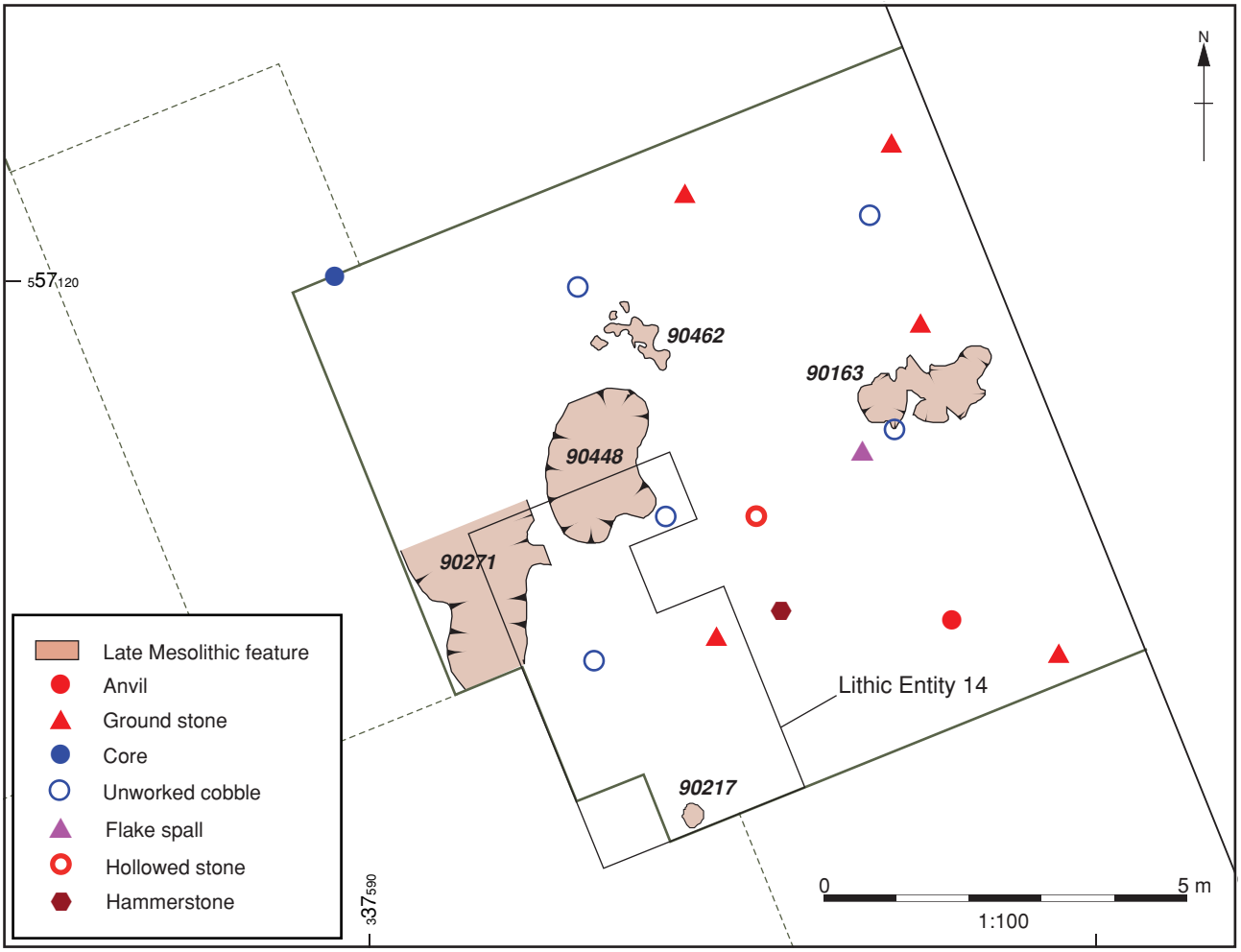

Figure 533: Distribution of the coarse-stone tools in the Butchery Area

unlikely to have related to stone-working activity, although one example does exhibit evidence for having been flaked. Finally, a ground stone adjacent to tree-throw ***90163*** (Lithic Entity 15) could have been associated with processing ochre (*above*).

Discussion: flaked lithics

The Butchery Area contained a large cluster of flaked lithics focused on grid-squares 554 and 582, with significant quantities of brown/grey flint, chert, and pebble flint, along with smaller quantities of other raw-material types, such as Scottish Southern Uplands chert. The main raw-material groups comprise flaked lithics from all stages of the reduction sequence, indicating that *in-situ* knapping took place and that the cluster formed a main knapping area (Lithic Entity 14).

A fairly large collection of microliths and retouched tools was associated with the main knapping area. The microliths include a large number of fragments, suggesting that knapping activity involved the production, use, and repair of tools. These were accompanied by backed bladelets, scalene triangles, and a much smaller number of fine points, along with a few other classifications. It is of note that scalene triangles were relatively more frequent than backed bladelets and fine points, and this could imply that different tasks were undertaken in this part of the site, compared with those in the other activity areas, where backed bladelets are frequently the dominant complete microlith. The exception to this is Structures 4/5 in the Habitation Area, where scalene triangles were also the dominant implement. The composition and quantity of the other retouched tools are similar to the spread and clusters of flaked lithics associated with hearth/hollow ***90245/90507*** in the Hide-working Area.

The main knapping area was also surrounded by a wider spread of worked stone that contained dispersed concentrations of brown/grey flint, chert, and pebble flint, which may relate to stone working that had been disturbed by later activity. Moreover, these materials could be associated with an early fifth millennium cal BC phase of occupation as they were focused on tree-throw ***90163*** (*above*; *'Mesolithic tree-throws/activity'* phase; Lithic Entity 15). This occupation may also have been related to activity in the Peripheral Area, which also contained a

tree-throw (***90208***) associated with the same phase of occupation. A small collection of microliths and macro-tools was also found in the vicinity of tree-throw ***90163***. The collection includes almost equal numbers of microlith fragments, backed bladelets, and scalene triangles, while fine points are almost absent. These microliths were accompanied by a small collection of other retouched tools, comprising awl/borers, scrapers, edge-retouched pieces, and notches, and, given the relatively small numbers of retouched tools, it is probable that they reflect small-scale occupation in the area.

Overall, flaked tuff was rare and consisted of a dispersed scatter of material, which includes blade, flake, and chunk debitage, and a few microliths. Cores and flaked pebbles are relatively few in number and this indicates that the *in-situ* reduction of tuff was not undertaken. Indeed, although a fragment from a tuff ground-stone tool was present in the northern part of this area, it was recovered from the *Mesolithic overbank alluvium* and exhibited no spatial relationship with the flaked tuff. In this respect, it could have been associated with the cobble tools and tuff ground-stone tools in the Midden Area. In contrast, a relatively large collection of pitchstone came from the Butchery Area. This was mainly dispersed, although two flakes were spatially associated with the main knapping area, and a bladelet core, a crested blade, and a blade chip formed a coherent group. These are Late Mesolithic lithic types, which suggests that, technologically, some of the pitchstone has affinities with Late Mesolithic stone-working activity.

Midden Area

The Midden Area was situated in the south-central part of the *Grid-square area*. It was defined as such because it principally contained flaked lithics representative of secondary dumping, and contained large concentrations and clusters of burnt worked stone (Table 244). It also contained several archaeological features (Fig 534), including hearth ***90593***, that was perhaps part of Structure 2, pre-dating the midden (*Ch 3*), and a pit (***90309***; *Ch 3*) and posthole (***90247***; *Ch 11*). Natural features were also present, the most significant in terms of lithics being tree-throw ***90526*** (*Ch 8*), hollow ***90314*** (*Ch 3*), and feature ***90498*** (*Ch 4*) In addition, three lithic entities were contained in the Midden Area (Table 245). One (Lithic Entity 18) encompassed tree-throw ***90526*** and its environs, and was subdivided into a collection of sub-entities; a second (Lithic Entity 19) was focused on Structure 2 and hollow ***90314***, and was also split into several sub-entities; whilst the third corresponded to Sample Areas 2 and 9 (*Appendix 1*).

Brown/grey flint

A large spread of brown/grey flint defined the Midden Area, comprising discrete clusters of different lithic types. For example, small flakes and

Features/ Sample Areas	Late Mesolithic flaked lithics				Coarse-stone, ochre, and stone implements	Dating evidence
	Assemblage	Knapping groups (KG)	Sourcing studies	Microwear		
Hearth/ hollow ***90593*** (Structure 2) Hearth ***90217*** Pit ***90309*** Tree-throw ***90526*** Natural features ***90498*** and hollow ***90314*** Sample Areas 2 and 9	Flaked lithics from all raw-material types present, along with a large volume of burnt lithics indicative of secondary dumping of lithic waste Some clusters represent the *in-situ* reduction of brown/grey flint, chert, pebble flint, and SSUC, relating to pre-Midden activity Lithics with probable hafting residues present	Brown/grey flint 28, 32, 69, 83, 84, 85, 87, and 101; pebble-flint 75, 76, and 81; chert 1, 19, 24, 42, 46, 48, 49, 58, 80, 95, and 97; SSUC 82 and 89; tuff 107 and 108; other 100 and 109; and cannot determine 13	Chert IG1 sub-group 1 (KG 42 and 97); IG1 sub-group 3 (KG 49); IG1 sub-group 4 (KG 1 and 24); and IG2 (KG 82) Brown/ grey-flint samples included in the flint-sourcing study	Tools and debitage used in a wide range of activities (bone/antler, plant/wood, and hide working, and butchery) Most common type of microwear produced by impact-related activities	Tools include a core tool, a faceted hammerstone, a facially pecked cobble, a ground stone, an incised stone, and a spall Concentrations of ochre associated with hearth/hollow ***90593***/***90314*** and tree-throw ***90526*** Two polished-axe fragments. One in the southern part of the midden is associated with a relatively dense collection of flaked tuff, including several microliths	No scientific dating evidence, though midden formed during earliest phase of Mesolithic occupation Added to during the life of the Mesolithic encampment

Table 244: Defining characteristics of the Midden Area

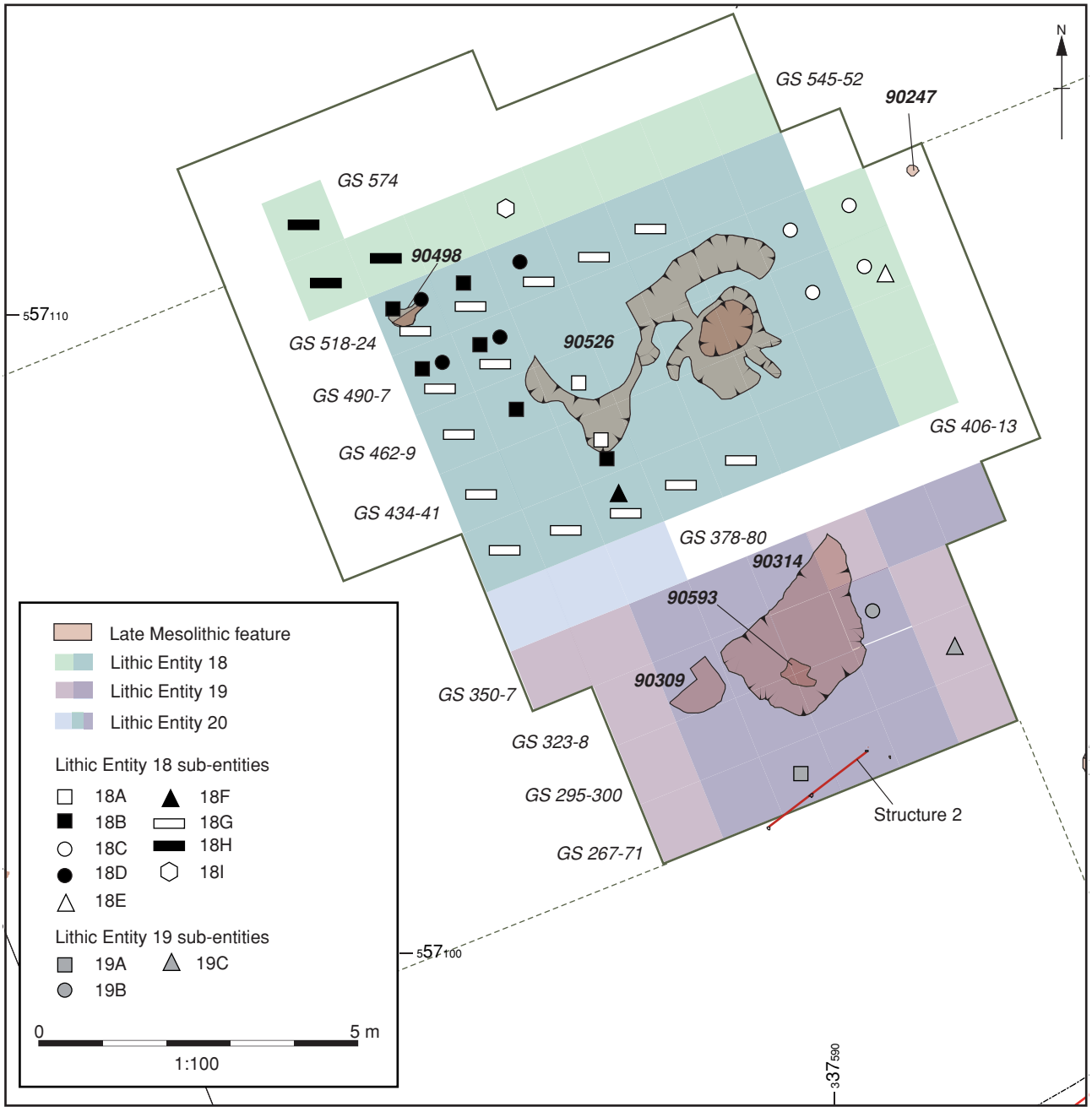

Figure 534: Archaeological and natural features, and Lithic Entities 18-20, in the Midden Area

blade chips were prevalent within grid-square 491 (Fig 535), with very few other lithic types present. There also appeared to be a greater concentration of broad blades in the northern half of the spread. Grid-squares 436 and 464 (Lithic Entity 18A) contained significant concentrations of flaked lithics and all stages of the reduction sequence were present; however, over 50% of the brown/grey flint from these squares was associated with deposits filling tree-throw ***90526***.

There were four knapping groups within the spread (*Appendix 3*). Two were on the north-western periphery of the midden, in grid-square 546 (knapping group 87), and to the south of tree throw ***90526*** in grid-square 407 (knapping group 101, comprising two refitting burnt flakes). The other two (knapping groups 84 and 85) were located in grid-square 523, consisting of small collections of debitage. It is of note that knapping group 85 contains significant amounts of burnt lithics, of interest since the majority of burnt brown/grey flint from the site came from the Midden Area (Fig 536). There were also concentrations in grid-squares 436 and 464.

Two interpretations relating to the formation of this central spread can be postulated on the basis of the brown/grey flint. One possibility is that the spread and the knapping groups represent episodes of dumping incorporated into the midden, which was

Lithic Entity	Description	Lithic sub-entity	Description
18	Late Mesolithic worked stone from the northern part of the Midden Area focused in and around tree-throw ***90526*** (grid-squares 406-13, 434-41, 462-9, 490-7, 518-24, and 546-52)	18A	Possible early areas of stone-working defined by concentrations of flaked lithics from all stages of the reduction sequence (grid-squares 436 and 464), perhaps disturbed by later activity relating to the formation of the tree-throw and the midden
		18B	Concentration of flaked chert (grid-squares 436, 463, 490, 491, 518, and 519)
		18C	Concentration of flaked chert (grid-squares 468, 469, 496, and 497)
		18D	Concentration of chert scalene triangles (grid-squares 490, 491, 518, and 520)
		18E	Two chert awls and two chert edge-retouched pieces, and pebble-flint scalene triangles and microlith fragments (grid-square 469)
		18F	Cluster of pebble-flint irregular chunk debitage (grid-square 408)
		18G	Semi-circular arrangement of pebble-flint microliths and tuff skirting the periphery of tree-throw ***90526*** (grid-squares 406-10, 434, 462, 490, 491, and 518-22)
		18H	Cluster of pebble-flint scalene triangles and microlith fragments (grid-squares 545, 546, and 574)
		18I	Cluster of pebble-flint scalene triangles and microlith fragments (grid-square 548)
19	Late Mesolithic worked stone from the southern part of the Midden Area, focused in and around hollow ***90314***/Structure 2 (grid-squares 267-72, 295-300, 323-8, and 350-7)	19A	Concentration of chert scalene triangles (grid-square 269)
		19B	A chert awl and two chert edge-retouched pieces (grid-square 327)
		19C	Cluster of eight pebble-flint scalene triangles (grid-square 300)
20	All microliths/retouched/ debitage subjected to microwear analysis in Sample Areas 2 and 9 (items from grid-squares 268-71, 296-9, 324-7, 350-2, 354, 355, 378-80, 406-12, 434-40, 462-8, 490-6, and 518-24)	-	-

Table 245: Lithic entities within the Midden Area

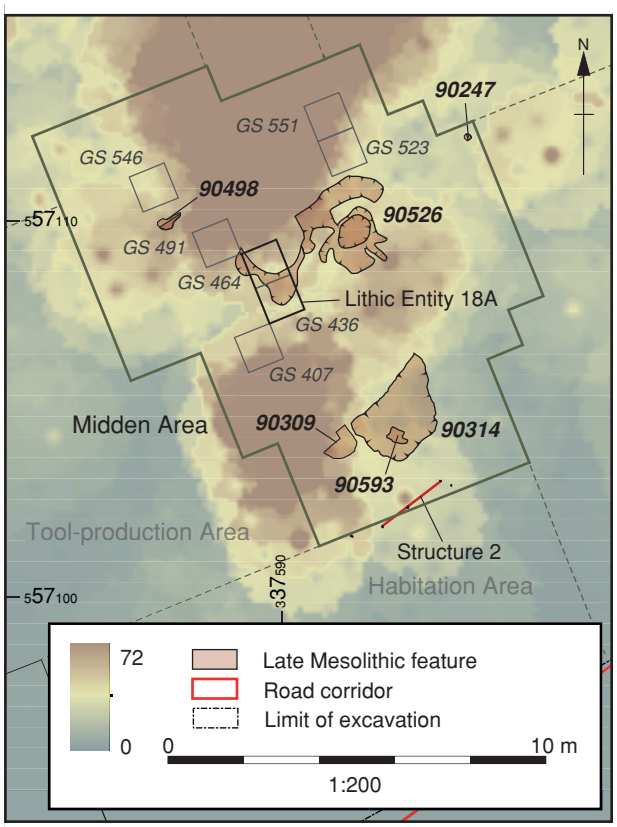

Figure 535: The spatial distribution of brown/grey-flint cores and debitage across the Midden Area

composed of all types of raw materials and a significant amount of burnt flaked lithics. Alternatively, the more significant concentrations, comprising the clusters in grid-squares 436 and 464 (Lithic Entity 18A) and the knapping groups, represent episodes of stone working, which had been disturbed by later activity relating to the formation of the tree-throw and the midden. In this respect, they could reflect a phase, or phases, of sporadic occupation akin to that represented by the same raw material associated with tree-throw ***90208*** in the Peripheral Area.

Pebble flint

The Midden Area contained the densest concentration of pebble-flint flaked lithics on the site, which had a similar, but more extensive, distributional pattern to the chert flaked lithics (*below*). Pebble-flint cores were clustered in several grid squares, with particular concentrations within and around hollow ***90314***, and tree-throw ***90526*** (Fig 537). Significantly, these concentrations were denser than in any other part of the site. Core fragments and core-dressing pieces had a very similar distribution to the cores, and tended to cluster with them. Blade chips also had a spatial correlation with some groups of core technology, but also clustered in grid squares where they were less concentrated, with particular agglomerations in grid-squares 241, 269, 463, 491, 520, 545, 548, and 577.

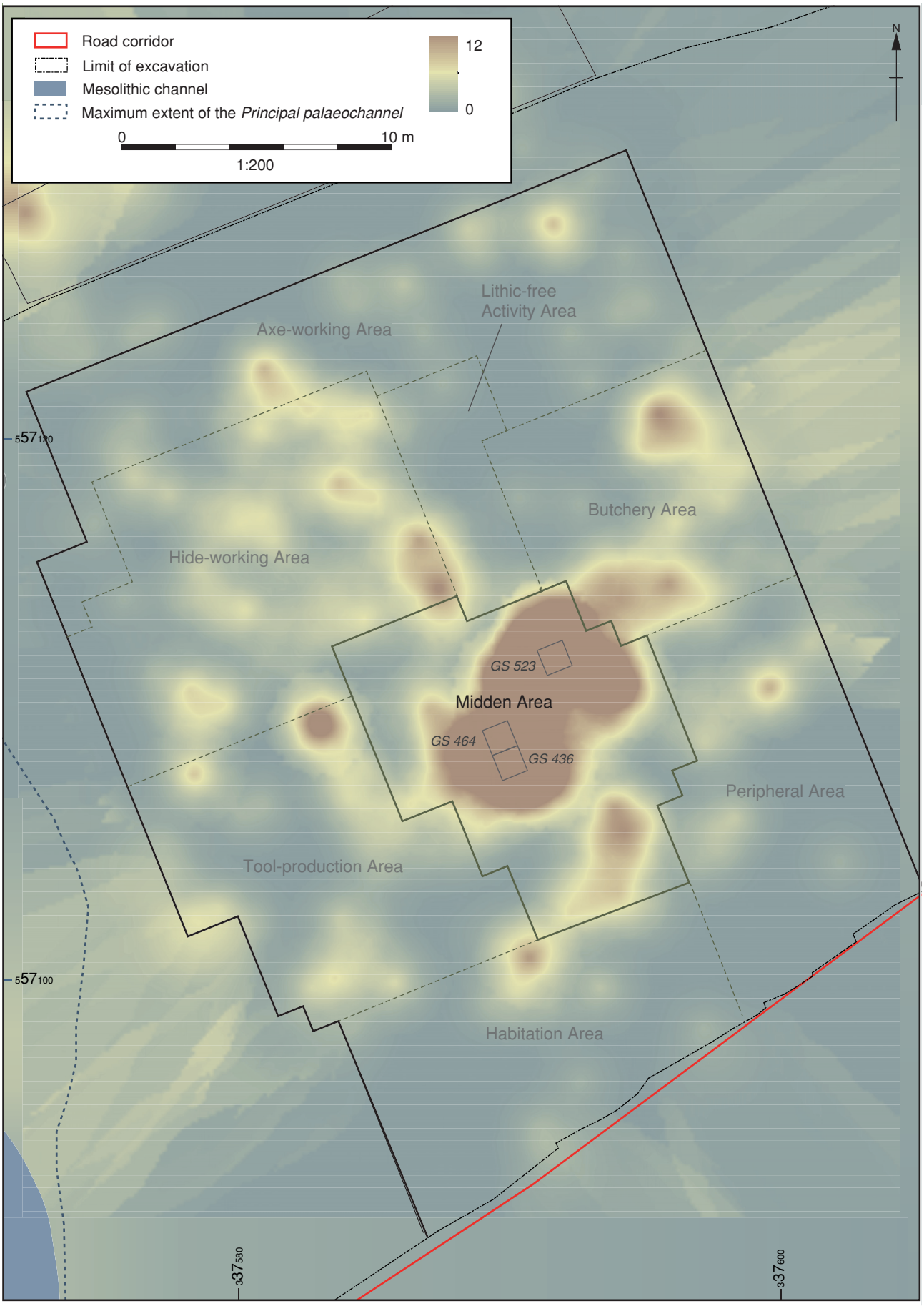

Figure 536: The spatial distribution of burnt brown/grey flint across the Grid-square area

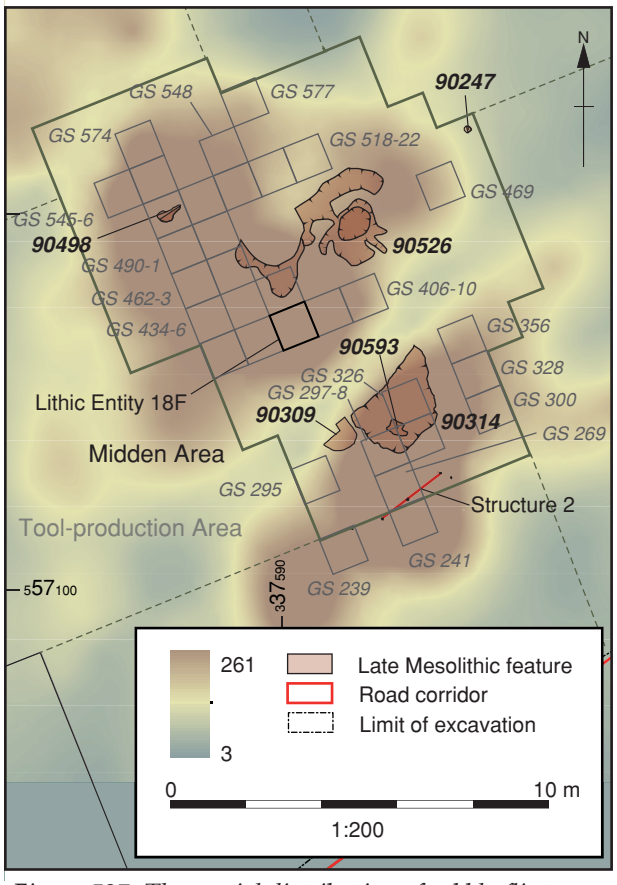

Figure 537: The spatial distribution of pebble-flint cores and debitage across the Midden Area

Irregular pebble-flint chunks and shatter from reduction were also more concentrated within the Midden Area than in other zones, and, again, there was a large cluster in those grid squares associated with hollow ***90314***. There was also a significant cluster of irregular chunk debitage in grid-square 408 (Lithic Entity 18F). Small-flake debitage was ubiquitous within the spread and, again, appeared to cluster in certain grid squares associated with hollow ***90314***, and in and around tree-throw ***90526***. Not all of these concentrations corresponded, however, to significant distributions of core technology.

There was a cluster of flaked debitage in the southern part of the spread, particularly in grid-squares 297, 298, and 326, and a large cluster centred on grid square 436 (part of Lithic Entity 18A). There were also clusters of regular flakes in grid-squares 490, 518, and 574. Broad blades had a general distribution throughout the spread, while narrow blades were much more ubiquitous, and were in greater concentrations around hollow ***90314***, and to the north and west of tree-throw ***90526***.

The spatial traits of the cores and associated debitage suggest that some concentrations probably represented *in-situ* stone-working (the presence of knapping group 81 in grid-square 462 lends support to this), while significant clusters of flaked lithics, on occasion dominated by particular lithic types, suggest the secondary dumping of material. The latter were rarely encountered in other parts of the site, where the character of stone-working has been interpreted as lithic reduction associated with discrete phases of occupation.

There were large numbers of pebble-flint microliths in the Midden Area, in both the northern and southern parts of the spread of flaked lithics (Fig 538). To the north (part of Lithic Entity 18), the large assemblage contains a wide range of microlith classifications. Backed bladelets, fine points, fragments, and scalene triangles account for a significant proportion of the total, with microlith fragments being the most common form. In terms of distribution, while there was at least one classification in the grid squares in the vicinity of tree-throw ***90526***, there appeared to be a semi-circular arrangement of the most common classifications skirting the periphery of the feature (Lithic Entity 18G; Fig 539). This was in grid-squares 406-10 on the southern side of the tree throw; 434, 462, 490, 491, 518, and 519 on a north/south orientation to the west of the feature; and 520-2 on the northern side. There were also outlying clusters in grid-squares 469, 545, 546, 548, and 574, and the tree-throw itself contained a significant number. The

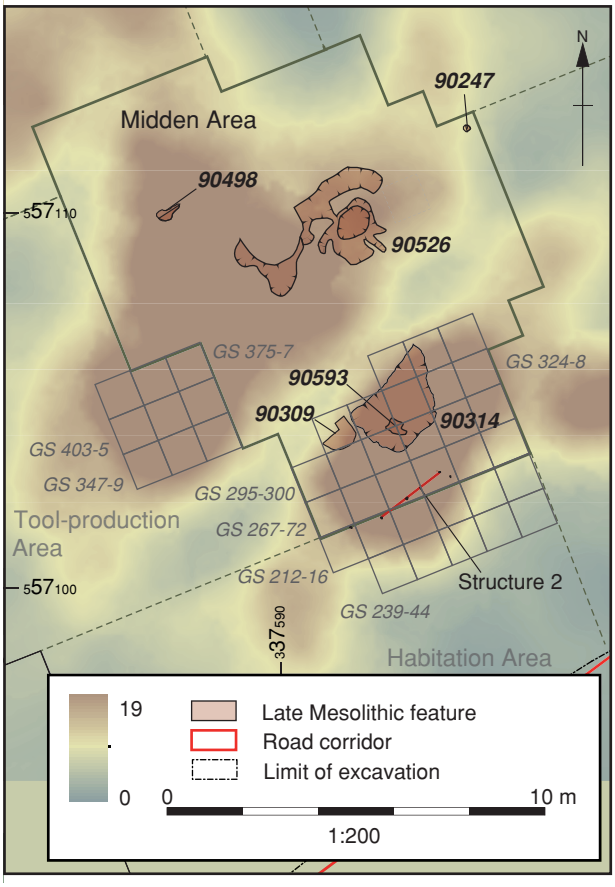

Figure 538: The spatial distribution of pebble-flint microliths across the Midden Area

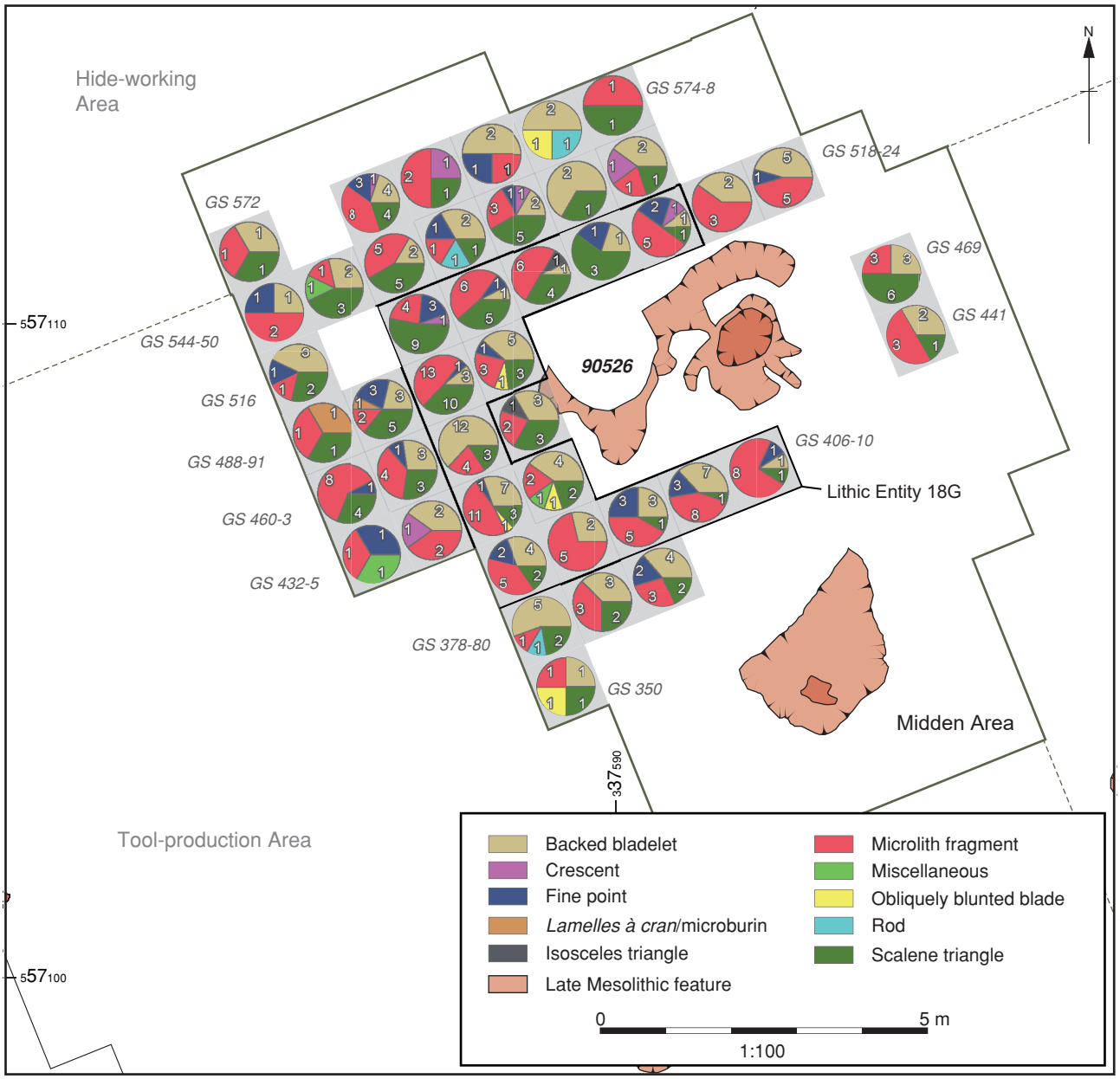

Figure 539: The distribution of microliths in the spread of pebble flint in the vicinity of tree-throw **90526**

microliths comprised backed bladelets, fine points, and fragments, which were clustered along the southern and south-eastern arc of the distribution, and microlith fragments and scalene triangles, which were clustered along the north-eastern and northern arc of the distribution. Scalene triangles and microlith fragments also featured heavily in outlying clusters to the east, west, and north, in grid squares 469 (Lithic Entity 18E), 545, 546, and 574 (Lithic Entity 18H), and 548 (Lithic Entity 18I). The fact that tree throw ***90526*** was at the centre of this activity warrants comment, as it is conceivable that this activity may have taken place around the base of a standing tree. Subsequently, the tree was either felled, or was toppled by natural causes, which disturbed the concentration of microliths, and other lithic waste, some of which became incorporated into the tree-throw. Conversely, the tree may have been a later feature which disturbed the concentrations of flaked lithics. Based on the existing evidence, either hypothesis could stand.

Within the microliths from the southern part of the spread (part of Lithic Entity 19), backed bladelets, fine points, microlith fragments, and scalene triangles are the most common forms (Fig 540). However, in contrast to the situation to the north (*above*), after the fragments, scalene triangles are the most frequent form, followed by back bladelets, and then fine points. There was also spatial patterning and/or association between the more common forms. For example, scalene triangles and microlith fragments were concentrated in the centre of the southern spread, and in grid-square 326 there was a cluster

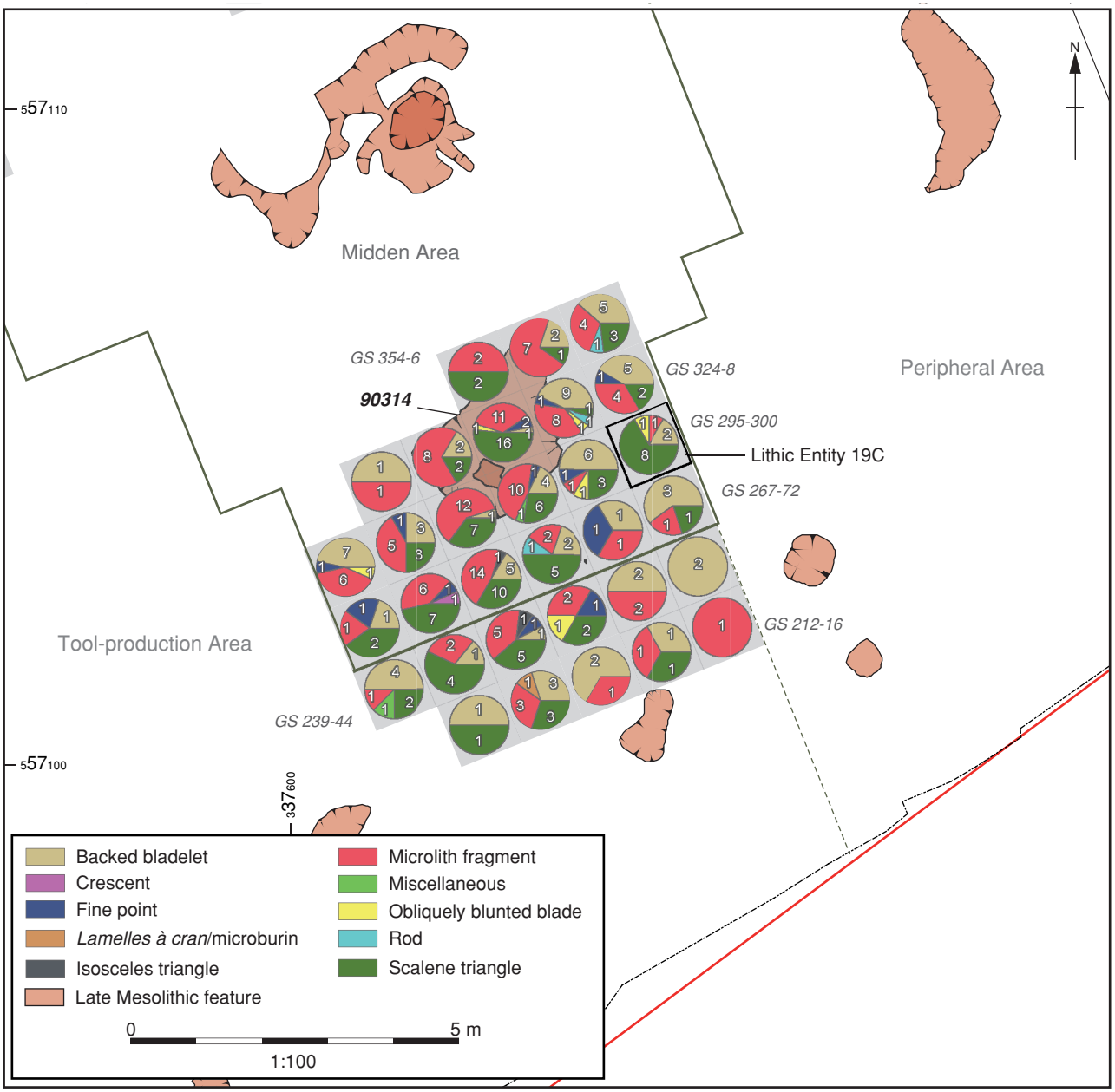

Figure 540: The distribution microliths in the spread of pebble flint in the vicinity of hollow **90314**

of 16 scalene triangles and 11 microlith fragments. An isolated cluster of eight scalene triangles also occurred in grid-square 300 (Lithic Entity 19C). While backed bladelets were common to the main spread, they also occurred in grid squares where they formed the dominant implement type and, in these instances, they were accompanied by varying quantities of microlith fragments (for instance, in grid-squares 239, 295, 328, and 356); interestingly, these clusters were on the periphery of the main concentration. Taken as a whole, the distributions, therefore, imply the secondary deposition of scalene triangles, along with microlith fragments, in the centre of the spread, with isolated clusters, possibly representing further depositional episodes, on the periphery of the main concentration.

There were also significant numbers of non-microlithic retouched tools, which, again, were present in both the southern and northern parts of the pebble-flint spread. In the northern area (part of Lithic Entity 18), 60 retouched tools were recovered from tree-throw ***90526*** and its vicinity (Fig 541). This collection chiefly comprises awls (eight), edge-retouched pieces (15), notches (11), and different forms of scrapers (four concave scrapers; four end scrapers; five side-and-end scrapers; and two side scrapers). Beyond the pieces contained within the tree-throw, the non-microlithic retouched items generally followed a similar distribution to the microliths, with particular clusters in grid-squares 406-9, to the south of the tree-throw.

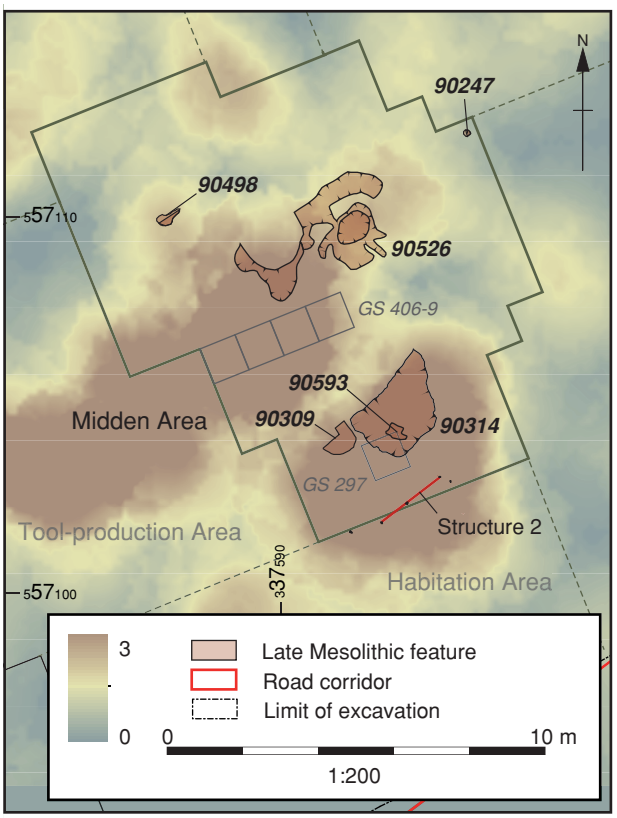

Figure 541: The spatial distribution of non-microlithic pebble-flint retouched tools across the Midden Area

There was also a relatively large collection of non-microlithic retouched tools in the southern part of the spread (part of Lithic Entity 19). This comprises a large number of awls (12), edge-retouched pieces (13), scraper forms and related pieces (13), and notches (five). The majority were scattered throughout the spread, but there were small collections, particularly of awls and scrapers, associated with the clusters of scalene triangles (*above*). Additionally, four awls were recorded in grid-square 297. Again, the greatest quantity of burnt pebble flint from the site was present in the Midden Area (Fig 542).

Chert

The greatest concentration of flaked chert from the site was located in the Midden Area. This was concentrated to the east and west of tree-throw ***90526*** in two main clusters (part of Lithic Entity 18), and was also associated with hollow ***90314*** (part of Lithic Entity 19). In both areas, flaked lithics from all stages of the reduction sequence were present.

The concentration to the west of the tree-throw ***90526***, included flaked lithics clustered in Lithic Entity 18B, while that to the east was prominent in Lithic Entity 18C (Fig 543). It should be noted that over 1100 chert struck lithics from grid-squares 436, 463, 468, 496, and 497 were derived from the fills of the tree-throw and were within a secondary depositional environment, whilst over 1700 pieces of flaked chert were derived from other grid squares associated with deposits filling this feature. Therefore, it appears that a significant component of the two main concentrations of flaked lithics, situated to the east and west of tree-throw ***90526***, eventually became incorporated within this feature.

The concentration of chert flaked lithics to the south of the tree-throw, associated with hollow ***90314***, was spread across grid-squares 241, 269, 270, 297-9, 326-8, 355-7, and 385. Within this spread, specific lithic types also clustered in certain grid squares. For example, there was a cluster of cores and regular flakes in grid-square 357; narrow blades were common to grid squares 241 and 356; and chunks were concentrated in grid-squares 241, 297, and 298.

Significantly, the assemblage included a large quantity of chert microliths (Fig 544). Fragments are the most common form (99) from tree-throw ***90526*** and its environs, with concentrations present around the edges of the tree-throw, in grid-squares 409, 410, 441, 489, 490, 546, 574, and 575, while from within this feature, smaller clusters were located in grid-squares 494 and 496. Backed bladelets are also a common feature of this assemblage (38); however, these were spread relatively evenly within and around the tree-throw. Scalene triangles (54) also feature prominently, with concentrations to the north-west, forming Lithic Entity 18D, while within the tree-throw, there was a small cluster in grid-square 463. Microlith fragments (46) and scalene triangles (58) were the most frequent forms from hollow ***90314***, and its surroundings, along with a much smaller number of backed bladelets (13). The microliths tended to cluster in grid-squares 269, 297-9, and 326-8, and there were significant concentrations of scalene triangles associated with 269 (Lithic Entity 19A; six), 297 (seven), 298 (five), and 326 (five).

Both areas surrounding and containing tree-throw ***90526*** and hollow ***90314*** also produced other retouched tools (Fig 545). The collection from the tree-throw and the surrounding grid squares comprises 24 items, and is dominated by simple edge-retouched pieces (12 items). The retouched pieces had a relatively even distribution outside the tree-throw, although there were two awls and two edge-retouched pieces associated with Lithic Entity 18E. Those recorded from within the tree-throw were concentrated towards its eastern end. The retouched tools from hollow ***90314***, and its environs, comprise 19 items, with simple edge-retouched pieces being more prevalent (eight). These retouched items were evenly distributed across the spread of debitage and microliths, the only notable group consisting of an awl and two edge-retouched pieces forming Lithic Entity 19B.

As expected, given the evidence for a midden, spatial analysis indicated that there was little evidence for *in-situ* reduction in this part of the site. While limited numbers of knapping groups were present, in the main they

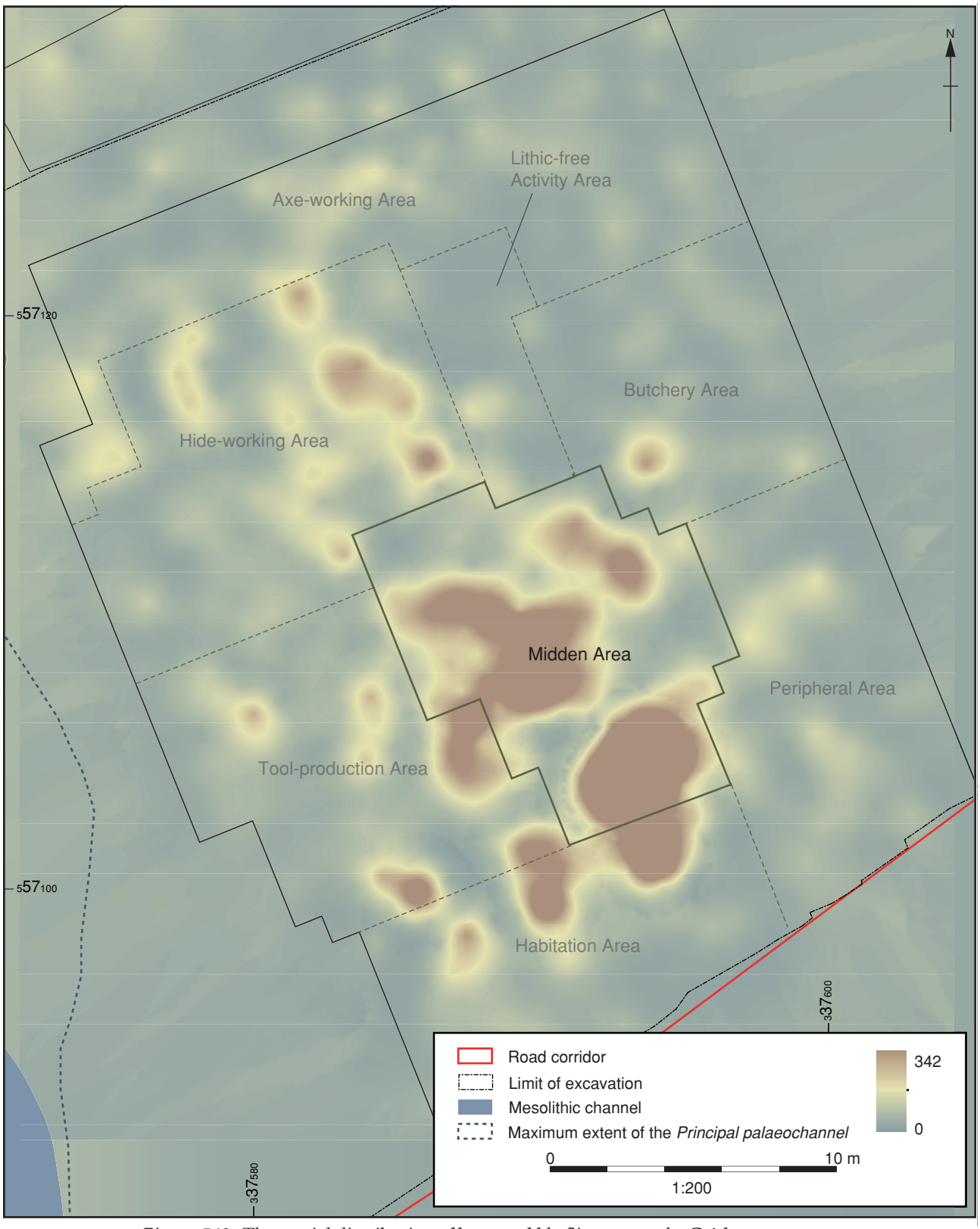

Figure 542: The spatial distribution of burnt pebble flint across the Grid-square area

were small collections of flaked lithics, and in two cases they represent mixed material from different knapping groups. For example, elements of knapping groups 1 and 58 were recorded in grid-square 463 (Fig 546), while the knapping groups in grid-square 269 include a discrete event (knapping group 48) and elements of knapping group 49. There were, however, two exceptions, in the form of knapping group 46, in grid-square 240, which consists of five chunks, including a short refitting sequence, and knapping group 24 in grid-square 498, which, although, small in quantity, contains flaked lithics from all stages of the reduction sequence. It is of note

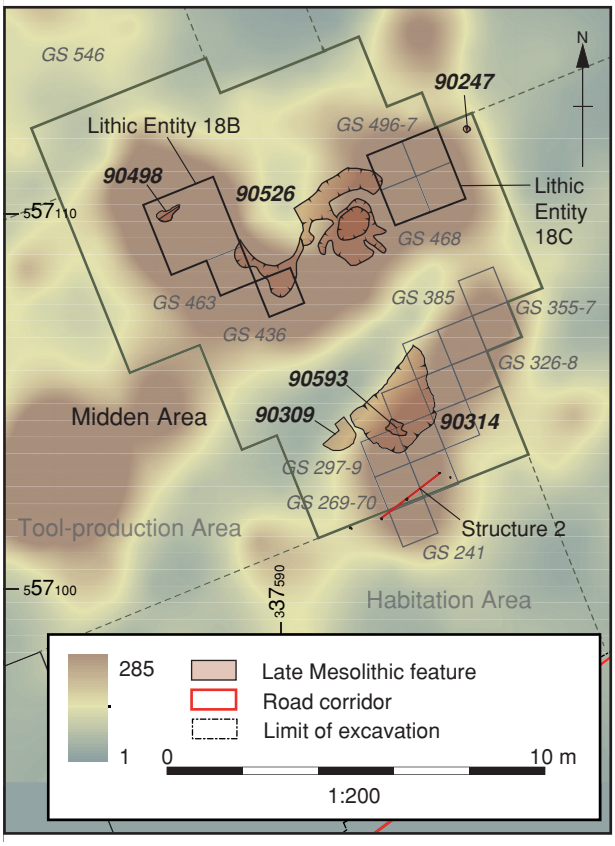

Figure 543: The spatial distribution of chert cores and debitage across the Midden Area

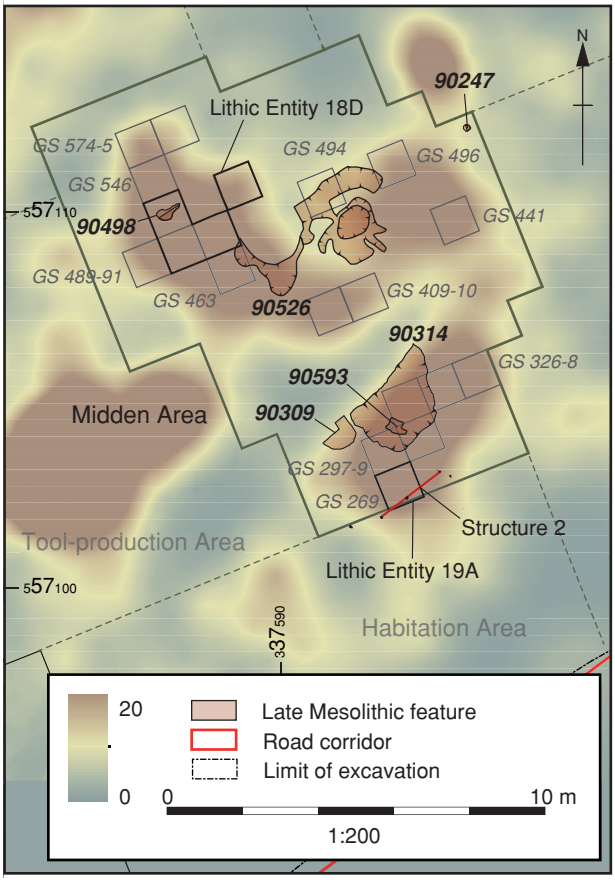

Figure 544: The spatial distribution of chert microliths across the Midden Area

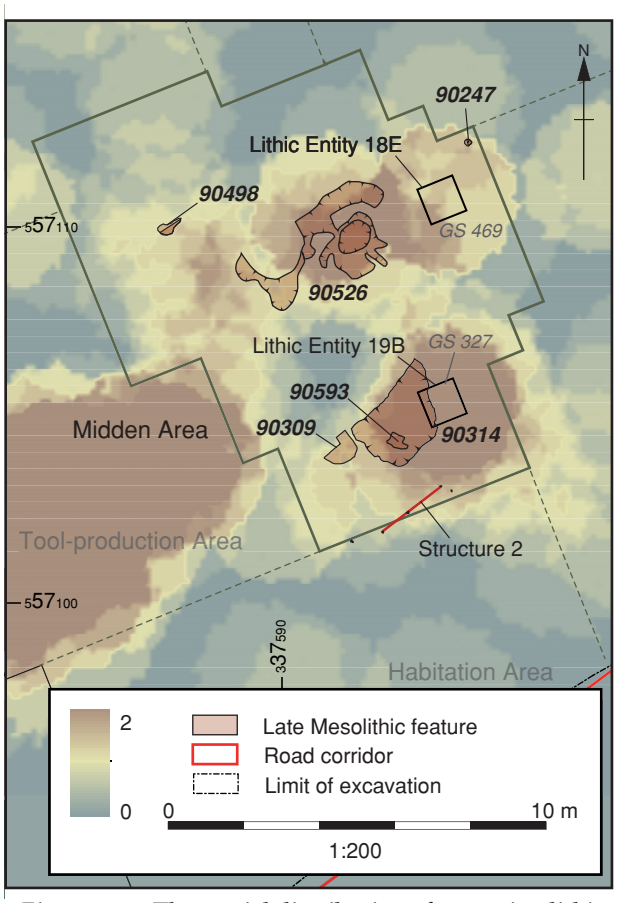

Figure 545: The spatial distribution of non-microlithic chert retouched tools across the Midden Area

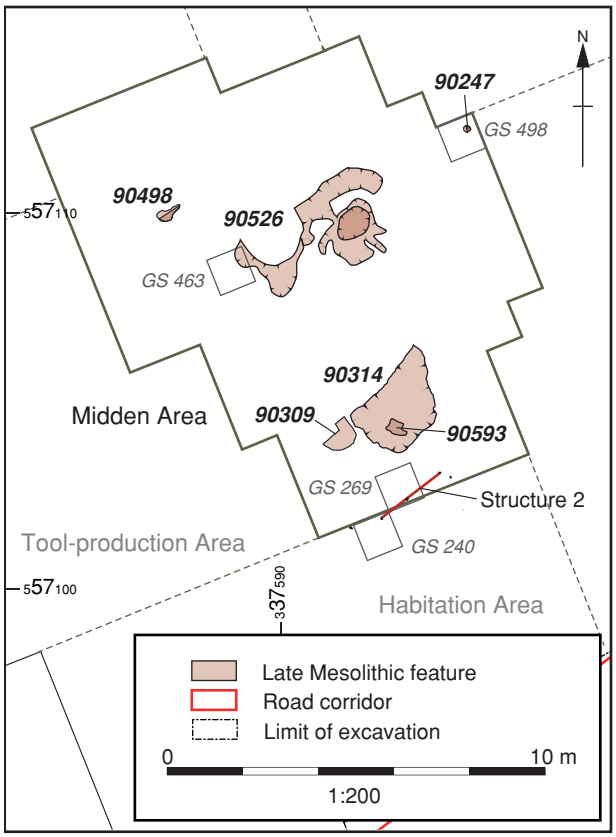

Figure 546: Grid-squares in the Midden Area associated with chert knapping groups

that these knapping groups were on the periphery of the midden and they, like other knapping groups in the same area, could relate to occupation activity before it became an established feature.

The spatial distribution of burnt chert also provides further confirmation for a midden in this part of the site, as these appear to relate to episodes of dumping. For instance, as with the other raw-material types, the main concentration was confined to this zone, particularly at the southern end (Fig 547). Within the area around tree-throw ***90526***, clusters of burnt chert were also present in several grid squares (463, 469, 518, 545, and 548), which indicate discrete dumps of material.

SSUC

There was a light spread and two clusters of Scottish Southern Uplands chert adjacent to tree-throw ***90526***. Most have been assigned to knapping groups 82 and 89, which formed clusters in grid-squares 440, 496, and 523 (Fig 548). The majority (94%) assigned to knapping group 82 were derived from the *Mesolithic overbank*

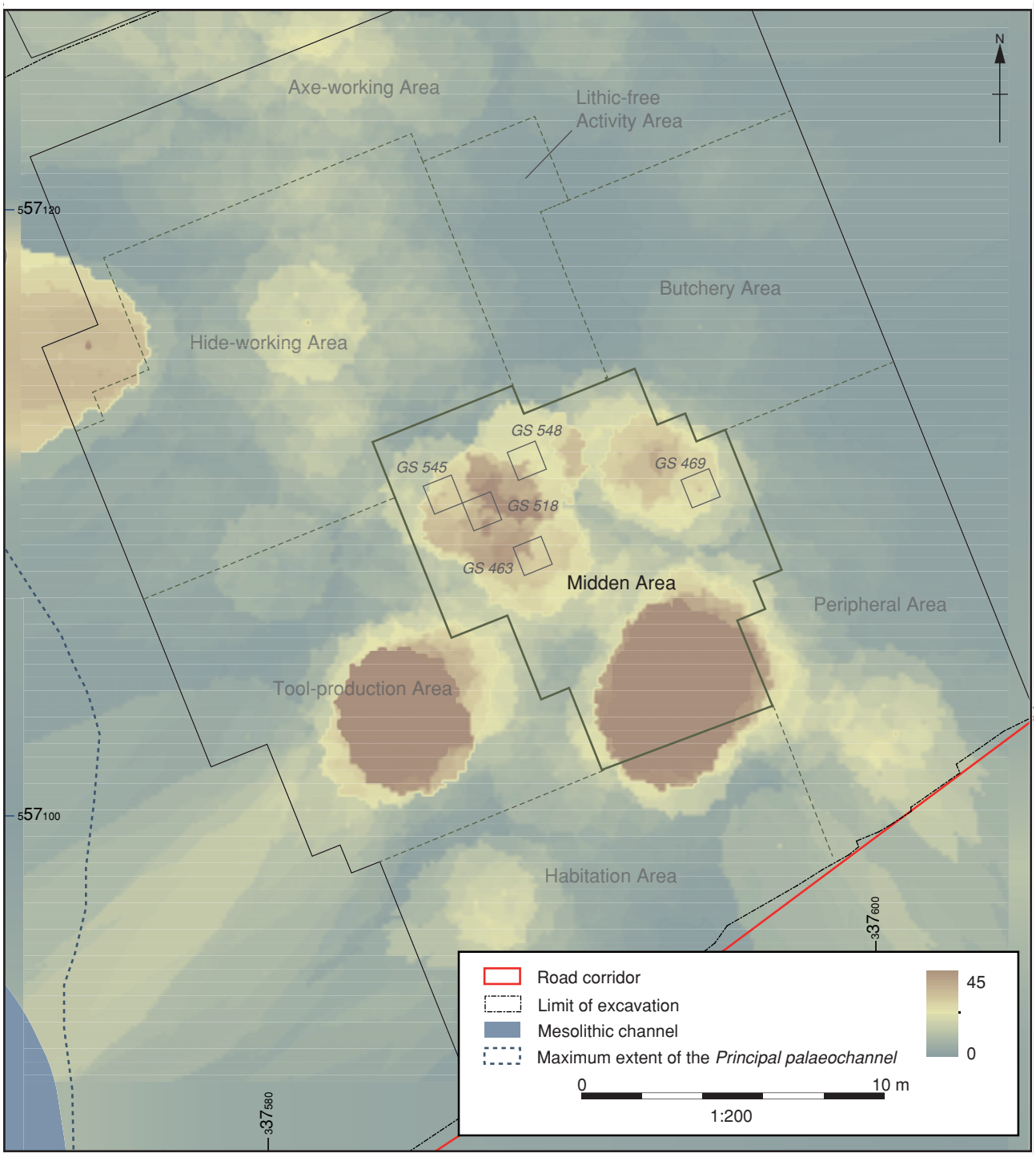

Figure 547: The spatial distribution of burnt chert within the Grid-square area

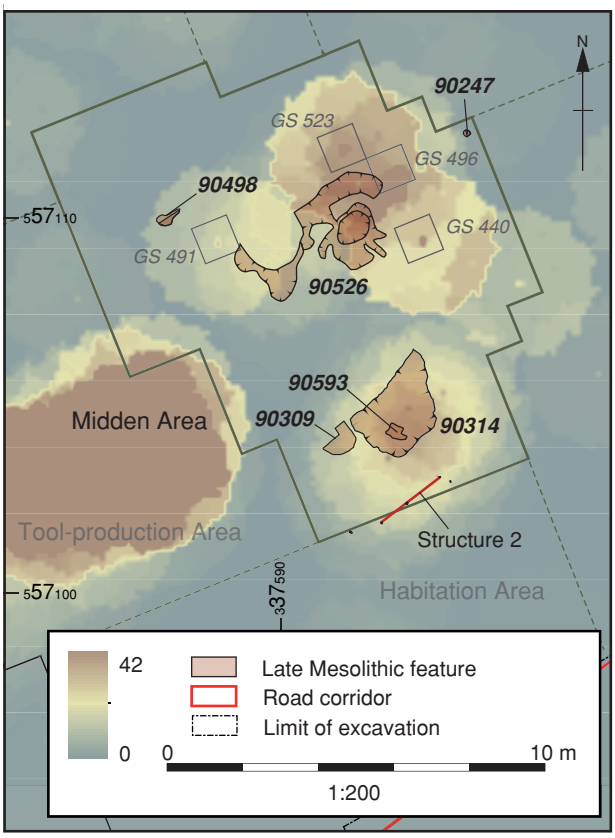

Figure 548: The spatial distribution of SSUC debitage across the Midden Area

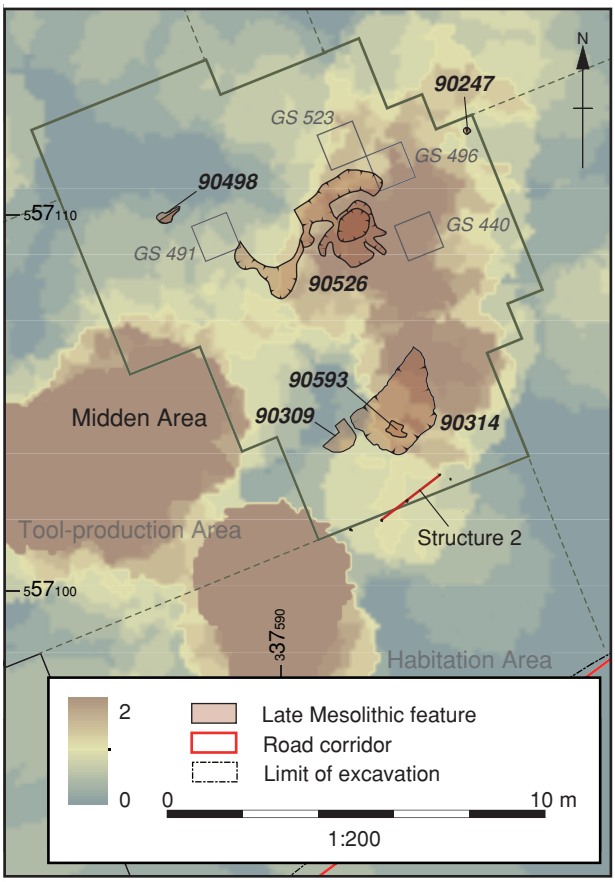

Figure 549: The spatial distribution of SSUC microliths across the Midden Area

alluvium (**90212**) in grid-square 523, while the remainder was associated with tree-throw **90526** in grid-square 496. Given that flaked lithics from all stages of the reduction sequence were associated with the *Mesolithic overbank alluvium* (**90212**), it can be inferred that this material relates to sporadic occupation during the formation of this alluvium. In this respect, the material from the tree-throw could have been redeposited. Alternatively, the flaked lithics forming knapping group 82 may have been wrongly assigned to the *Mesolithic overbank alluvium*, and might instead have been associated with the wider spread of Scottish Southern Uplands chert, and also knapping group 89. Knapping group 89 consists of flaked lithics from all stages of the reduction sequence, all the material being recovered from tree-throw **90526**; it is possible that this relates to occupation, which potentially took place prior to the formation of the midden.

Further pieces of this chert, forming a light spread, were recorded from in and around tree-throw **90526**, with a marked concentration of flake debitage and chunks in grid-square 491 (all associated *with Mesolithic overbank alluvium* **90212**). It is possible that this represents the secondary deposition of lithic material and therefore can be associated with the midden. In addition, there was also a spread of Scottish Southern Uplands chert in the southern part of the midden, in Sample Area 2 (*Appendix 1*), which mainly comprises flakes, narrow blades, and microliths (Fig 549). Given the dispersed distribution

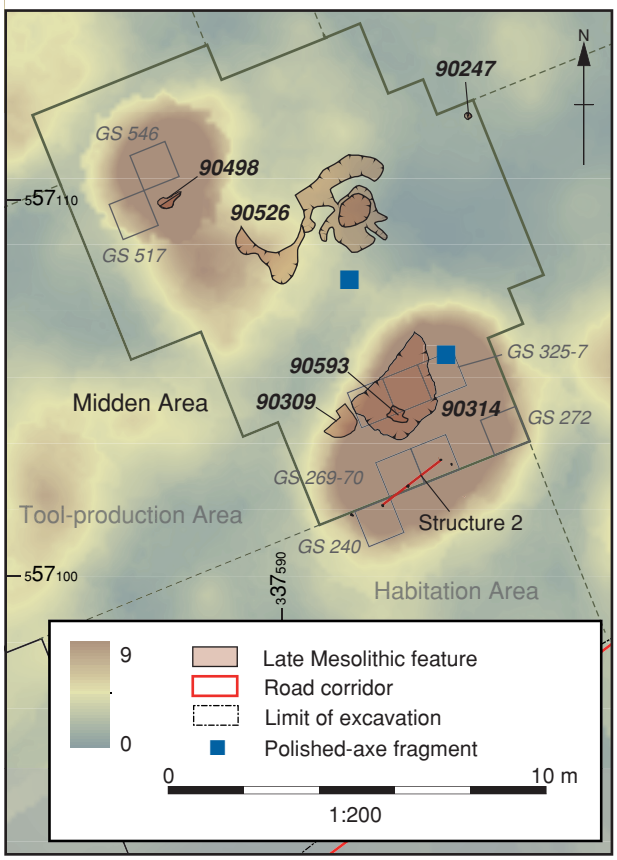

Figure 550: The spatial distribution of tuff cores and debitage, and stone implements, within the Midden Area

of this material, and its exclusive composition, it is likely that it also relates to the secondary deposition of flaked lithics.

Tuff, polished-tuff axe fragments, and pitchstone
Concentrated spreads of flaked tuff were recorded in the southern part of the midden (Lithic Entity 19; Fig 550), whilst to the north, a relatively small amount of flaked tuff, mainly flakes and chunks, was situated within the area skirting the edge of tree throw ***90526*** (Lithic Entity 19F), which was also associated with pebble-flint microliths. While there were no particular concentrations of flaked tuff, there was a cluster focused on grid-square 546. This did not, however, represent a complete reduction sequence, both in composition and quantity, and could therefore relate to secondary dumping, or a knapping event that has been disturbed by later activity.

Very little flaked tuff was recorded from deposits filling tree-throw ***90526***, though to the south there was a dispersed spread, spatially associated with hollow ***90314***, which included flaked lithics from all stages of the reduction sequence. No clusters were present, but there were groups of specific lithic types in different parts of the spread. For example, flakes and chunks were more common to the north-east, in grid-squares 325-7; microliths and broad blades were concentrated on the south-western edge of the spread, in grid-squares 240, 269, and 270; and there was a small collection of regular flakes and narrow blades in grid-square 272. The 11 tuff microliths from this part of the site include five scalene triangles. Two polished-tuff axe fragments were also present in the Midden Area, one associated with a cluster of flaked tuff. However, no knapping groups were identified, and it is possible that the piece, and potentially the rest of the tuff, was the result of secondary redeposition. Small concentrations of pitchstone were present. Spatially, these were found in the northern part (Lithic Entity 18), particularly to the north of tree-throw ***90526***.

Ochre
There were several worked lumps of ochre/haematite, small fragments, and rounded lumps in the vicinity of hearth ***90593*** (in hollow ***90314***) in the southern part of the midden small fragments, along with larger amounts of rounded crumbs. Although these were dispersed over a wide area, particular concentrations were present in grid-squares 269, 298, 299, 326, and 355 (Fig 551). Bearing in mind the relationship

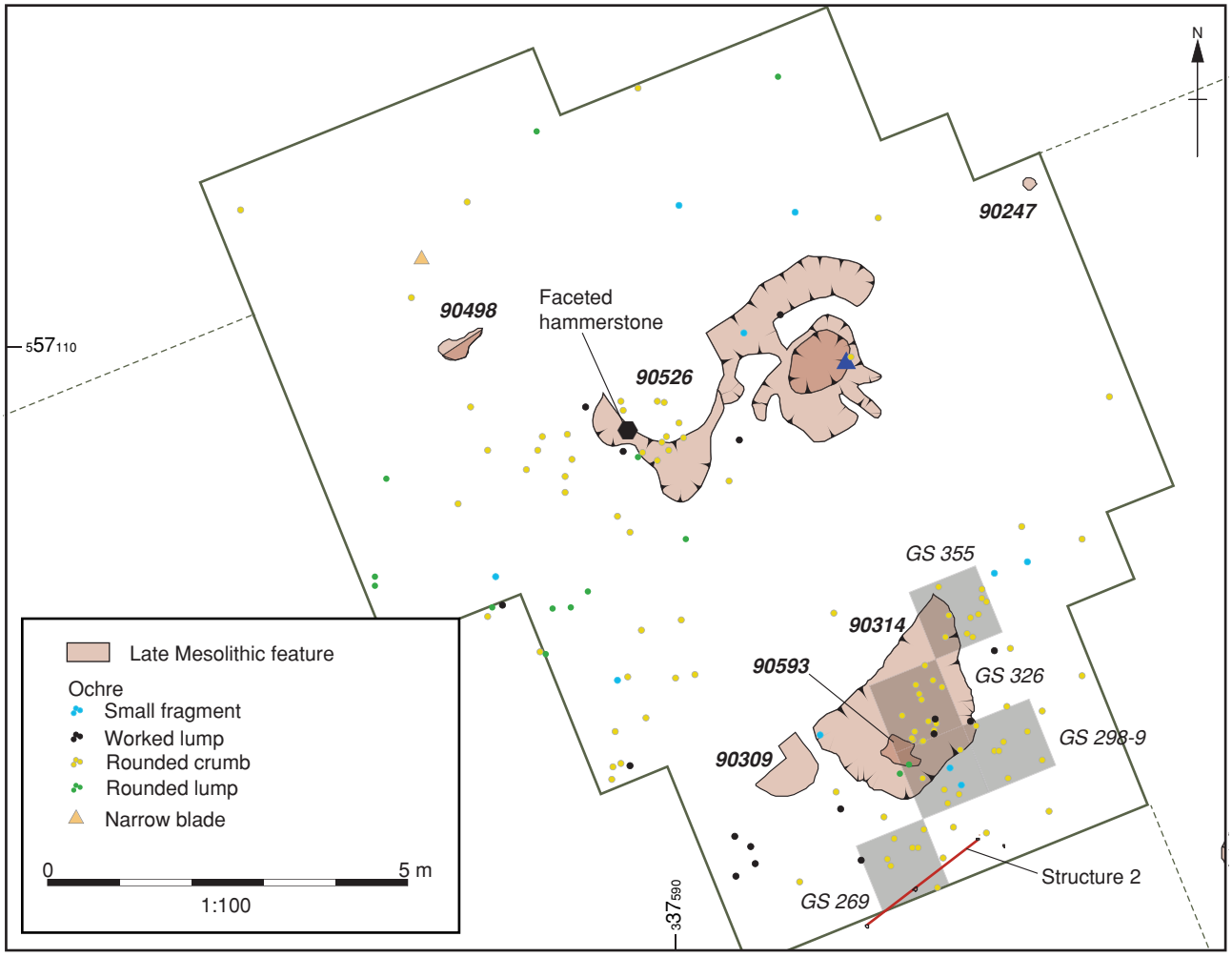

Figure 551: Distribution of ochre within the Midden Area

between ochre and hearths identified in other parts of the site, this cluster could relate to pre-midden activity. However, the majority of the small clusters did not exhibit a spatial relationship with coarse-stone tools and unworn cobbles, and could therefore relate to the secondary deposition of ochre within the midden.

To the north, in the vicinity of tree-throw ***90526***, there was also a dispersed spread of ochre/haematite, consisting of three worked lumps and several fragments, rounded lumps, and crumbs. Some of these fragments and a worked lump were associated with a faceted hammerstone, which may suggest that they relate to a discrete episode of pre-midden ochre processing. A knapped ochre narrow blade was also located on the northern periphery of the midden.

Tasks and activities

Microwear analysis of a sample of flaked lithics from the Midden Area revealed that these tools and debitage were put to a variety of uses (Lithic Entity 20). Bone/antler working was represented by a small number of knife forms, simple edge-retouched blades and flakes, and an unmodified blade. These tools were more common at the northern end of the midden, although they were dispersed across several grid squares (Fig 552). Tools used in butchery and the processing of hide were relatively common, consisting of a range of microliths, macro-tools, and debitage, which had mainly been used for cutting. Again, distribution was dispersed but there was a small group (including a burin) in the north-west corner of the midden. Given their spatial positioning, it is possible that these were used in the adjacent Butchery Area and then dumped onto the midden. It is also of note that, of the three obliquely blunted points included in the microwear study, two exhibit wear associated with the cutting and piercing of meat/hide. More generally, this microlith type is very distinctive in terms of morphology and technological

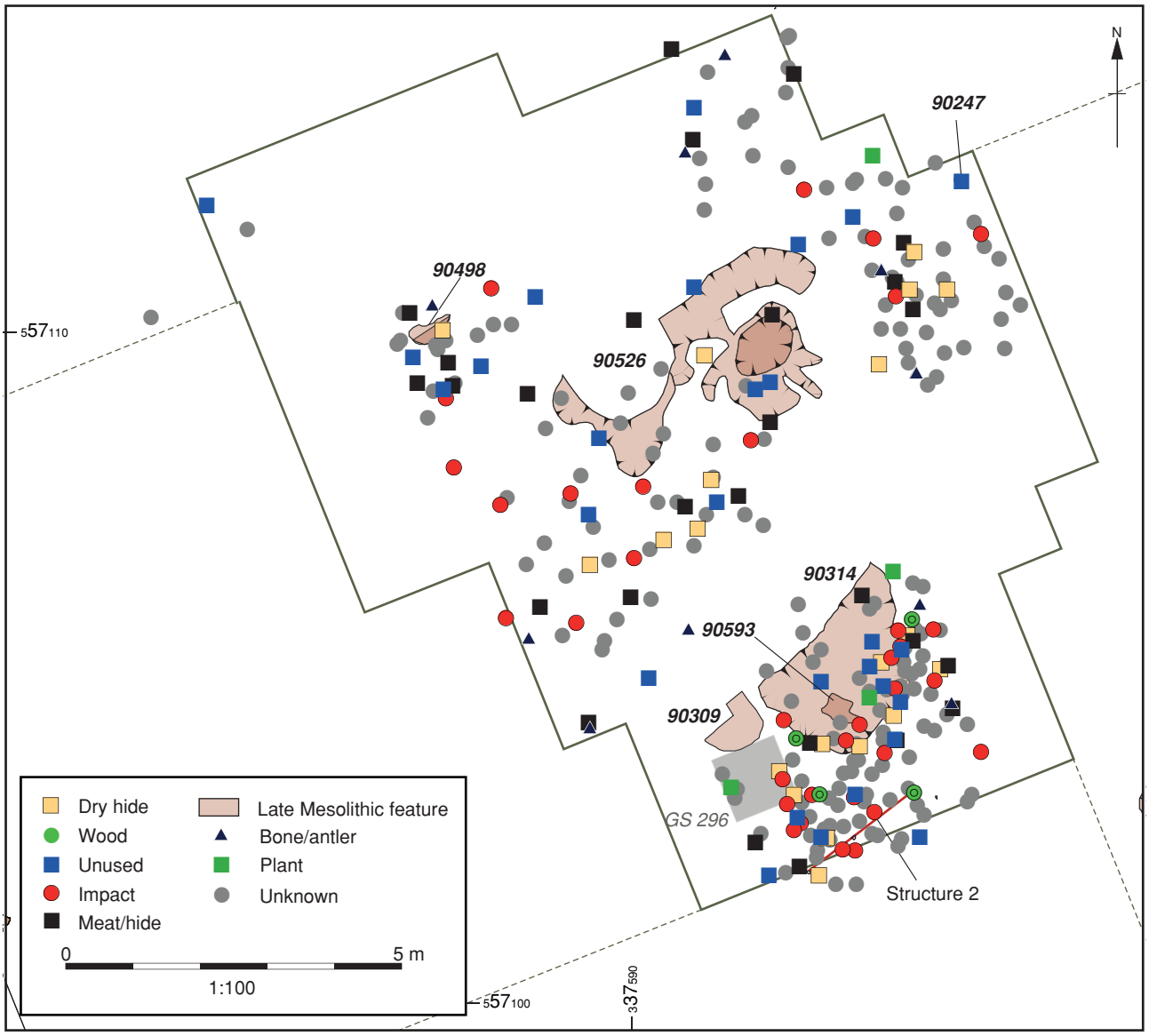

Figure 552: Distribution of the flaked lithics exhibiting different types of microwear across the Midden Area

character, and ten of these points were scattered throughout the Midden Area.

There are relatively few tools and debitage with microwear from the working of dry hide, all from the southern part of the midden. In this area, four pieces were situated in two adjacent grid squares, comprising microliths, microlith fragments, and other retouched tools made on a variety of raw materials. A few pieces, mainly unmodified debitage and macro-tools, exhibit microwear associated with working plant and woody material. Interestingly, all of these pieces were confined to the southern part of the midden, where they generally had a dispersed distribution, although an edge-retouched blade and a fine point, probably associated with working plant material, were located in grid-square 296.

By far the most common form of use-wear encountered relates to impact damage. Apart from a notched blade, these pieces were microliths, with fragments and scalene triangles accounting for 58% of the sample. A single crescent and two rods provide limited evidence for the presence of armatures from projectile weaponry. The bulk of the impact-damaged implements were from the southern part of the midden, where the majority of the fragments and scalene triangles were found. Occasionally, several pieces clustered within a specific grid square, which could signify the discard of composite tools within the midden, although they invariably include different microlith classifications, and different raw materials.

Coarse-stone tools

The coarse-stone tools from the Midden Area had a dispersed distribution (Fig 553). A core tool, a faceted hammerstone, and an incised cobble were situated adjacent to tree-throw ***90526***, while a facially pecked cobble and a spall produced from working a cobble

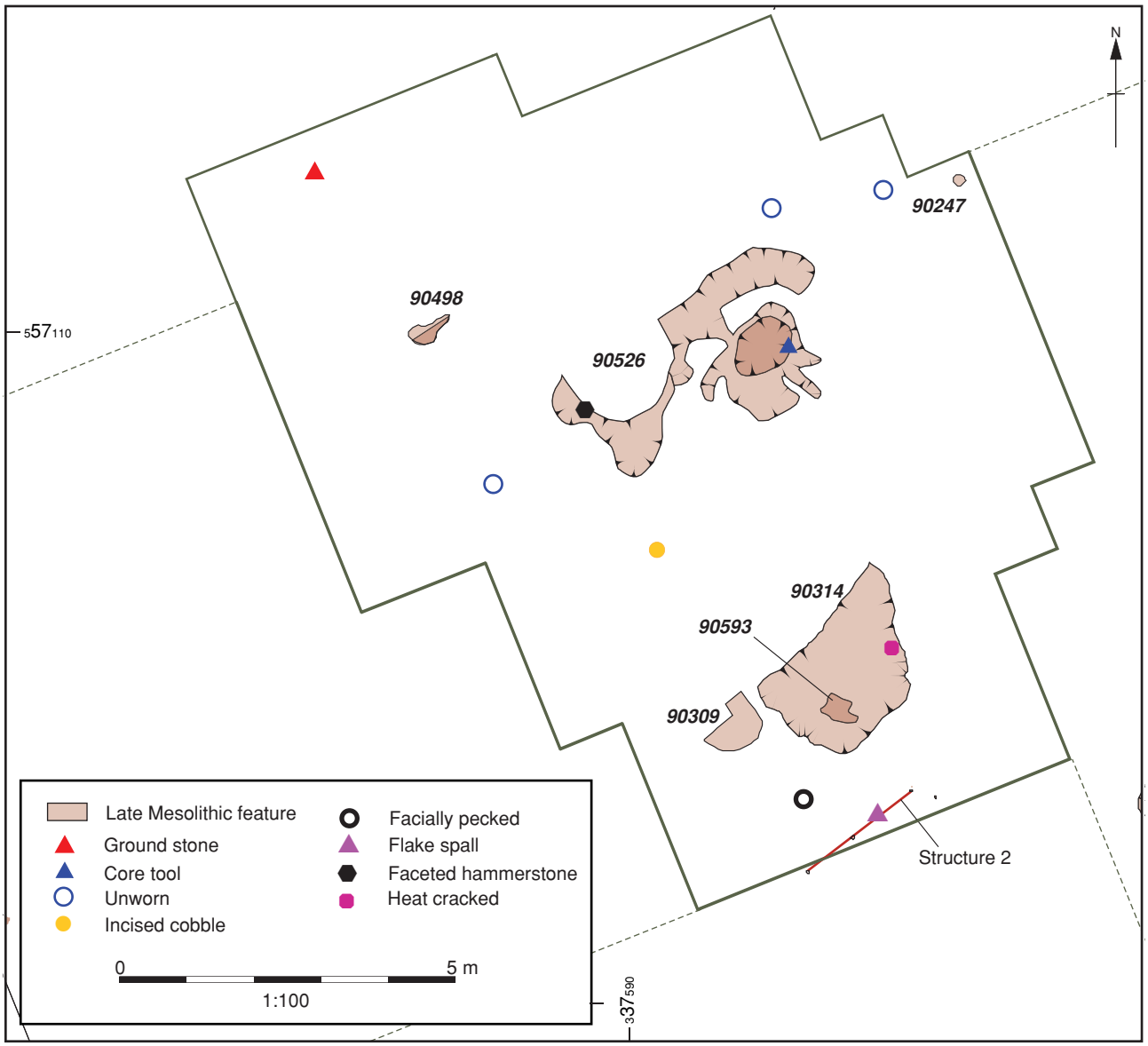

Figure 553: Distribution of coarse-stone tools in the Midden Area

were located in the southern area. Given the dispersed distribution and the variety in tool type, little can be said about the tasks that the coarse-stone tools were put to, and it is probable that they were dumped in the midden along with the flaked lithics.

Discussion: flaked lithics

This part of the site contained a mass of flaked lithics, which formed a dense concentration associated with the midden (Fig 554). The majority have technological affinities with a Late Mesolithic stone-working tradition, and they therefore link it with the Late Mesolithic activity identified in the other parts of the *Grid-square area*.

The midden appears to have masked more coherent clusters of Late Mesolithic stone working. Some of these clusters, particularly those on its periphery,

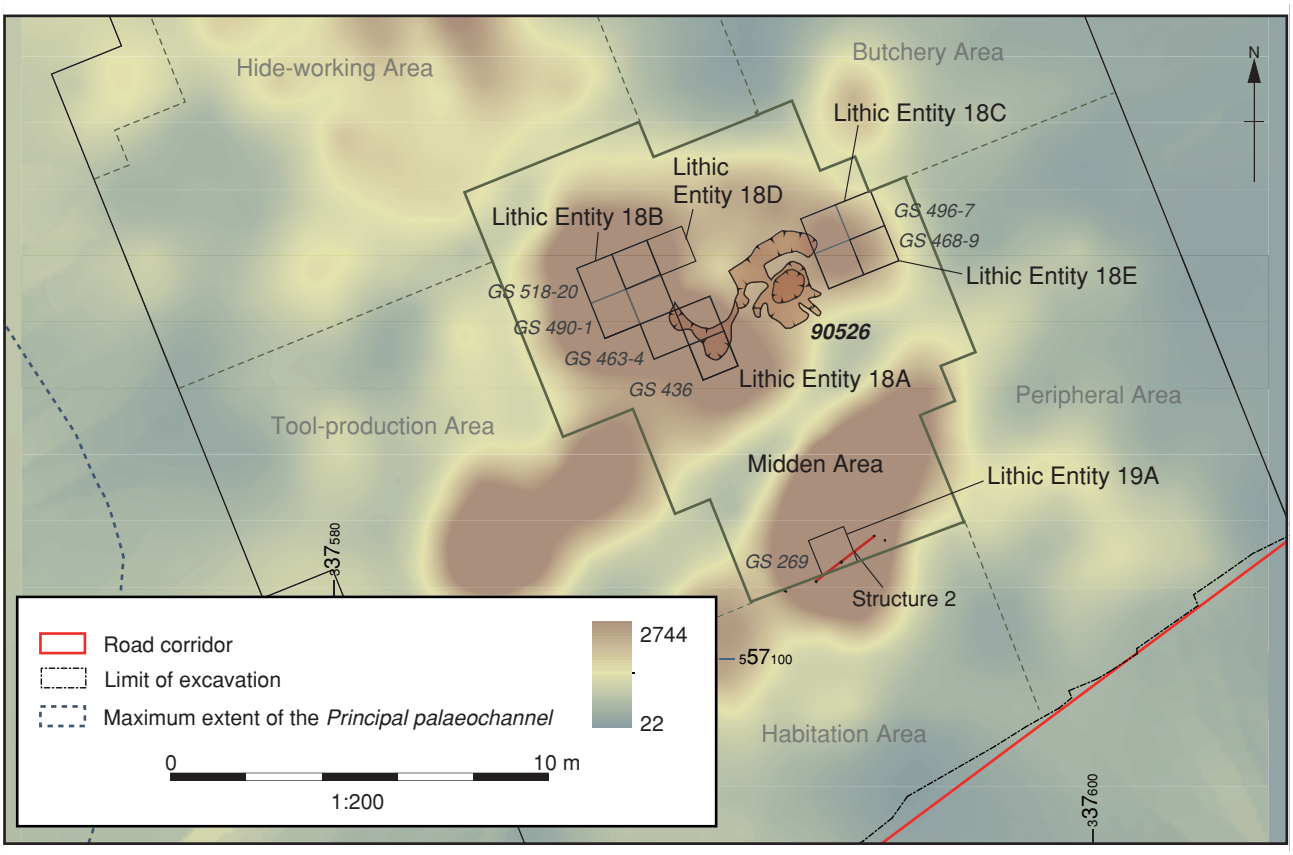

Figure 554: The spatial distribution of all flaked lithics across the Midden Area

Features/Sample Areas	Late Mesolithic flaked lithics			Coarse-stone, ochre, and stone implements	Dating evidence
	Assemblage	Knapping groups (KG)	Sourcing studies		
Structure 1 (hearth ***90452***; pits ***90174***, ***90464***, and ***90473***; stakeholes ***90131***, ***90196***, and ***90210***) *Backwater channel* Tree-throw ***90208***	Lithics defined footprint of Structure 1; contains all the main raw-material groups A similar repertoire of raw-material use associated with tree-throw ***90208*** Discrete clusters of material in the northern part of the activity area, some of which represent dumping of lithic waste, whilst others probably represent *in-situ* reduction Material from the midden impinges into the north-western part of this activity area	Brown/grey flint 10-12, and 101; chert 1, 3, 6-9, and 29; other 109; and 'cannot determine' 5 and 22	Chert IG1 sub-group 2 (KG 3); IG1 sub-group 4 (KG 1); IG1 sub-group 5 (KG 29) Brown/grey-flint sample included in the flint-sourcing study	Unworn cobbles and a hammerstone clustered around Structure 1 Ground stone, an incised stone, a hammerstone, and two unworn cobbles clustered around tree-throw ***90208*** A small cluster of ochre adjacent to tree-throw ***90208***. Dispersed spread of ochre associated with Structure 1	Structure 1 dates to the *'Earliest Mesolithic activity'* phase Tree-throw ***90208*** dates to the *'Mesolithic tree-throws/ activity'* phase

Table 246: Defining characteristics of the Peripheral Area

probably pre-date its formation, while others could be contemporary with it. Moreover, the midden appears to have sealed a structure (Structure 2) and its creation may even have referenced this earlier feature. Furthermore, although it was created and added to during the Late Mesolithic period, it also appears to have acted as a significant feature in later periods, based on the discovery of a small number of Neolithic and/or Early Bronze Age flaked lithics.

Generally, the composition of the flaked lithics suggests the secondary dumping of knapping material, most likely derived from the other Late Mesolithic activity areas, whilst there were large quantities of microlith fragments (27% of the entire assemblage), concentrations of specific microlith types, and a wide range of macro-tools, which again are indicative of dumping tools (Lithic Entities 18D and 18A-C). Finally, this area contained large concentrations and clusters of burnt material, in specific areas, which again appear to relate to the discrete dumping of material.

Large spreads of brown/grey flint, chert, and pebble flint were present, which defined the footprint of the midden. Of these, clusters of specific lithic types were found within the general spread of brown/grey flint. Similarly, significant concentrations of chert were evident within the general spread, situated to the east and west of, and within, tree-throw ***90526***. A concentration of chert was also present in the southern part, including a large number of microliths, dominated by fragments and scalene triangles, with a particular cluster (Lithic Entity 19A) adjacent to the Habitation Area to the south. Interestingly, a cluster of scalene triangles (Lithic Entity 18E) was also located adjacent to the Butchery Area.

Unsurprisingly, flaked pebble flint constituted the densest spread of material, exhibiting a similar, but more extensive, distribution pattern to the chert, and contained clusters of cores, core fragments, and core-dressing pieces. While the distribution of pebble-flint blade and flake debitage showed some spatial affiliation with the cores and core-dressing pieces, they also clustered in areas where the latter were not prevalent, suggesting the clearing of knapping waste from other parts of the site and its secondary deposition in the midden. The pebble-flint microliths also exhibited a similar patterning to the chert examples, whereby specific classifications were clustered in different areas. For example, scalene triangles were dominant in the southern part of the midden, and in certain grid-squares, these were found together with clusters of microlith fragments. It is significant that similar quantities of implements associated with specific grid squares were very rarely encountered in the other activity areas where the evidence for *in-situ* knapping has been identified. More generally, the clustering of microliths was more prevalent on the periphery of the midden, which could possibly relate to the discard of composite tools whose wooden shafts have since decayed. This appears to be confirmed by the presence of several pieces of debitage, retouched tools, and microliths with remnants of a probable hafting residue on their principal surfaces, and it is of note that these were more common at the southern end of the midden.

Brown/grey flint, chert, and pebble flint were complemented by smaller amounts of other raw-material types, including Scottish Southern Uplands chert, tuff, and pitchstone. Tuff was more common at the southern end of the midden, suggesting that groups using different raw-material types may have dumped lithic material within specific parts of the feature. Pitchstone, on the other hand, was randomly distributed across both the northern and southern parts of the midden, and appears to have a spatial affinity with the main concentrations of flaked lithics; as such, it probably relates to Late Mesolithic activity.

Peripheral Area

The south-eastern part of the *Grid-square area* was clearly peripheral to much of the activity in the encampment (*Ch* 4). It did, however, contain part of the *Backwater channel*, three stakeholes (***90131***, ***90196***, and ***90210***; *Ch 3*), a hearth (***90452***; *Ch 3*), three pits (***90174***, ***90464***, and ***90473***; *Ch 3*), and a tree-throw (***90208***; *Ch 3*; Table 246; Fig 555). Some of these features seemed to relate to Late Mesolithic activity that preceded the establishment of the Mesolithic encampment, including hearth ***90452***, which has been radiocarbon dated to the late seventh/early sixth millennium cal BC ('*Earliest Mesolithic activity*' phase), and tree-throw ***90208***, which was at the base of the Backwater channel and has been scientifically dated to the early fifth millennium cal BC ('*Mesolithic tree-throws/activity*' phase; *Ch 3*; *Appendix 20*).

Significantly, the hearth, pits, and stakeholes were also associated with a horseshoe-shaped cluster of lithics, which reflects the footprint of a Late Mesolithic structure (Structure 1; *Ch 3*). This formed Lithic Entity 21, one of the six lithic entities in this part of the site, which could also be divided into several lithic sub-entities (Table 247). Four of the others (Lithic Entities 22-4 and 26) formed discrete clusters, composed of different raw-material types, whilst the remaining one (Lithic Entity 25) consisted of those lithics recorded in tree-throw ***90208*** and its immediate environs.

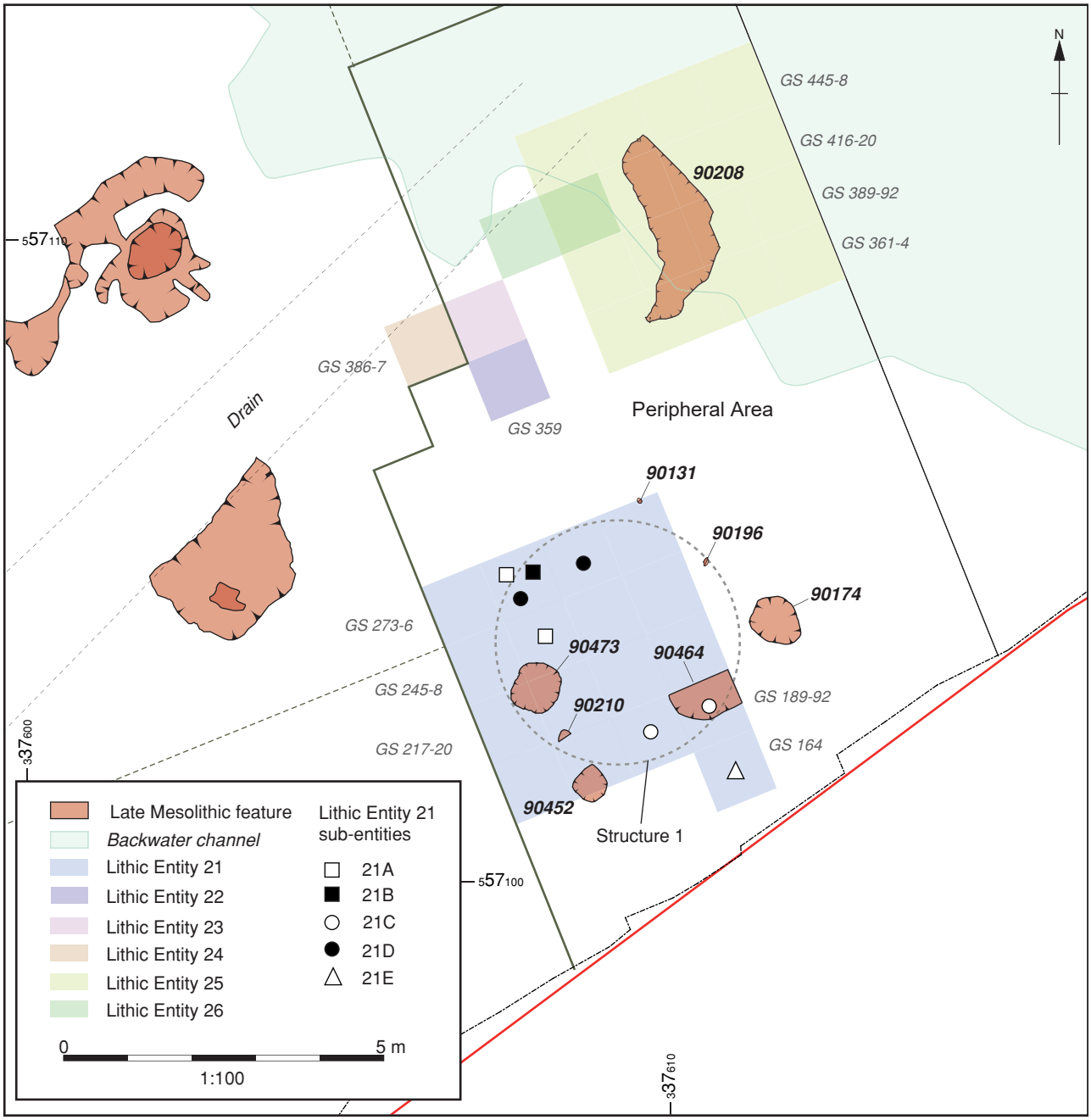

Figure 555: Archaeological and natural features, and Lithic Entities 21-6, in the Peripheral Area

Brown/grey flint

Several small clusters of brown/grey flint were located in this area (Fig 556), and although they were not around hearth ***90452*** and pit ***90473*** (*above*), a dispersed spread was centred on grid-square 246 (part of Lithic Entity 21A; *above*), which may have been associated with Structure 1. Beyond this, another cluster formed Lithic Entity 22, which included material from knapping groups 10, 11, and 12, and comprised small amounts of debitage and tools; however, no cores or core fragments were present within or near the cluster. It could therefore represent small discrete dumps of debitage derived from stone-working activity which was undertaken elsewhere. Finally, an assemblage of brown/grey-flint debitage was recovered from the fill of tree-throw ***90208***.

Pebble flint

There was a significant number of pebble-flint flaked lithics concentrated within Structure 1, focused on hearth ***90452*** and pit ***90473*** (Fig 557), and also within a general spread to the north. Within this were possible clusters of pebble-flint core technology and debitage, such as Lithic Entity 23, though it is unclear whether this related to activity associated with the Midden Area, or represents discrete stone-working activity. There was also a thin spread of pebble flint in the grid squares to the west of tree-throw ***90208***.

Lithic Entity	Description	Lithic sub-entity	Description
21	Late Mesolithic worked stone associated with Structure 1 (grid-squares 189-92, 217-20, 245-8, and 273-6)	21A	Cluster of flaked brown/grey flint (grid-squares 246 and 274)
		21B	Cluster of flaked chert (grid-square 274)
		21C	Cluster of flaked chert, including clusters of blade chips and narrow blades (grid-squares 190-2)
		21D	Cluster of pebble-flint microliths (grid-squares 274 and 275)
		21E	Cluster of tuff blade and flake debitage, and microliths (grid-square 164)
22	Cluster of brown/grey-flint flaked lithics (grid-square 359). Includes knapping groups 10, 11, and 12	-	-
23	Clusters of pebble-flint core technology and debitage (grid-square 387)	-	-
24	Cluster of SSUC (grid-square 386)	-	-
25	Late Mesolithic worked stone from tree-throw ***90208*** and its immediate vicinity (grid-squares 361-4, 389-92, 417-20, and 445-8)	-	-
26	Cluster of ochre/haematite (grid-squares 416 and 417)	-	-

Table 247: Lithic entities within the Peripheral Area

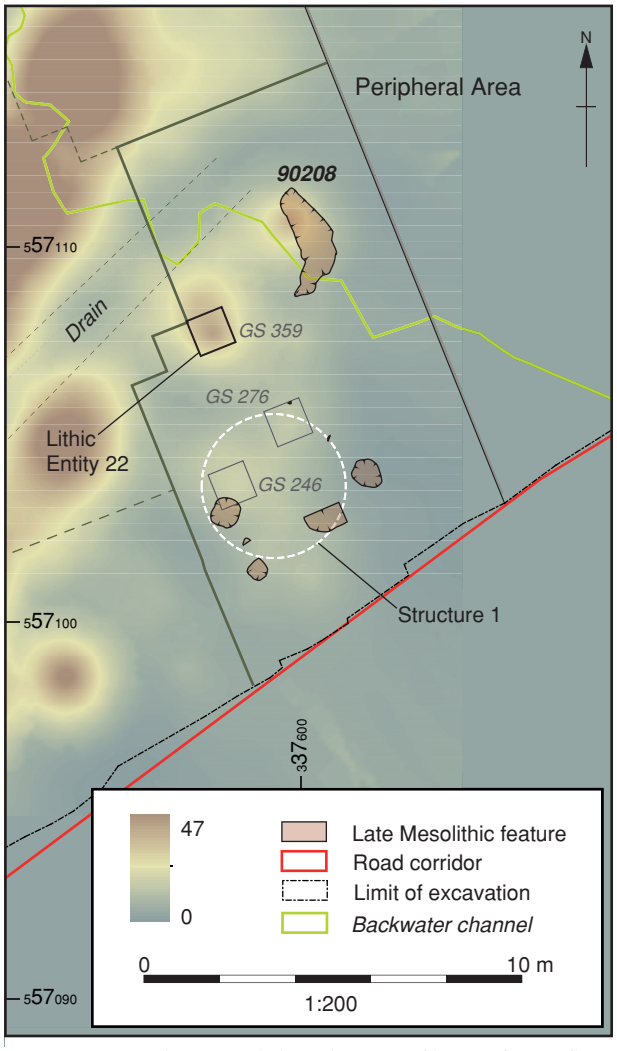

Figure 556: The spatial distribution of brown/grey-flint debitage across the Peripheral Area

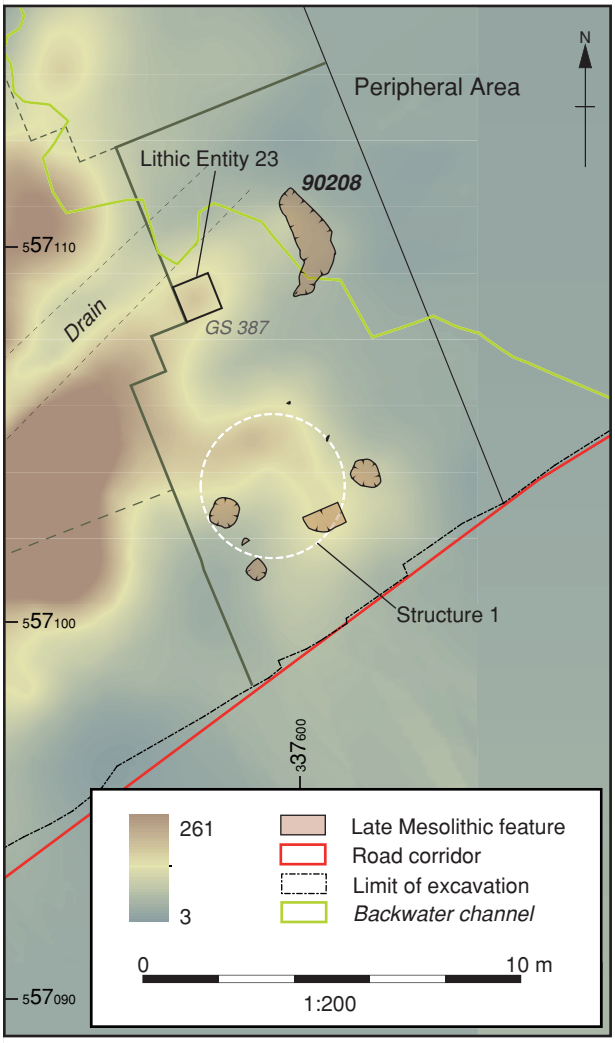

Figure 557: The spatial distribution of pebble-flint cores and debitage across the Peripheral Area

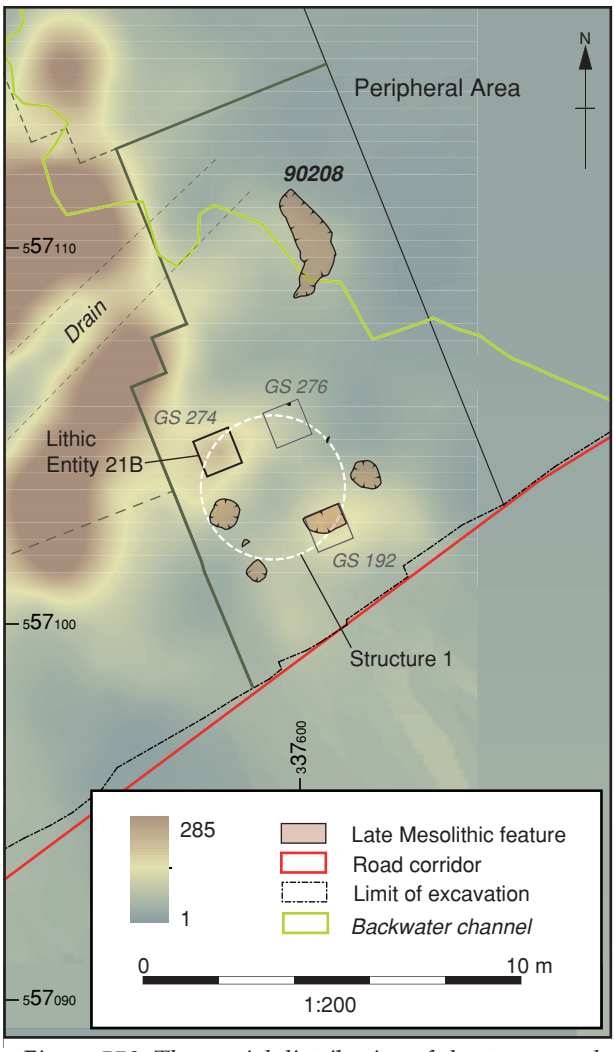

Figure 558: The spatial distribution of chert cores and debitage across the Peripheral Area

Chert

Several clusters of flaked chert, including material from all stages of the reduction sequence, were associated with Structure 1 (Fig 558), notably in Lithic Entity 21B and grid-square 192 (part of Lithic Entity 21C). The spatial positioning of these clusters suggest that Structure 1 was associated with discrete collections of raw materials, supported by the identification of knapping groups 7-9, in in Lithic Entity 21B and grid-square 276. However, these knapping groups are only associated with a small number of lithics, chiefly comprising blade and flake debitage, some of which was burnt. Additionally, a small assemblage of flaked chert was spatially associated with tree-throw ***90208***.

SSUC

Interestingly, no Scottish Southern Uplands chert was found in association with Structure 1, although a small collection was found to the north (Lithic Entity 24; Fig 559). Several chunks and narrow blades were also associated with the lithic material from tree-throw ***90208***.

Tuff and Pitchstone

A spread of flaked tuff was found within the area of Structure 1 (Lithic Entity 21), and immediately next to its northern, eastern, and southern sides, with only very minimal amounts deriving from other parts of the Peripheral Area (Fig 560). Flaked pitchstone was also associated with hearth ***90452*** and pit ***90473***, elements of Structure 1.

Ochre

A cluster of ochre/haematite (Lithic Entity 26) was present in this area, comprising 12 crumbs (Fig 561). Two (in grid-square 416) were derived from the *Stabilised land surface* (***90003***), whilst the remaining ten pieces (in grid-square 417) were from a localised deposit of clay filling an undulation in the underlying *Basal sands and gravels* (***90327***).

Structure 1

The footprint of Structure 1 was defined by a horseshoe-shaped concentration, which was clearly defined, forming a near-continuous configuration

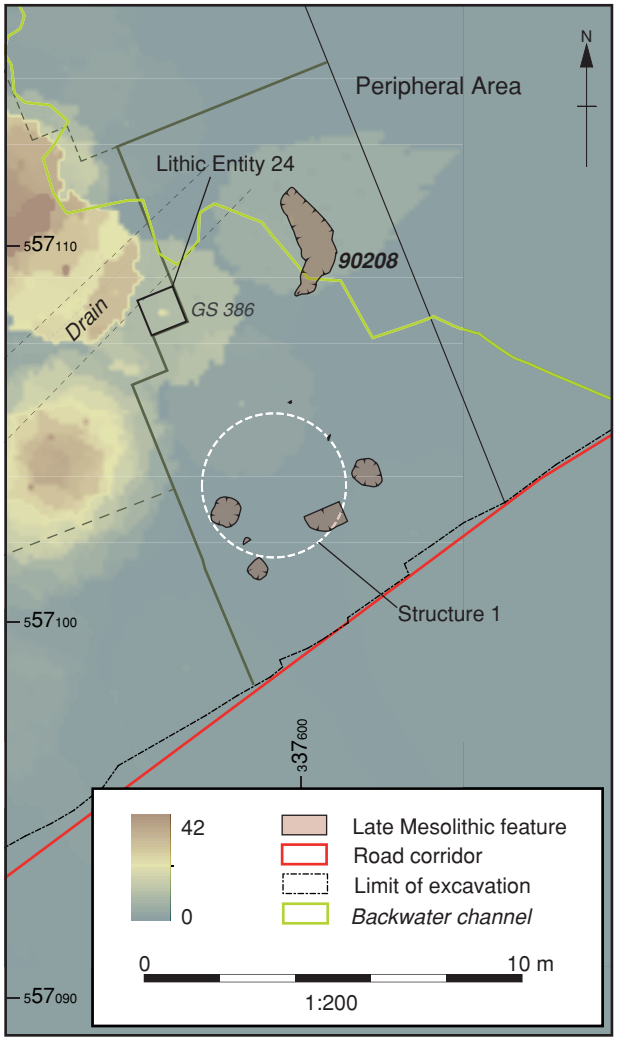

Figure 559: The spatial distribution of SSUC debitage across the Peripheral Area

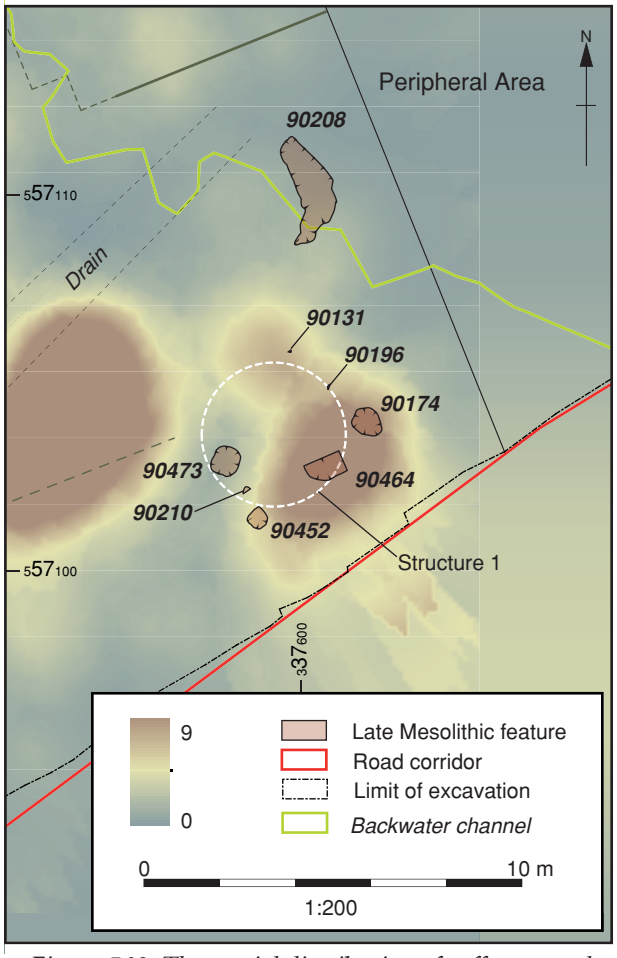

Figure 560: The spatial distribution of tuff cores and debitage across the Peripheral Area

(Fig 562). This contained flaked lithics associated with the working of all the main raw-material categories, including all stages of the reduction sequence (Lithic Entity 21). There were fewer flaked lithics in the south-west corner, near the hearth and pit (***90452*** and ***90473***), perhaps indicating the position of an entrance.

Brown/grey-flint flaked lithics were spread throughout the area covered by the structure, with a small cluster situated in grid-squares 246 and 274 (Lithic Entity 21A), containing six microliths. These comprise four backed bladelets and two microlith fragments. The flaked lithics constitute a partial reduction sequence and, in this respect, do not reflect *in-situ* working.

Flaked chert was more prevalent within the structure, and there were particular concentrations in the south-east corner and along the northern perimeter of the setting, where material from all stages of the reduction sequence was recorded. There were also clusters of blade chips and narrow blades in grid-squares 190 and 191 (part of Lithic Entity 21C), and a significant number of microliths and several other retouched tools were associated with the structure. The microliths include backed bladelets (nine items), fine points (four), and microlith fragments (ten). These were generally dispersed throughout the structure, although there was a small concentration of microlith fragments along its northern edge. The chert non-microlithic retouched tools comprise an awl, two notches, and a side scraper.

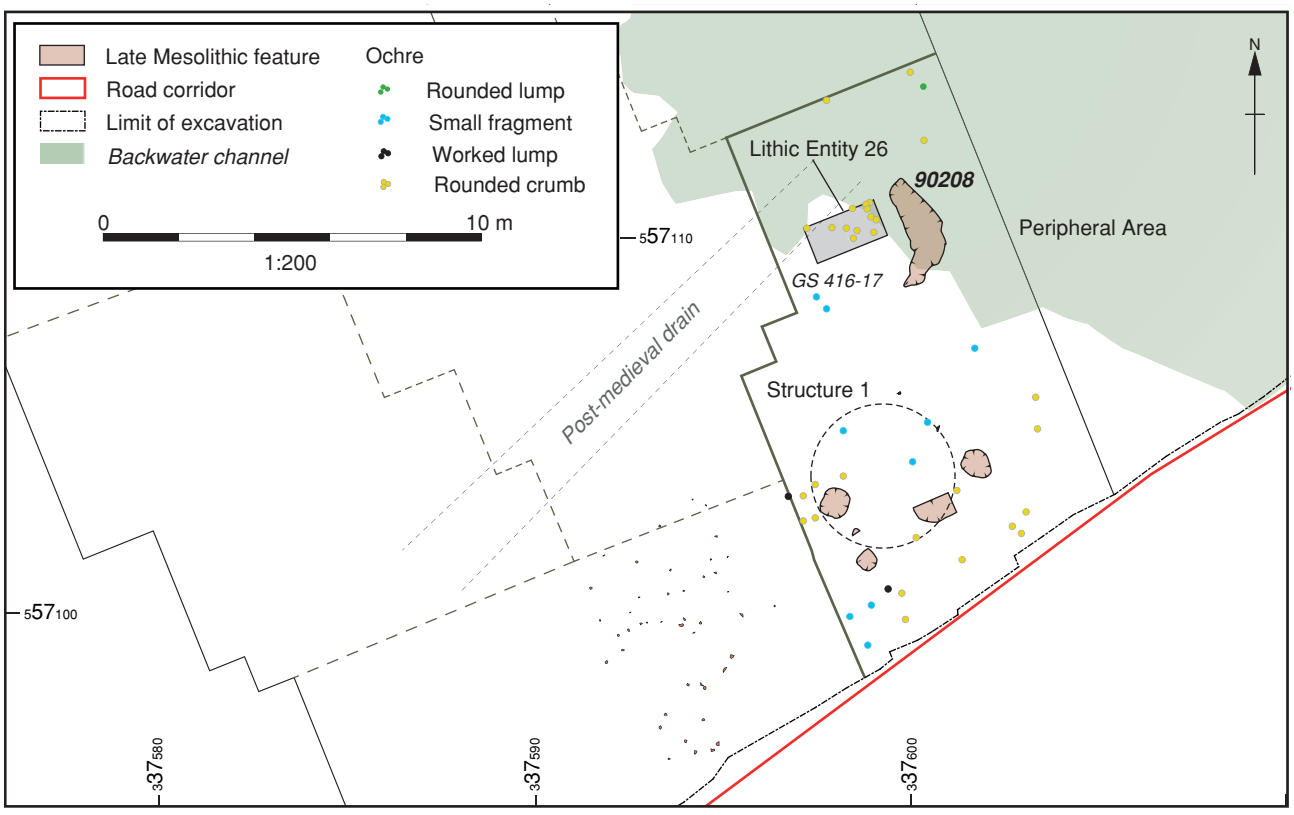

Figure 561: Distribution of ochre with the Peripheral Area

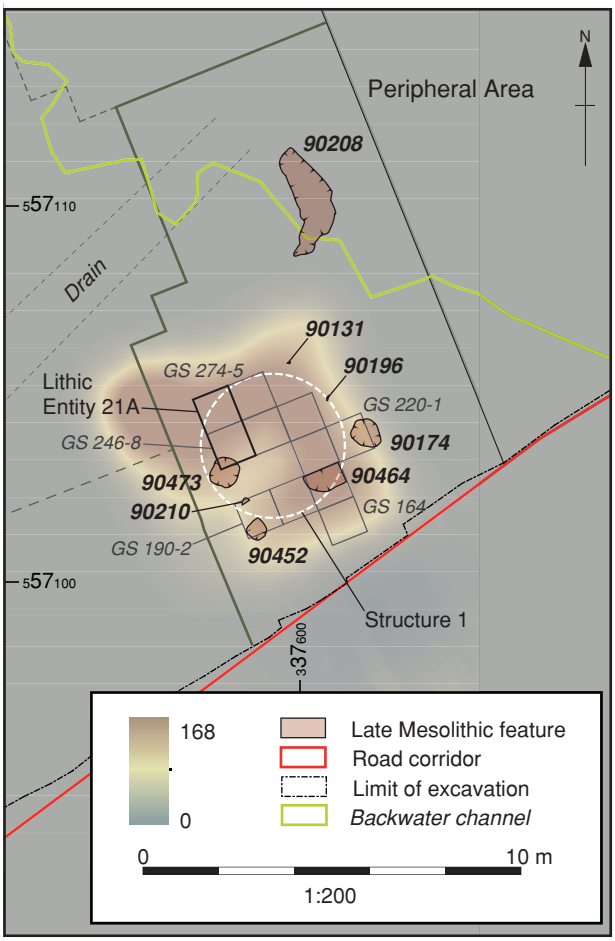

Figure 562: The spatial distribution of all flaked lithic types forming a horseshoe-shape (Structure 1) in the Peripheral Area

Flaked lithics relating to the reduction of pebble flint were also distributed throughout the structure, although they clustered on its northern and eastern arc. There was also a significant amount of small flakes and blade chips in the north-east corner, whilst chunks were concentrated in grid-square 275. In total, there were 104 pebble-flint microliths associated with the structure (Fig 563). The majority of these were grouped along its northern edge, particularly in grid-squares 274 and 275 (Lithic Entity 21D), where microlith fragments, backed bladelets, and fine points were especially prevalent, while scalene triangles had a stronger representation in the centre and on the western side. Only a few pebble-flint non-microlithic retouched tools were present, including an awl, a burin spall, a scraper, and a notch.

Flaked tuff was concentrated on the southern edge of the structure, with a cluster of blade and flake debitage and microliths recorded in grid-square 192, which may have continued into grid-square 164 (Lithic Entity 21E), immediately to the south. A dispersed group of flaked-tuff debitage and microliths was found in the northern part of the structure, whilst immediately beyond the setting, flaked tuff was recorded in grid-square 221, and also to the north and south, suggesting that worked stone from the main setting had been dispersed into these areas.

Flaked lithics made from the other raw-material categories were present, though in relatively small

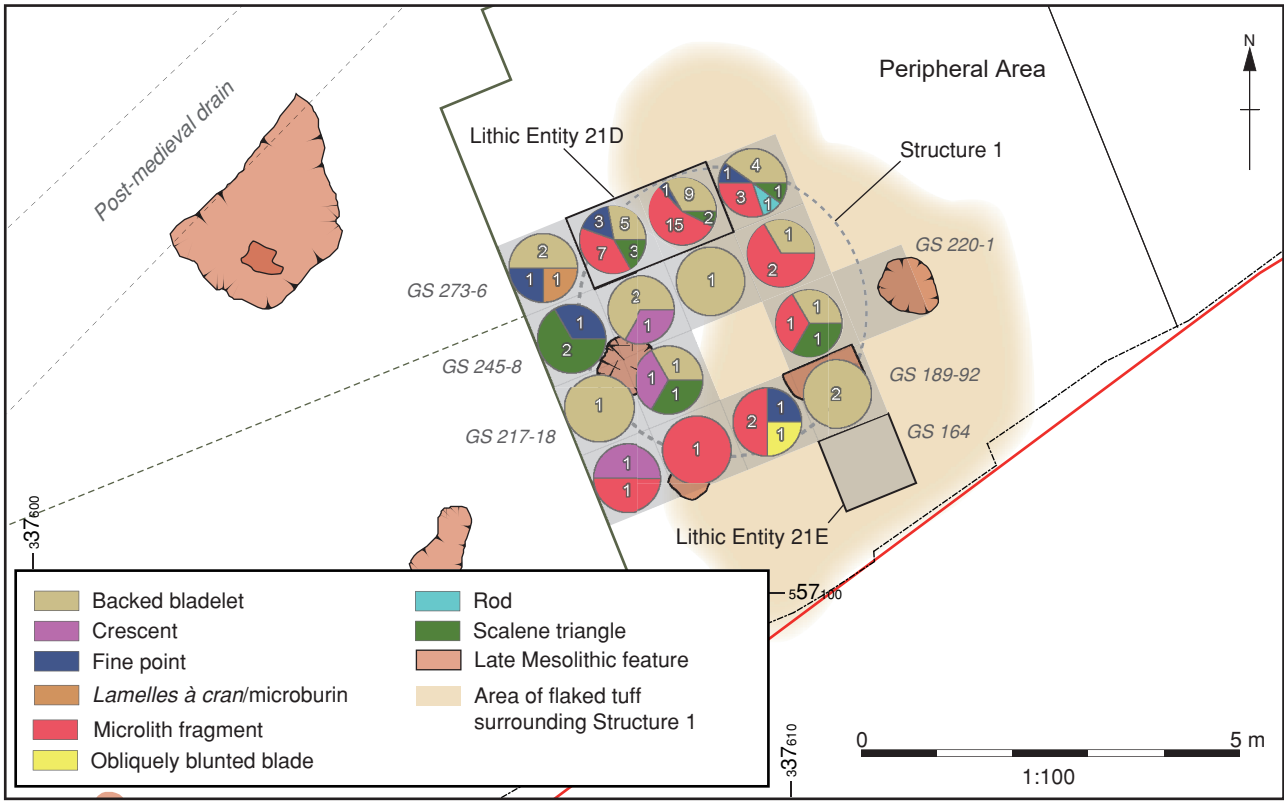

Figure 563: The distribution of microliths around Structure 1 in the Peripheral Area

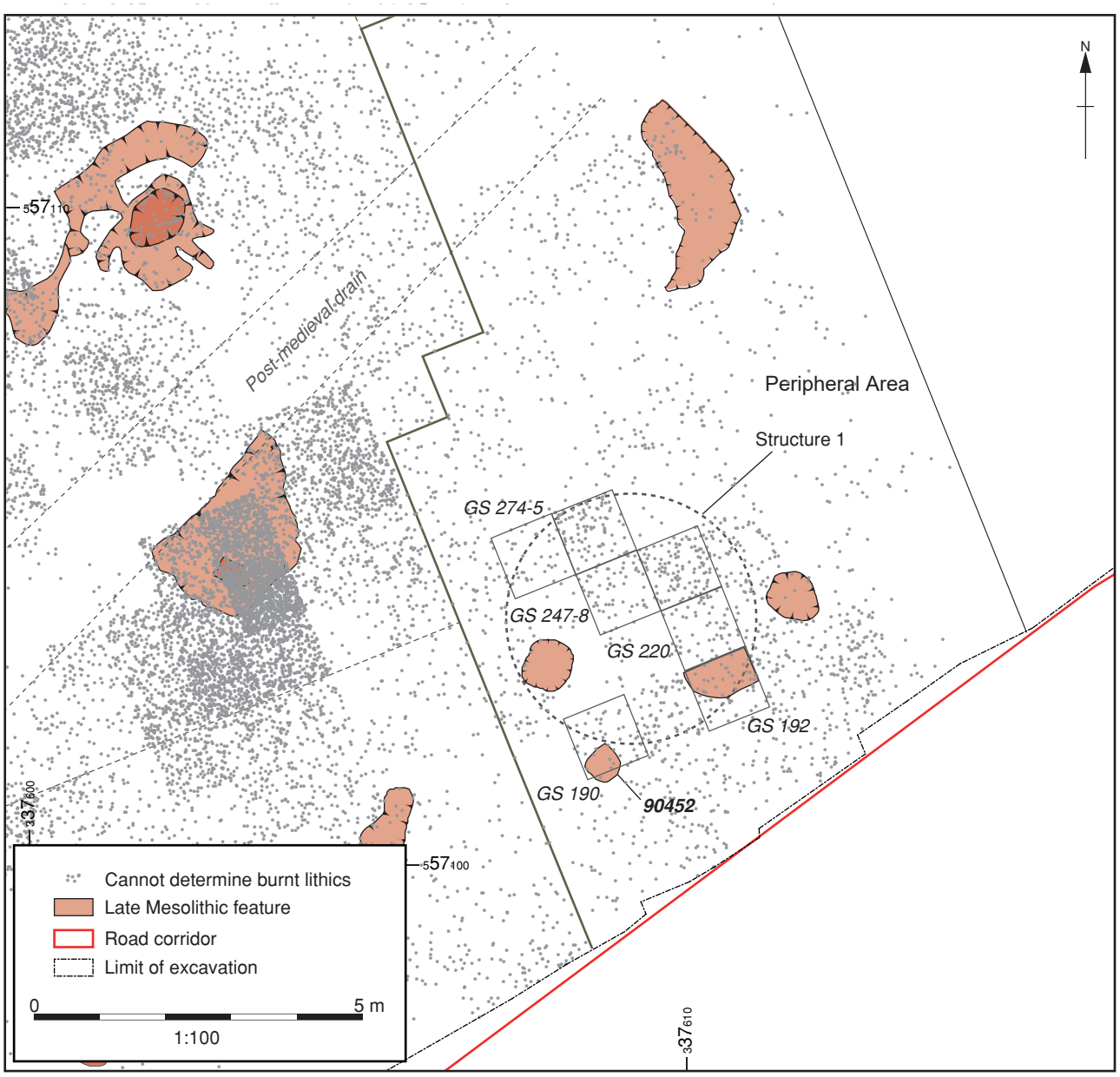

Figure 564: The spatial distribution of 'cannot determine' burnt lithics around Structure 1 in the Peripheral Area

amounts. For example, only four pitchstone artefacts were recorded, including three small flakes. The exception was the 'cannot determine' lithology, mainly burnt items (Fig 564?), these being clustered in grid-square 190, close to hearth ***90452***; grid-squares 192 and 220 in the south-eastern corner; and grid-squares 247, 248, 274, and 275 in the north-east.

Tree-throw 90208

Tree-throw ***90208*** (Fig 565) has been dated to the first half of the fifth millennium cal BC (*Ch 3*; *Appendix 20*), and it contained a flaked lithic assemblage dominated by chert and pebble flint, along with smaller amounts of brown/grey flint, and very little in the way of other raw-material types, other than a few pieces of burnt material (Lithic Entity 25). All stages of the reduction sequence were represented, and average core dimensions, morphology, and reduction schemas were consistent with those from other parts of the site, indicating that they are compliant with the dominant narrow blade, geometric microlith technology employed at Stainton West. Although there was no attribute and technological data available for the unmodified debitage, it is likely that it was associated with the same general reduction sequences as those exhibited by the cores. The secondary technology was also consistent with that from the wider site assemblage and included several examples of the main microlith forms. The exception to this was a teardrop-shaped microlith recovered from fill ***90225***, which appears to be a variant of pear-shaped and boat-shaped microliths (Jacobi 1978a). Several other microliths with a similar morphology have been recorded from the site, and it may be significant that two were recovered from grid-squares 330 and 333, to the south of the tree-throw.

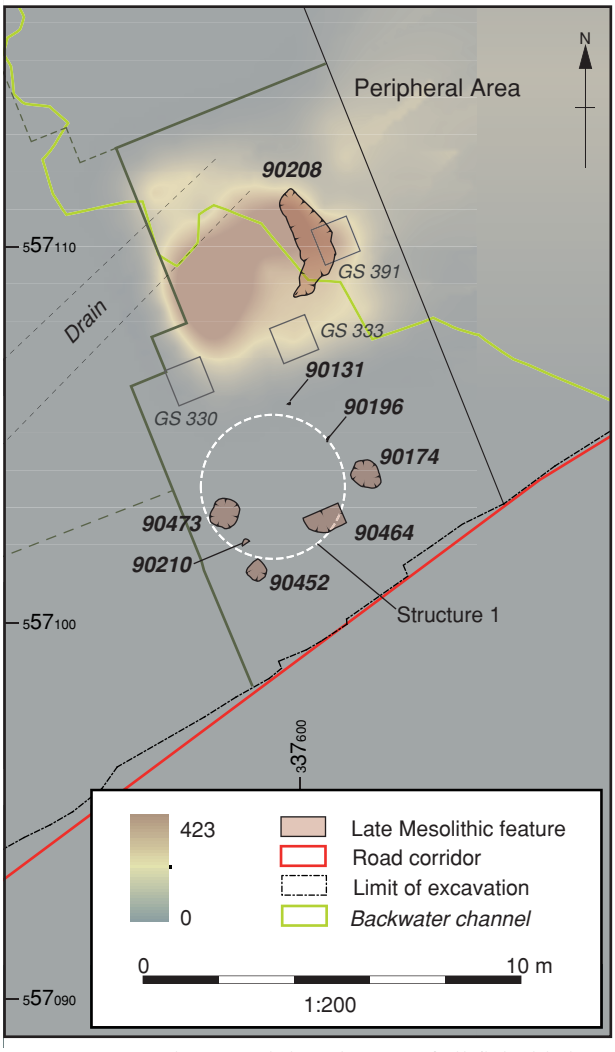

Figure 565: The spatial distribution of all flaked lithic types within tree-throw **90208** *and its environs*

When considering the assemblage as a whole, only partial reduction sequences of any one raw-material type were represented in this feature (Lithic Entity 25), implying that the struck lithics were within a secondary depositional context. For example, all the cores from fill ***90225*** were made on chert, whereas debitage was seemingly under-represented in relation to the number of cores. Moreover, pebble-flint debitage was more dominant within the same fill. Nevertheless, struck lithics representing the initial stages of core preparation, and the early stages of reduction, along with abundant evidence for systematic blade production (illustrated by the greater amount of blade debitage in relation to flake debitage in fill ***90225***), particularly from the reduction of pebble-flint cores, suggests that various raw materials were worked in the vicinity of the tree-throw. This appears to have included the reduction of a brown/grey-flint core (or cores), illustrated by a blade-dominated debitage sequence from fill ***90225***. Further confirmation for this was evident from the large amounts of small-flake debitage contained within the tree-throw. Furthermore, judging by the number of microliths and microlith fragments present, the manufacture, use, and repair of tools was also taking place near to the feature. That the tools had been used is exemplified by possible impact fractures and evidence of edge-use damage on some of the pieces.

The distribution of flaked lithics in the tree-throw included a concentration of material at its northern end. A further concentration extended to the south and west of the feature; however, this probably represents material associated with the Midden Area. There was also a concentration of debitage on its eastern edge, in grid-square 391, which corresponds spatially to material in the feature.

Coarse-stone tools

Coarse-stone tools from this area were few in number (Fig 566). They include several unworn cobbles and a hammerstone that may have been associated with Structure 1 (Lithic Entity 21), whilst a ground stone, an incised stone, a hammerstone, and two unworn cobbles could have been associated with occupation in the vicinity of tree-throw ***90208*** (Lithic Entity 25). It is not clear what activities the coarse-stone tools were put to, but those close to tree-throw ***90208*** were associated with a cluster of ochre, and it is possible that they were linked to the processing (crushing?) of this material.

Discussion: flaked lithics

Structure 1 (Lithic Entity 21), dating to the late seventh/early sixth millennium cal BC (*Ch 3*), was associated with a collection of microliths, which consist of a similar repertoire of implements to those present in the other parts of the *Grid-square area*. Microlith fragments dominate the collection, supplemented by a significant number of backed bladelets. Fine points and scalene triangles are present in much smaller quantities, along with rods, crescents, and obliquely blunted blades. Although no tools or debitage from this area were included in the microwear study, microliths were more common on the northern arc, where there was a concentration of backed bladelets and microlith fragments. Microwear analysis of backed bladelets from other parts of the site indicates that they were used in a variety of tasks, although they have a particular affinity with cutting activities (*Appendix 7*), while the microlith fragments point to the production, use, and maintenance of implements. Furthermore, while the concentration of microliths could indicate the spatial organisation of tasks within the structure, it is more likely that they were the secondary deposition of flaked lithics, material that had been cleared from elsewhere in and around the structure. Other retouched tools were fewer in number and include awl/borers, several simple edge-retouched pieces, four end-and-side scrapers, and five notches.

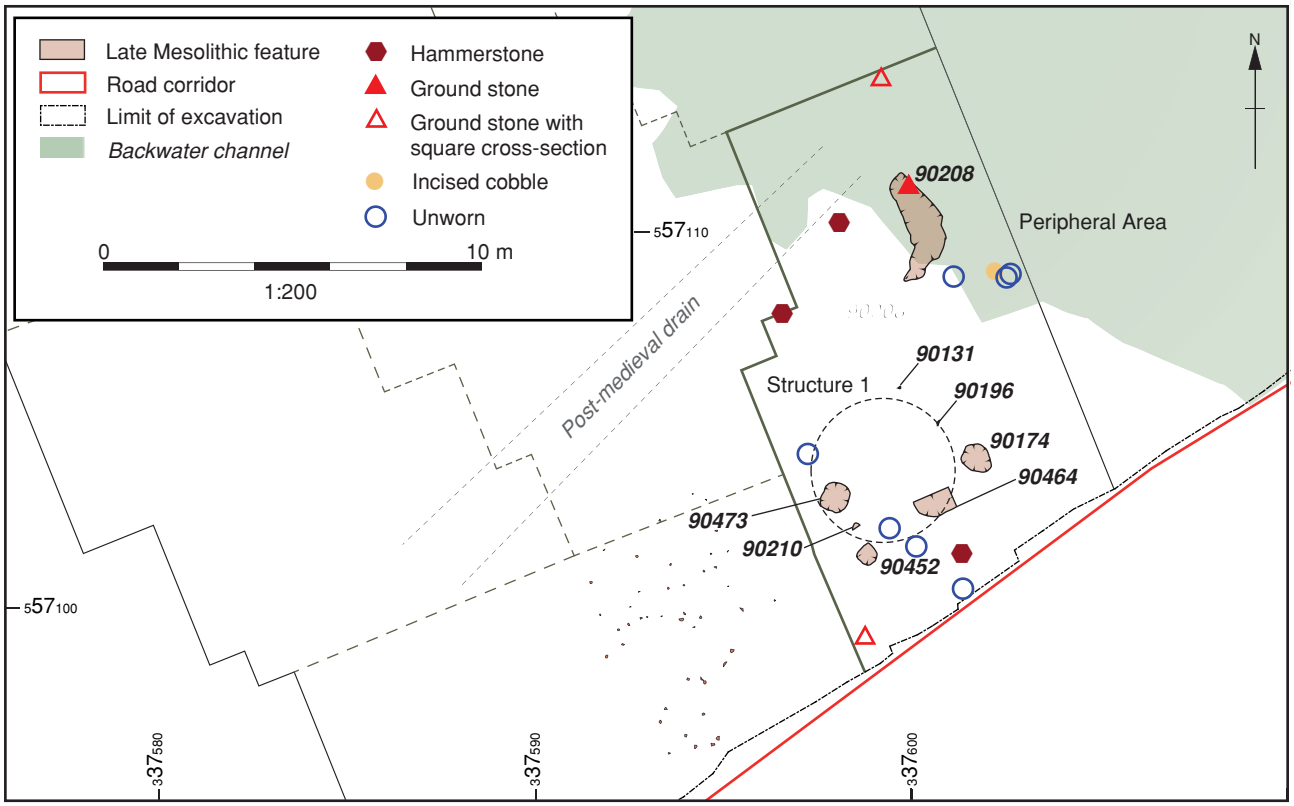

Figure 566: Distribution of coarse-stone tools across the Peripheral Area

As with Structure 1, tree-throw ***90208*** (Lithic Entity 25), which dates to the early fifth millennium cal BC (*Ch 3*), contained brown/grey flint, suggesting links with north-eastern England during this period. Microliths and other retouched tools were also present, probably associated with occupation in the vicinity of the tree-throw. They comprise a small group of tools which, in terms of classifications and numbers, is proportionally similar to the group associated with Structure 1. More specifically, the tree-throw group includes a collection of microlith fragments, backed bladelets, and scalene triangles, from and adjacent to the centre of the feature, whilst other retouched tools were spread throughout it.

Beyond the flaked lithics associated with Structure 1 and the tree-throw, there was a general spread of material across the Peripheral Area, which contained several discrete clusters. These included one of brown/grey flint (Lithic Entity 22) in the central-eastern area, which has been assigned to several knapping groups, but does not reflect complete reduction sequences. A cluster of pebble flint (Lithic Entity 23) was also located immediately to the north, and it is possible that this and the brown/grey flint represent discrete dumps, which could be associated with the midden. It is of interest that, although tuff-flaked lithics are common to this area, including a cluster of material in Structure 1, no fragments of ground-stone tools were present.

Axe-working Area

A further activity zone, apparently associated with Late Mesolithic axe-working, was identified in the northern part of the *Grid-square area* (Table 248; Fig 567). It contained several natural features, specifically the *Backwater channel* and tree-throws ***90522***, ***90508***, and ***90531***, the two latter forming elements of the *'Early Neolithic activity in the Grid-square area'* phase (*Ch 8; Appendix 20*), whilst tree-throw ***90522*** dates to the Late Neolithic period (*Ch 10*). The only possible Late Mesolithic features in this area were pits ***90115***, ***90162***, and ***90516*** (*Ch 4*).

This area also contained 11 lithic entities (Table 249). These seem to reflect Late Mesolithic knapping areas (Lithic Entities 27-31), possible caches of raw materials (Lithic Entities 32 and 34), a discrete cluster (Lithic Entity 33), and a large collection of coarse-stone tools and polished-axe fragments (Lithic Entity 35). In addition, two lithic entities (36 and 37) were assigned to the Neolithic tree-throws, though it was apparent that the majority of the lithics from these were Late Mesolithic in date.

Brown/grey flint

Brown/grey flint had a dispersed spatial distribution across the Axe-working Area (Fig 568), although within this broad spread two discrete clusters of flaked lithics can be tentatively identified, containing all stages of the reduction sequence. The first was situated in the north-west corner of the area and

Features/ Sample Areas	Late Mesolithic flaked lithics			Coarse-stone, ochre, and stone implements	Dating evidence
	Assemblage	Knapping groups (KG)	Sourcing studies		
Backwater channel Tree-throws ***90508***, ***90522***, and ***90531*** Pits ***90115***, ***90162***, and ***90516***	General spread of lithics associated with *Backwater channel*, along with cluster of flaked and whole pebbles which may form part of a dump/ cache Discrete area of early knapping activity (associated with the *Principal palaeochannel* and the western edge of *Grid-square area*) General spread in the *Grid-square area*, along with clusters of brown/ grey flint; pebble flint; brown, grey, and black chert; and tuff. These represent *in-situ* reduction, some of which has been disturbed by later activity	Brown/grey flint 16, 17, and 91; pebble-flint 110; chert 1, 29, 92, and 103; tuff 112 and 113; other 109; and cannot determine 114 and 96	Chert IG1 sub-group 2 (KG 92); IG1 sub-group 4 (KG 1); IG1 sub-group 5 (KG 29) Brown/ grey-flint samples included in the flint-sourcing study	Large collection of coarse-stone tools Concentration of anvils, ground stones, and hammerstones in north-east corner of the area Dispersed spread of cobble tools, cores, flakes, and incised stones Large number of unworn cobbles, including a cluster associated with a collection of flaked and whole chert pebbles Only a few small fragments of ochre present An axe/adze and a polished-axe fragment associated with a concentration of (mainly volcaniclastic) coarse-stone tools in the north-eastern part of the area Two polished-axe fragments associated with a dense concentration of flaked tuff (KG 112 and 113) and several microliths; this relates to the late Mesolithic reworking of ground-stone implements A fragment from a Group VI polished axe came from natural deposits sealed below the late Mesolithic alluvium filling the *Backwater channel*; indicates this item dates to the late Mesolithic period	Tree-throws ***90508*** and ***90531*** date to the '*Early Neolithic activity in the Grid-square area*' phase Tree-throw ***90522*** dates to the Late Neolithic period

Table 248: Defining characteristics of the Axe-working Area

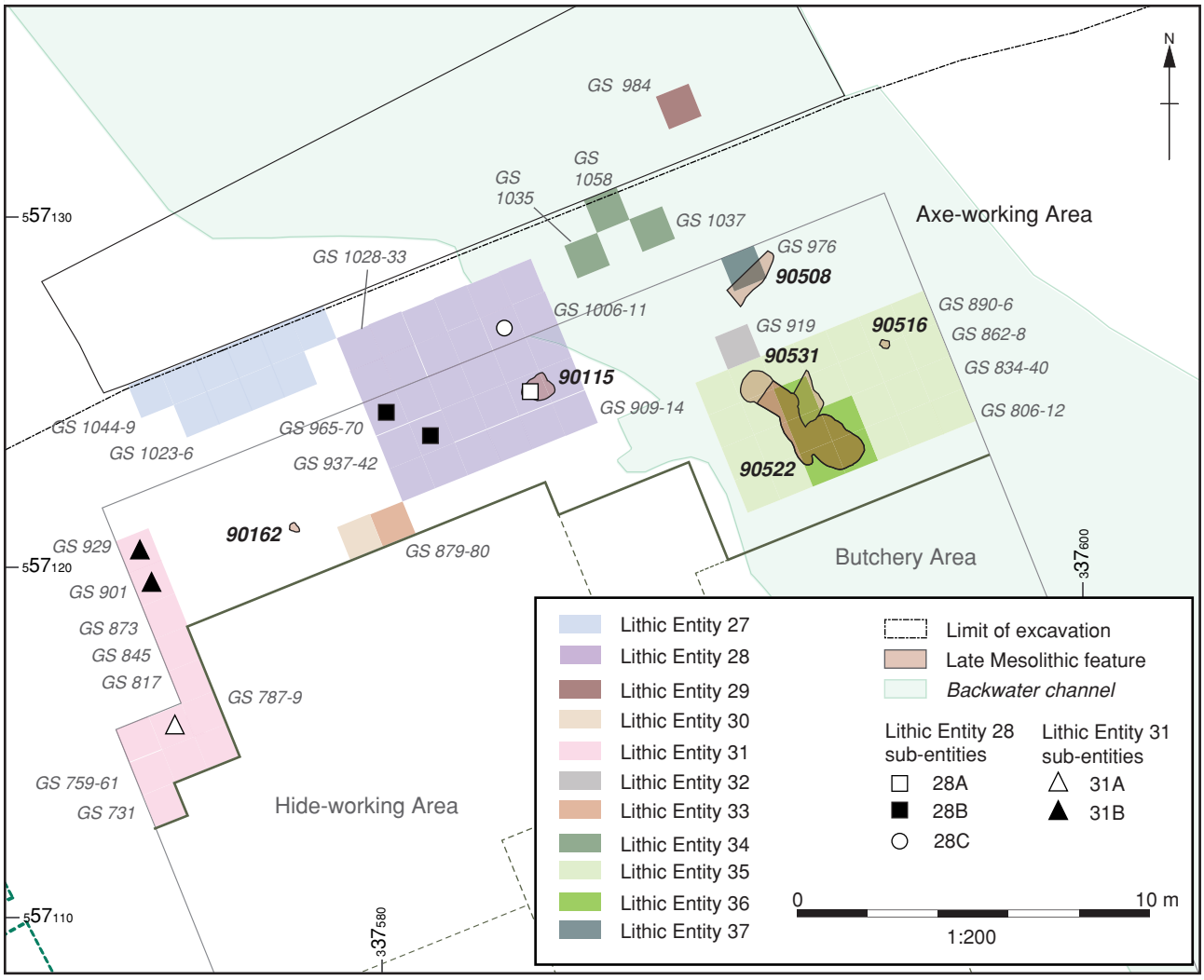

Figure 567: Archaeological and natural features, and Lithic Entities 27-37, in the Axe-working Area

Lithic Entity	Description	Lithic sub-entity	Description
27	Late Mesolithic worked stone associated with a possible knapping area (grid-squares 1023-6 and 1044-9)	-	-
28	Late Mesolithic worked stone associated with possible knapping area (grid-squares 909-14, 937-42, 965-70, 1006-11, and 1028-33). Includes knapping groups 112 and 113	28A	Collection of chert debitage and tools (grid-square 941)
		28B	Cluster of flaked tuff (grid-squares 938 and 965)
		28C	Cluster of flaked tuff (grid-square 1010)
29	Late Mesolithic worked stone associated with possible knapping area, or dump of lithic waste (grid-square 984). Includes knapping groups 91 and 92	-	-
30	Possible *in situ* chert, pebble-flint, and pitchstone knapping area (grid-squares 879 and 880)	-	-
31	Late Mesolithic worked stone associated with possible knapping area (grid-squares 731, 759-61, 787-9, 817, 845, 873, 901, and 929)	31A	Possible chert and pebble-flint knapping area (grid-square 788)
		31B	Possible chert and pebble-flint knapping area (grid-squares 901 and 929). Includes knapping groups 103 and 114

Table 249: Lithic entities within the Axe-working Area

Lithic Entity	Description	Lithic sub-entity	Description
32	Concentration of flaked and whole chert pebbles, which may represent a raw-material cache (centred on grid-square 919)	-	-
33	Cluster of pebble-flint flaked lithics (grid-square 880)	-	-
34	Possible cache of pebble-flint pebbles (grid-squares 1035, 1037, and 1058)	-	-
35	An axe/adze and a collection of coarse-stone tools and polished-axe fragments (items from grid-squares 722-8, 750-6, 778-84, 806-12, 834-40, 862-8, and 890-6)	-	-
36	Late Mesolithic worked stone from intercutting tree-throws ***90522*** and ***90531***	-	-
37	All worked stone from tree-throw ***90508***	-	-

Table 249: Lithic entities within the Axe-working Area (cont'd)

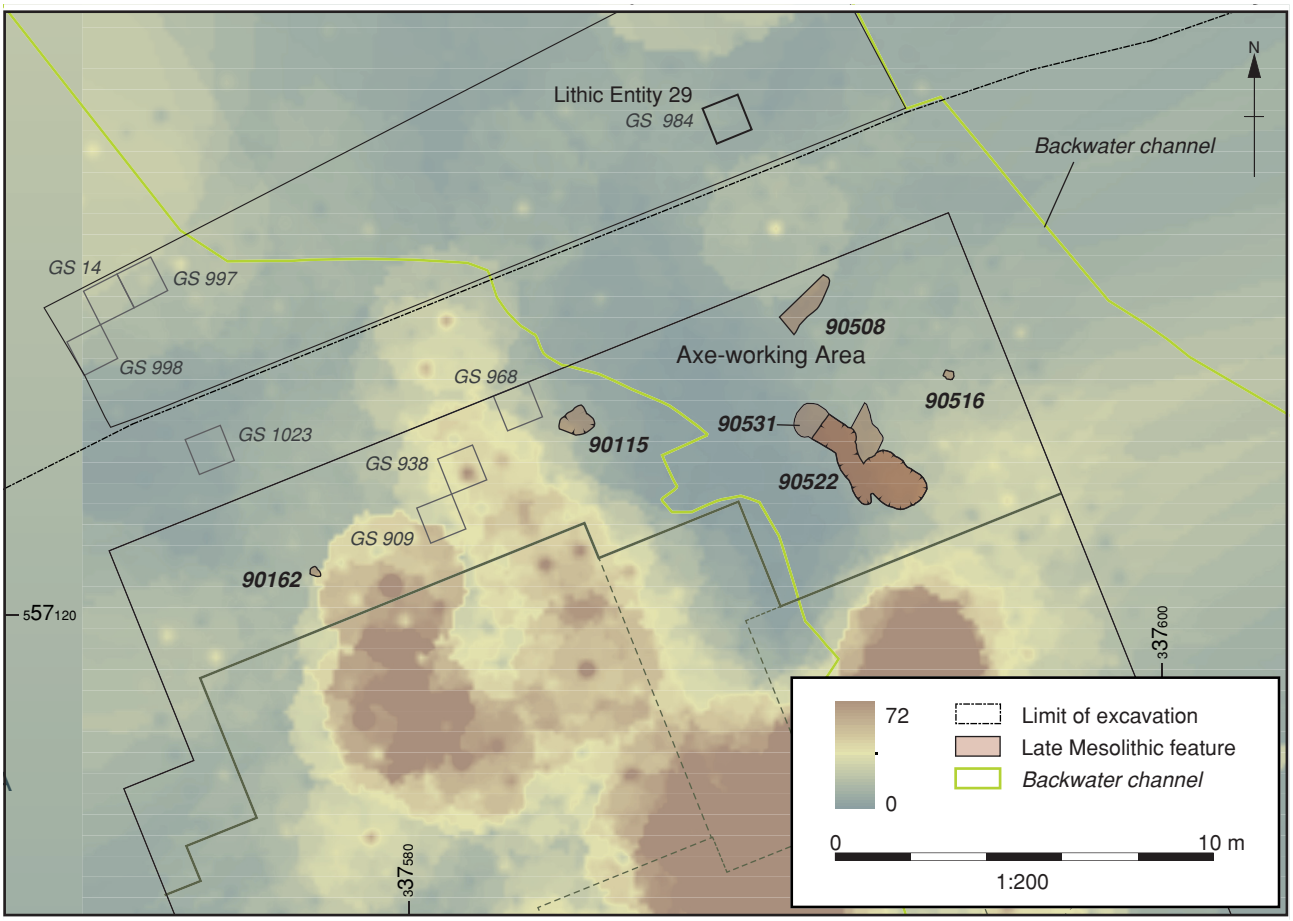

Figure 568: The spatial distribution of brown/grey-flint cores and debitage across the Axe-working Area

was focused on grid-square 1023 and adjacent grid squares (comprising Lithic Entity 27; *above*). It is also possible that this concentration continued to the north-west into grid-squares 14, 997, and 998. The second cluster was located in grid-squares 909 and 938 (part of Lithic Entity 28), and, potentially, others to the south. There were also large concentrations of cores in this part of the *Grid-square area*, which were associated with a minimal amount of debitage and are unlikely to relate to *in-situ* reduction. Small numbers of microliths were present in both of the clusters, but they were more common in the north-west. There,

they included four backed bladelets and two scalene triangles; however, the problems in identifying brown/grey-flint microliths could account for the overall small number, and make any interpretation relating to tool use misleading. Non-microlithic retouched tools and edge-utilised pieces also occurred in, or near, both clusters, and included five edge-retouched pieces and two knife forms.

Another potential cluster of brown/grey flint was located in grid-square 984 on the north-eastern edge of the site (Lithic Entity 29). The majority of this material formed part of knapping group 91 (*Appendix 3*) and included lithics from several stages of a generalised reduction sequence. Although no cores were found in the knapping group, a single specimen was present within the related assemblage, though seemingly not associated with it. The majority of the flaked lithics in grid-square 984 were associated with the *Mesolithic overbank alluvium* (***90181***) within the *Backwater channel*.

Beyond the clusters, the wider spread of brown/grey-flint flaked lithics included two knapping groups (16 and 17: *Appendix 3*), which were both found in grid-square 968. Knapping group 16 consists of two flakes struck from the same nodule, while knapping group 17 consists of five chunks of the same material. Neither knapping group contains full-reduction sequences and it is probable they were secondary dumps of material. The wider spread showed very little spatial patterning, and it is possible that stone-working activity in this material may have been disturbed by later occupation. In this respect, the flint is part of a larger concentration of other types of raw material.

Pebble flint

Two main spreads of pebble flint were situated within the Axe-working Area, which corresponded closely to the two zones of chert (*ie* the central zone and western zone). However, there was a slight variation for the pebble flint in the horizontal extent of these zones.

In the central zone, while the pebble flint was distributed across the same area as the chert, it also extended to the south, taking in grid-squares 909-13 (Fig 569; part of Lithic Entity 28). Within this broad spread, several clusters of cores and debitage were present, which potentially relate to *in-situ* knapping. They were focused on grid-squares 909, 910, 937, and 938; grid-square 1006 and adjacent grid squares to the north and west; and also possibly grid-squares 965, 1008-11, and 1030. At least two of these clusters overlapped spatially with chert clusters, although the pebble-flint appears more extensive, particularly

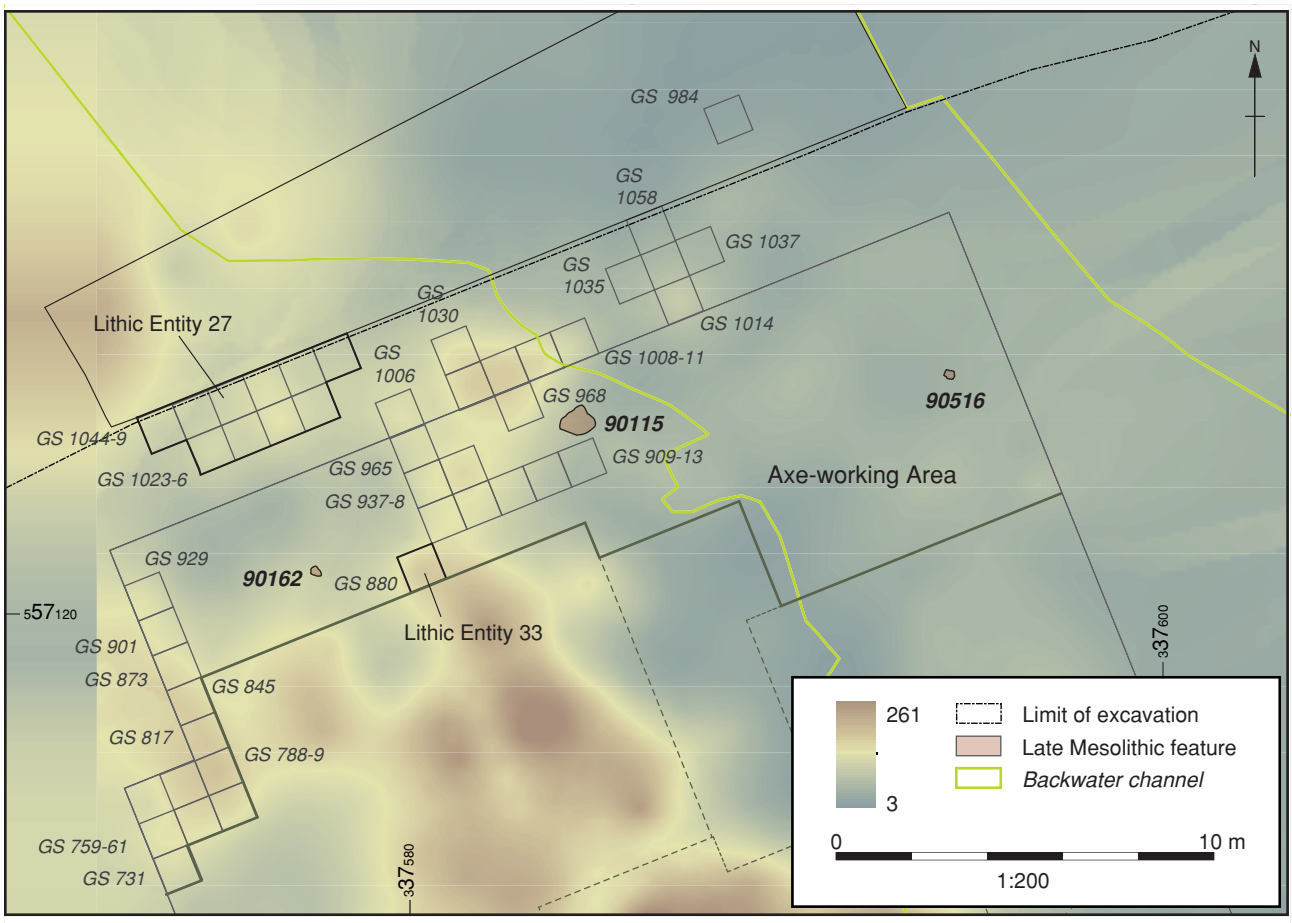

Figure 569: The spatial distribution of pebble-flint cores and debitage across the Axe-working Area

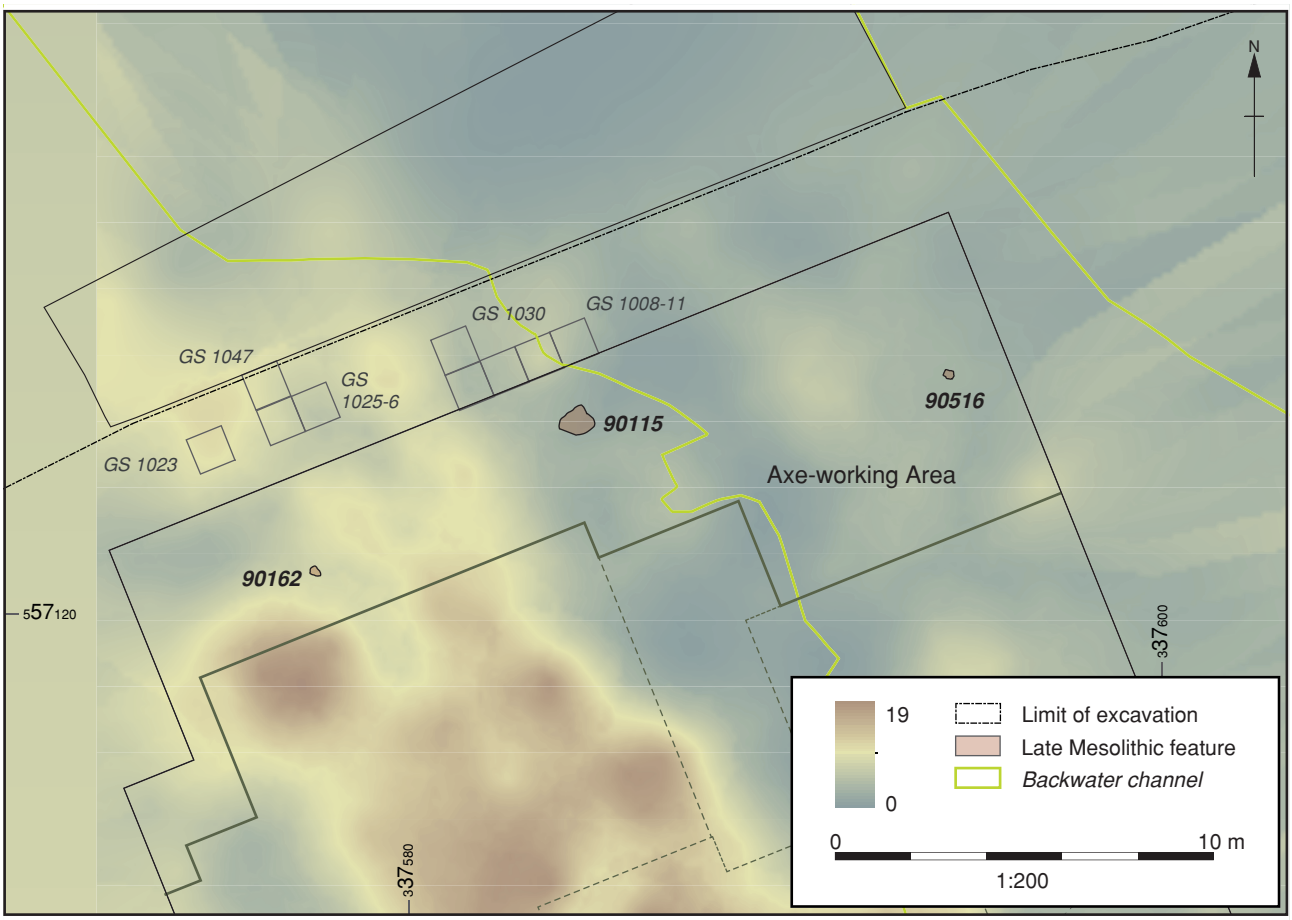

Figure 570: The spatial distribution of pebble-flint microliths across the Axe-working Area

the material encompassing grid-squares 1008-11 and 1030. In all these areas, flaked lithics from all stages of the reduction sequence were present, implying the *in-situ* reduction of pebble flint. Although few knapping groups were recorded, two flakes of a distinctive type of pebble flint were located in grid-square 968. Interestingly, grid-squares 1008-11 and 1030 contained very few pebble-flint microliths, though they were more prevalent in the surrounding grid squares (Fig 570). They mainly comprised backed bladelets and microlith fragments, suggesting manufacture and use were taking place. Furthermore, several flaked pebbles were spread throughout the northern central spread of lithics. These consist of a mixed group of flint, chert, and chalcedony (red chert?) pebbles and their presence adds support to the notion for *in-situ* reduction in this part of the site.

In the western zone, pebble flint was concentrated in grid-squares 1023-6 and 1044-9 (Lithic Entity 27), the cluster also overlapping with the other types of raw material in the same area. However, the pebble-flint clusters in grid-squares 1023, (possibly extending into adjacent grid squares to the north, south, and east), 1025, 1026, and 1047 were less dense than the chert concentrations. Again, lithics from all stages of the reduction sequence were present in these clusters, including significant numbers of microliths, again suggesting that *in-situ* reduction could have taken place in this area.

Concentrations of pebble-flint were also present in the grid squares to the north of the two main zones, indicating that its use extended beyond the northern limits of the *Grid-square area*. There was also a cluster (Lithic Entity 33) focused on grid-square 880, to the south-west of the central zone. Although this material did not include cores, core fragments were present, and they were recorded in adjacent grid squares.

Pebble flint was associated with the *Colluvium* and deposits filling the *Backwater channel* and, though much of this formed an undifferentiated spread, a possible cluster was centred on grid-square 2014; however, the fact that this was associated with the *Colluvium* could indicate redeposited material. To the north and east, a small collection of whole pebbles was located in grid-squares 1037 and 1058 (Lithic Entity 34). In nearby grid-square 1035, five unworn cobbles and a fragment of a coarse-stone core were also recorded, and it is possible that these had been dumped or were a cache; again, though, the material was recovered from the *Colluvium* and could have been redeposited.

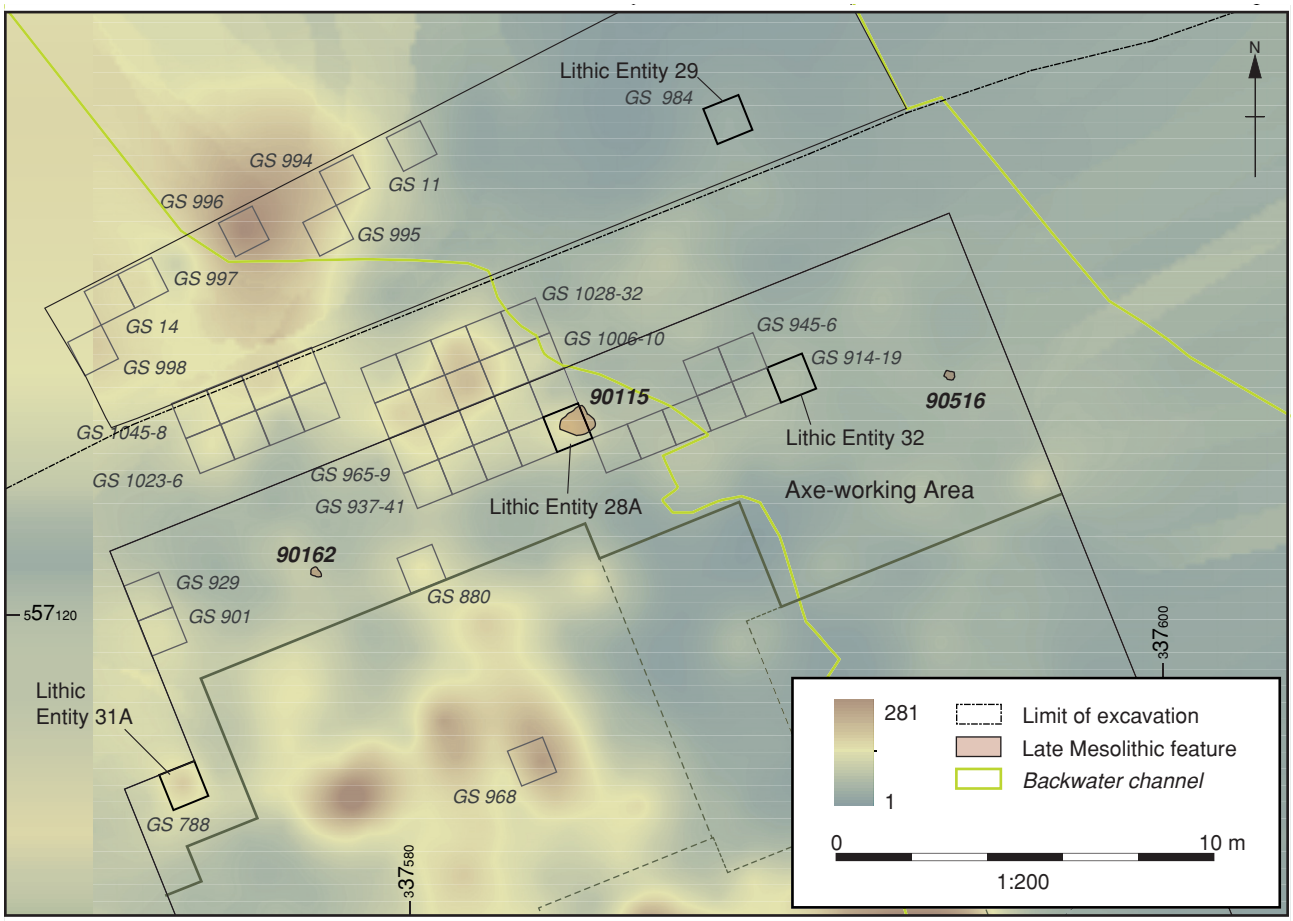

Figure 571: The spatial distribution of chert cores and debitage across the Axe-working Area

Finally, a spread of flaked pebble flints was identified on the north-western edge of the *Grid-square area*, with clusters in grid-squares 731, 759-61, 788, 789, 817, 845, 873, 901, and 929 (Lithic Entity 19). This formed part of a larger concentration, which also included a significant amount of chert (*below*). The material also continued into the eastern fringes of the *Principal palaeochannel*, and probably represents an early phase of activity.

Chert

A dense and widespread concentration of chert was located in the Axe-working Area (Fig 571). This was mainly spread over an area comprising two distinct zones: in the centre, with material derived from grid-squares 937-41, 965-9, 1006-10, and 1028-32 (part of Lithic Entity 28); and a western zone, which was defined by material from grid-squares 1023-6 and 1045-8 (part of Lithic Entity 27). Chert associated with both of these zones probably also continued into the grid squares to the north, where significant amounts of worked material were recorded in grid-squares 11, 14, and 994-8.

In the central zone (within Lithic Entity 28), all stages of the reduction sequence were represented, and probable stone-working activity appeared to have been focused on grid-squares 1006-8 and 1030, where significant concentrations of small flakes, blade chips, and chunks were present. A similar assemblage was contained in the western zone, where small flakes, blade chips, and chunks were strongly represented in grid-squares 1023-4, 1026, 1045, and 1047-8 (within Lithic Entity 27).

Relatively large numbers of microliths (36 items) were found in the central zone, comprising eight backed bladelets, six fine points, 12 microlith fragments, and ten scalene triangles, with significant concentrations in grid-squares 937 and 941 (Lithic Entity 28A; Fig 572). Other retouched tools were also present in the central zone, including an awl and a knife, the former being recovered from grid-square 937.

Fewer microliths (19) were, however, present in the western zone, with backed bladelets (six) and scalene triangles (seven items) being the dominant forms. Within this area, microliths were concentrated in grid-squares 1023 and adjacent grid-square 1045. Other retouched tools were sparsely represented, with a single awl from grid-square 1023.

Elements of knapping group 1 were also located in the western zone, principally in grid-square 1026, with

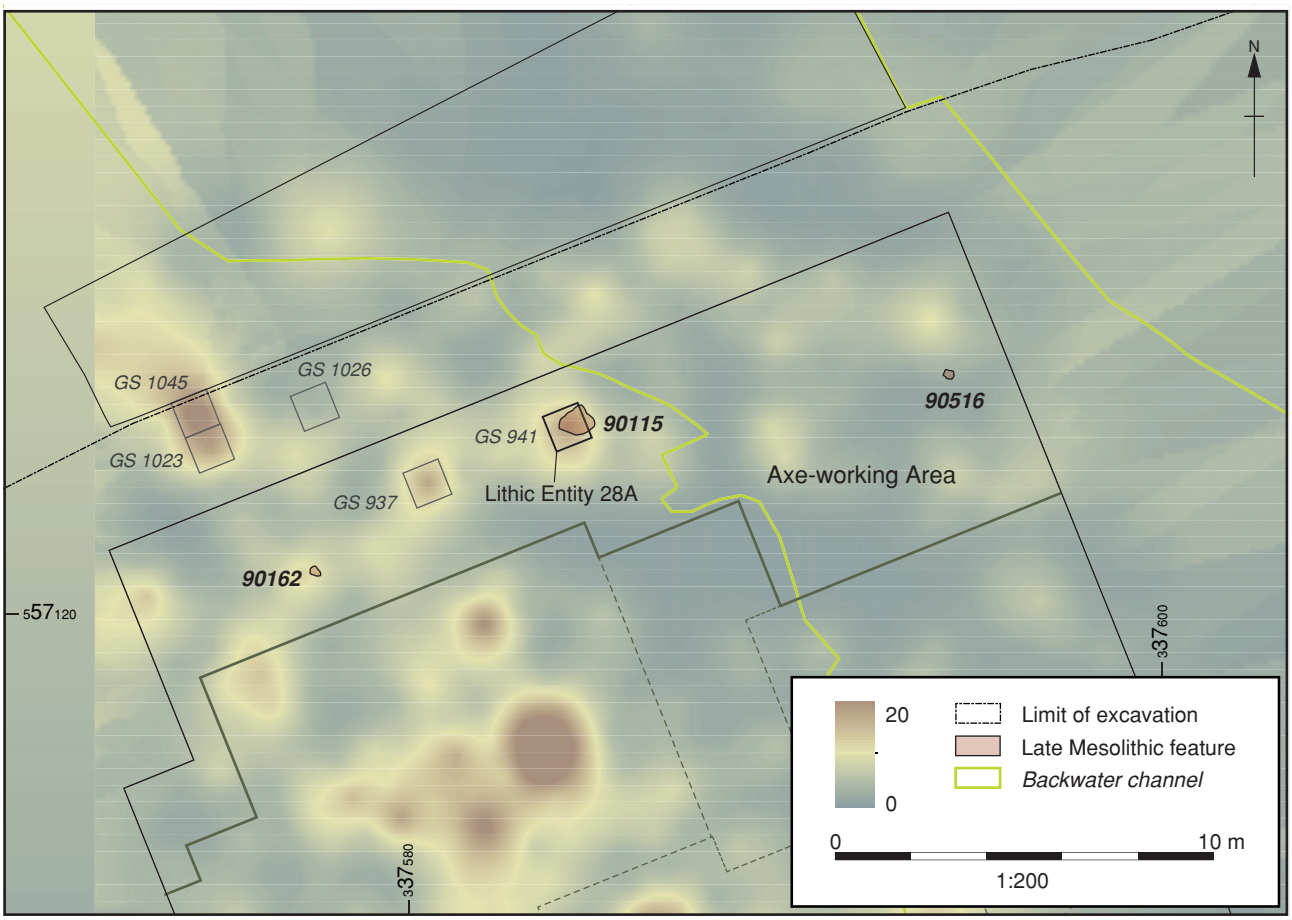

Figure 572: The spatial distribution of chert microliths across the Axe-working Area

smaller amounts of this material in the central zone. This knapping group comprises a large amount of a distinctive grey chert (*Ch 4*; *Appendix 3*), which has a wide distribution across the site, linking all of the Late Mesolithic activity areas.

Apart from the two distinct zones of chert, other possible concentrations were defined by a collection of debitage and tools, including microliths, in grid-square 941 (Lithic Entity 28A), which were associated with pit ***90115*** (Fig 571). A core, blades, flakes, chunks, and small-flake debitage were also present in grid-square 880 (part of Lithic Entity 30), and these probably relate to *in-situ* knapping. A further concentration of chert was present in grid-squares 788, 901, and 929, forming part of a larger concentration of flaked lithics, which included a wide range of lithic types (Lithic Entity 31). This material also continued into the eastern edge of the *Principal palaeochannel*, where it was sealed by Burnt Mound 2, and probably represents activity associated with an early phase of Late Mesolithic activity.

A concentration of flaked and whole chert pebbles was also present in the north-east corner of the *Grid-square area*, focused on grid-square 919 (Lithic Entity 32). Six flaked and two whole pebbles were present in grid-square 919, while 11 pieces were spread throughout the rest of the grid squares (914-18, 945, and 946) to the west. The majority were derived from the *Mesolithic overbank alluvium* (***90181***) within the *Backwater channel* and they comprise ten flaked and whole pebbles of black chert, along with three other flaked chert pebbles and a single flaked flint pebble. The remainder were associated with the *Stabilised land surface* (***90003***) on the western edge of the *Principal palaeochannel*, whilst a single piece was from the *Colluvium* (***90002***). These items include two chert, two flint, and a chalcedony (possible red chert?) pebble. The group was identified in a part of the site where there were no significant concentrations of flaked lithics, and they probably represent a dump of material deemed not suitable for further working, or a potential raw-material cache. Indeed, some of the black-chert nodules are relatively large, which could possibly support the latter interpretation. Additionally, at least one piece has a coarse angular cortex, suggesting a provenance from, or near to, a primary source for some of this chert. It is of note that three unworn cobbles were also located in the grid squares to the north and east of grid-square 919 (*above*).

A cluster was also recovered from grid-square 984 on the northern edge of the *Grid-square area*

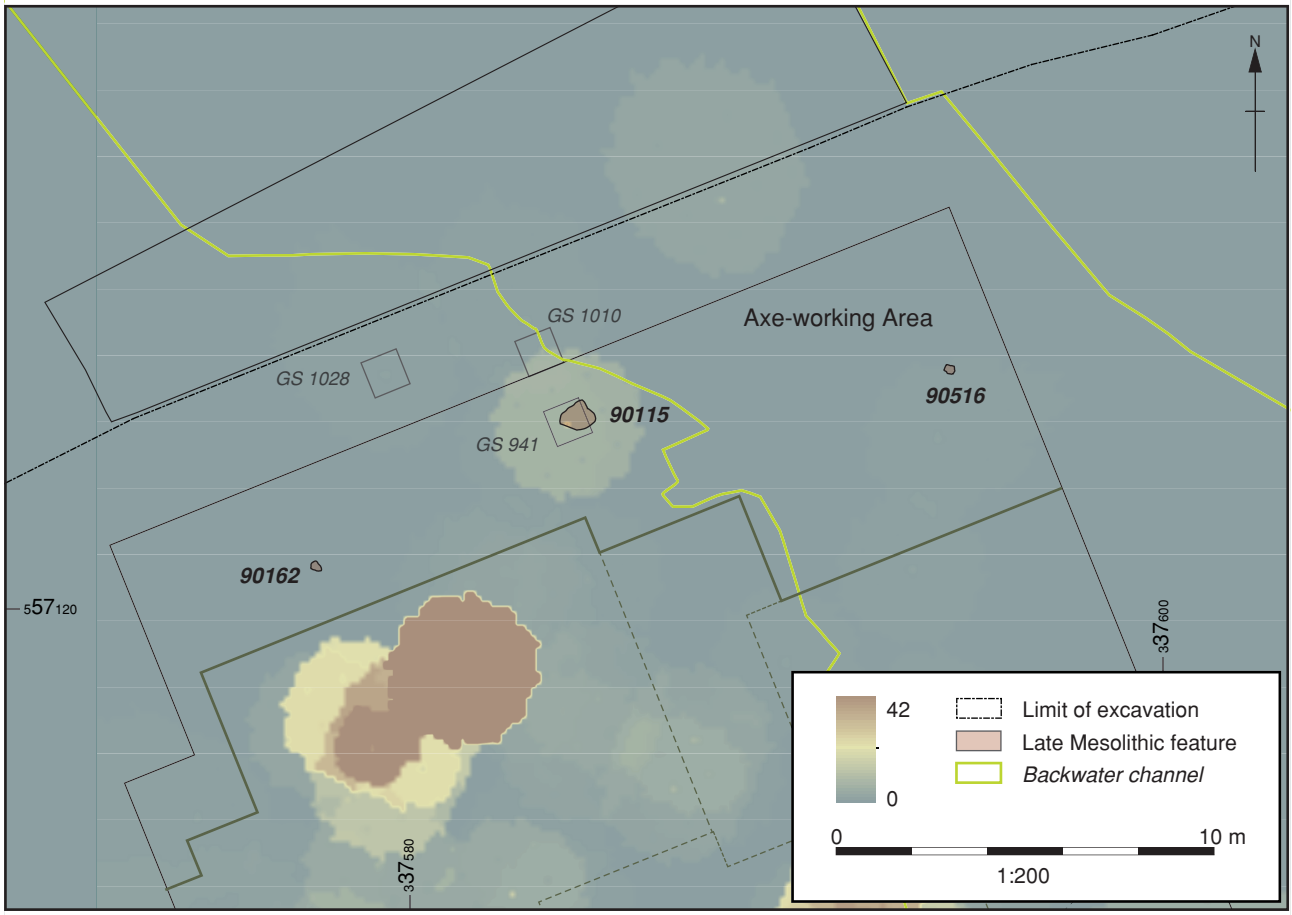

Figure 573: The spatial distribution of SSUC debitage across the Axe-working Area

(Lithic Entity 29). This is of interest as it comprises knapping group 92 and was also associated with a concentration of brown/grey flint and smaller quantities of other raw materials, including pebble flint. Although, given the isolated nature of this material, it is unclear what the concentration related to, it could represent another stone-working area, or a dump of lithic waste. Finally, a cluster of burnt chert was located in grid-square 788 (Lithic Entity 31A). This probably relates to occupation activity on the edge of the *Principal palaeochannel*, or material that had become heat-affected during activity associated with the overlying burnt mound (Burnt Mound 2; *Ch 11*).

SSUC

There were several discrete clusters of Scottish Southern Uplands chert, though these only contained small numbers of specific types of lithic debitage (Fig 573). For example, there was a collection of narrow blades in grid-square 941, and two clusters of small flakes in grid-squares 1010 and 1028. All were situated within a large spread of flaked lithics (Lithic Entity 28), which was mainly associated with the reduction of chert and pebble flint, and also contained a dispersed spread of microliths and other retouched tools.

Pitchstone

The majority of the pitchstone in this area had a random distribution; however, two blade chips and a broad blade were present in grid-square 914 (Fig 574; part of Lithic Entity 28). This material, and three irregular flakes and a blade chip located to the north and east, was situated on the periphery of a large spread of flaked pebble flint. A second small collection of chunks and flakes was centred on grid-square 879, immediately to the west of a cluster of chert and pebble flint focused on grid-square 880 (Lithic Entity 30).

Tuff and polished-tuff axe fragments

There was a large spread of tuff, comprising material from all stages of the reduction sequence, in the Axe-working Area, with particularly strong clusters in grid-squares 938 and 965 (Lithic Entity 28B), and 1010 (Lithic Entity 28C; Fig 575). All contained microliths, and they were also found in adjacent grid squares. Some of the flaked tuff in grid-squares 938, 939, and 965 was assigned to knapping groups 112 and 113 (*Ch 4*; *Appendix 3*), which suggests that there was integrity to the clusters, it being of interest that the majority were from deposits associated with the *Stabilised land surface* (***27109*** and ***90003***). However, it should be noted that, while all stages of the reduction sequence were

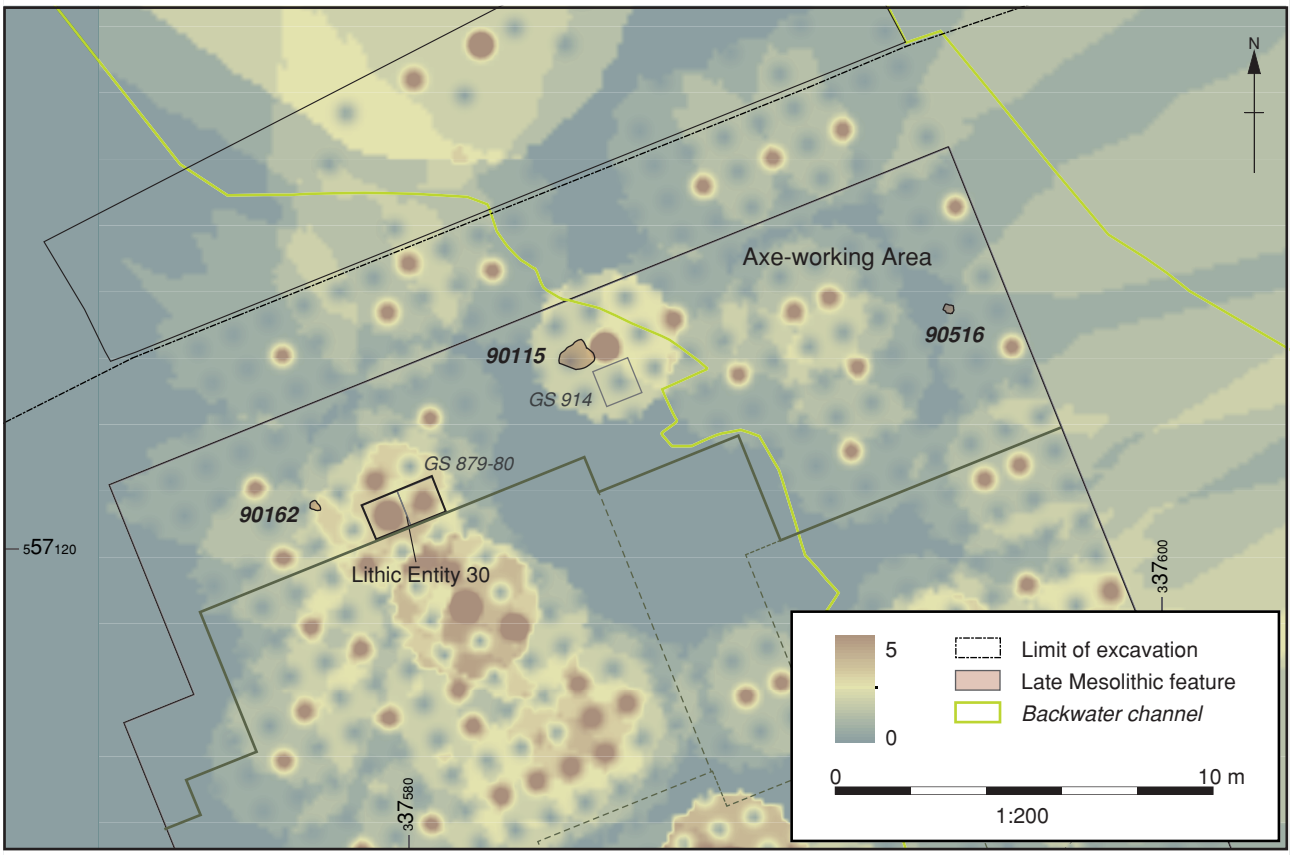

Figure 574: The spatial distribution of pitchstone debitage across the Axe-working Area

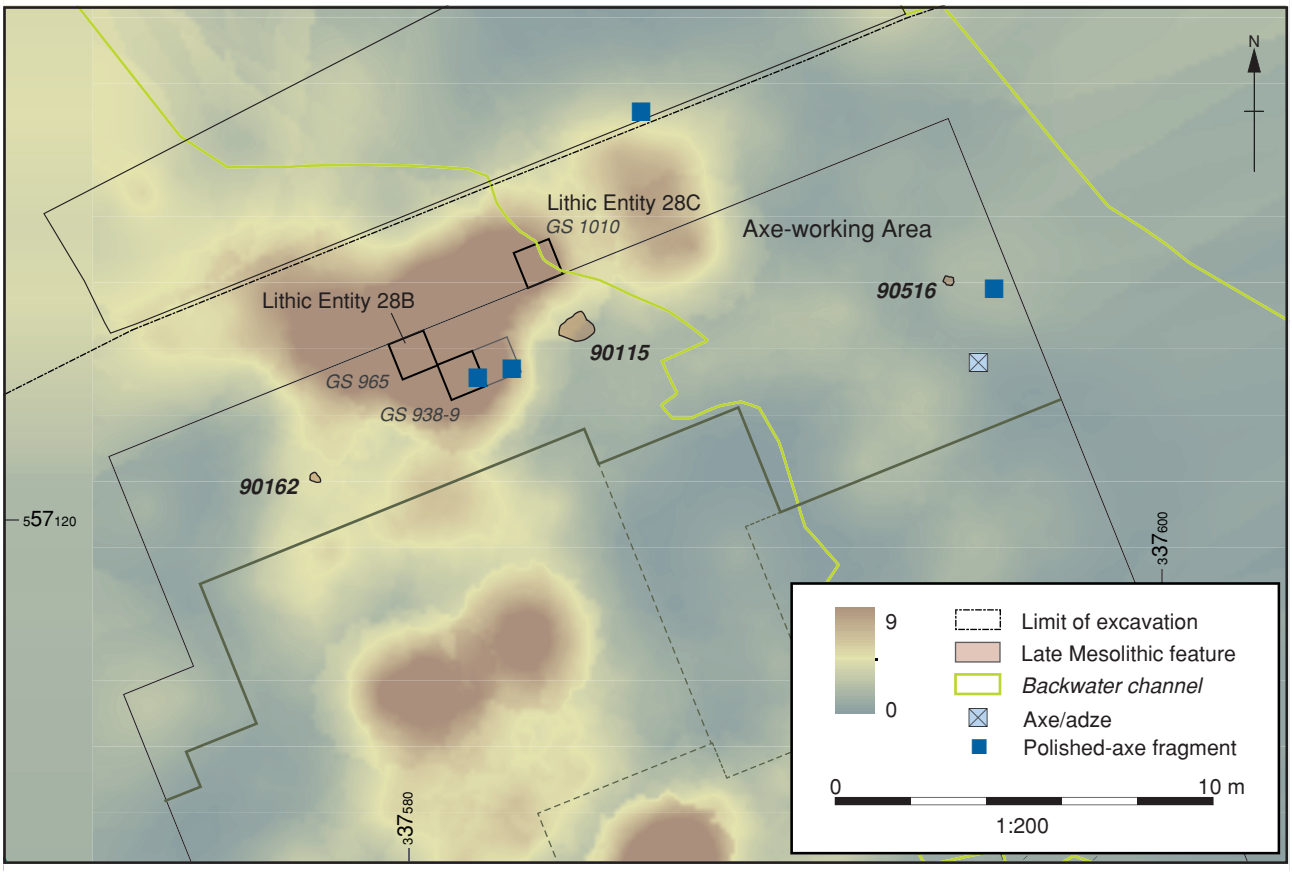

Figure 575: The spatial distribution of tuff cores and debitage, and stone implements, across the Axe-working Area

represented in this spread, the amount of different lithic types was relatively small and, beyond the main clusters, had a scattered distribution. In this respect, it is possible that the flaked tuff represents knapping that had been disturbed by later activity.

Two polished-tuff flakes had a close spatial association and were associated with the wider spread of tuff debitage and tools, including several microliths and knapping groups 112 and 113 (*above*). It is therefore possible that, during the Late Mesolithic period, the reduction of ground-stone tools (probably polished axes) was undertaken in this part of the site. Moreover, given that the two flakes are made from different types of tuff (dacite and andestic tuff; *Ch 4*; *Appendix 6*), the reworking of at least two ground-stone tools must have taken place. In addition, other fragments from polished-stone axes were present, including one tuff fragment from the *Mesolithic overbank alluvium* filling the *Backwater channel*, and another from a peaty deposit (***90571***) lying above the channel. The former object is probably of Late Mesolithic date, given that its parent deposit accumulated in the mid-fifth millennium cal BC (*Appendix 20*), whilst the date of the latter is not entirely clear.

Of greater significance is a polished-stone axe fragment from the base of the *Backwater channel*, which, given its stratigraphic position, clearly attests to the Late Mesolithic reworking of such axes. However, this reworked fragment also holds further significance, as petrological analysis indicates that it was made from Group VI tuff, from Langdale in the central Cumbrian fells (*Appendix 6*). It therefore implies that the stone sources at Langdale were being accessed during the Late Mesolithic period, prior to their more intensive exploitation (Bradley and Edmonds 1993).

A complete axe/adze (*Appendix 2*) was also recovered from the *Mesolithic overbank alluvium* filling the *Backwater channel*, and is therefore likely to date to the Late Mesolithic period as well. Although it appears to be an isolated artefact, several pieces of flaked tuff were present in nearby grid squares, but not in any significant concentrations. It is possible the axe/adze was associated with the several coarse-stone tools and unworn cobbles from the *Backwater channel*, and that these, along with other ground-stone tools, represented by the tuff fragments with polished surfaces, were used in a related activity. This may specifically relate to the production or reworking of polished-stone tools in this part of the site.

Ochre

Only a very few small fragments of ochre were present within the Axe-working Area. These included two fragments from the *Backwater channel*, and a fragment and some crumbs to the west (Fig 576).

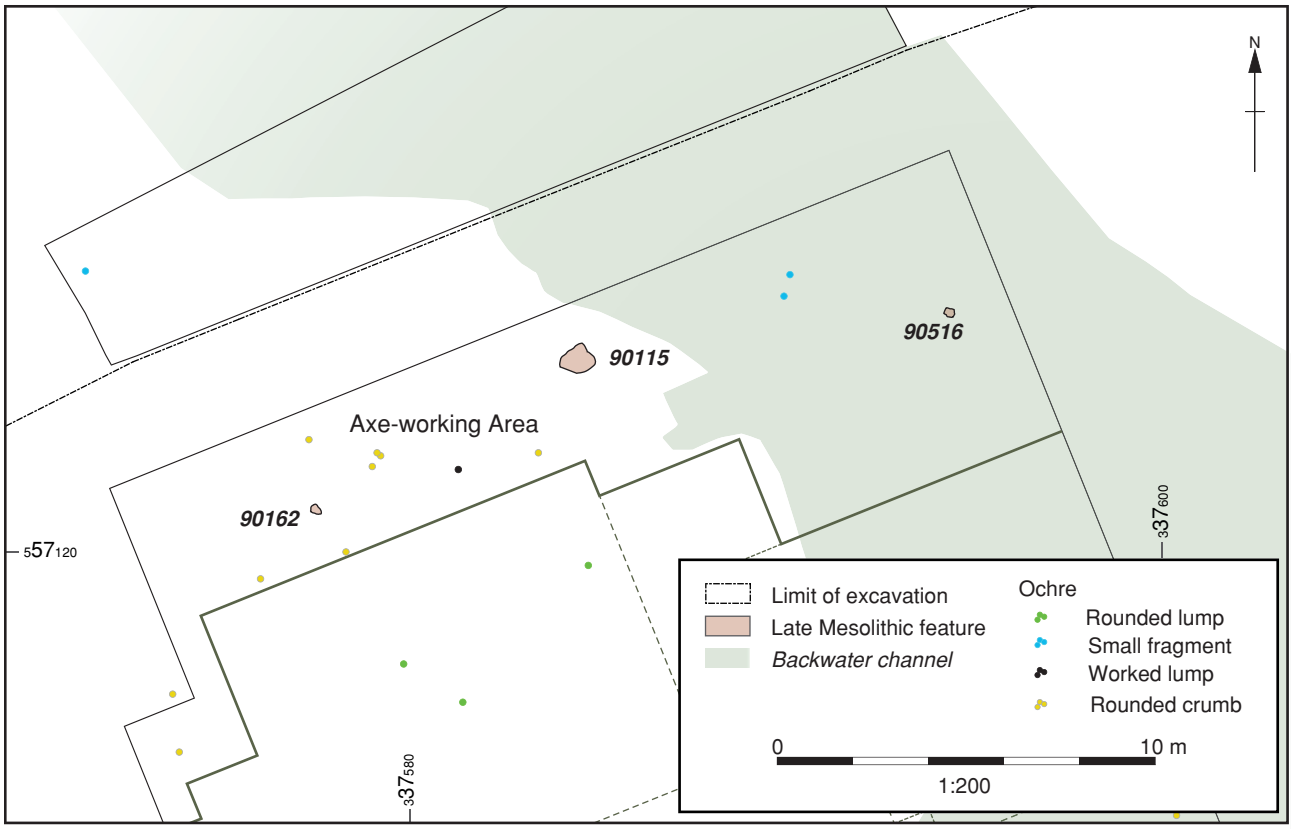

Figure 576: Distribution of ochre in the Axe-working Area

The Mesolithic alluvium

A collection of lithics within the *Principal palaeochannel* was associated with the *Mesolithic alluvium* (***70097*** and ***70321***), the *Mesolithic overbank alluvium* (***90202***), and the *Basal sands and gravels* (***90039***) beneath Burnt Mound 2 (*Ch 11*), which probably related to a larger spread of flaked lithics (Lithic Entity 31; Fig 577). This assemblage contains ten complete cores, representative of single and multiple platforms, and bipolar reduction strategies, along with a large collection of core fragments, mainly reflecting the reduction of chert and pebble flint, along with the limited reduction of brown flint, material of the 'cannot determine' lithology, and possibly basalt. The majority of the cores and core fragments were derived from grid-squares 873, 901, and 929. Interestingly, six of the ten core fragments and cores associated with the *Mesolithic alluvium* were identified adjacent to these grid-squares, providing a spatial, and probably chronological, affinity between the two groups of flaked lithics. Core-dressing pieces, representing the maintenance of pebble flint, chert, and cores of the 'cannot determine' lithology, were also recovered, the majority from grid-squares 901 and 929. A brown-flint core-trimming piece was associated with the latter grid square, which is of note, as a core fragment made from the same raw material was present in the *Principal palaeochannel* adjacent to this grid-square. There was also a large amount of blade, flake, chunk, and small-flake debitage, which was mainly associated with the reduction of chert and pebble flint. Alongside this, there were smaller amounts of brown/grey-flint and tuff debitage, which suggests that very little, if any, reduction of those raw materials took place.

The spatial distribution of the cores and debitage suggests the existence of two activity areas associated with the reduction of chert and pebble flint. One of these was focused to the south, in grid-square 788 (Lithic Entity 31A) and adjacent squares; the other was in the north, in grid-squares 901 and 929 (Lithic Entity 31B), which was spatially associated with knapping groups 103 and 114 (*Appendix 3*). A difference in the type and quantity of debitage, particularly blades, between these two activity areas suggests that there may have been a variation in the intensity of stone-working or occupation activity.

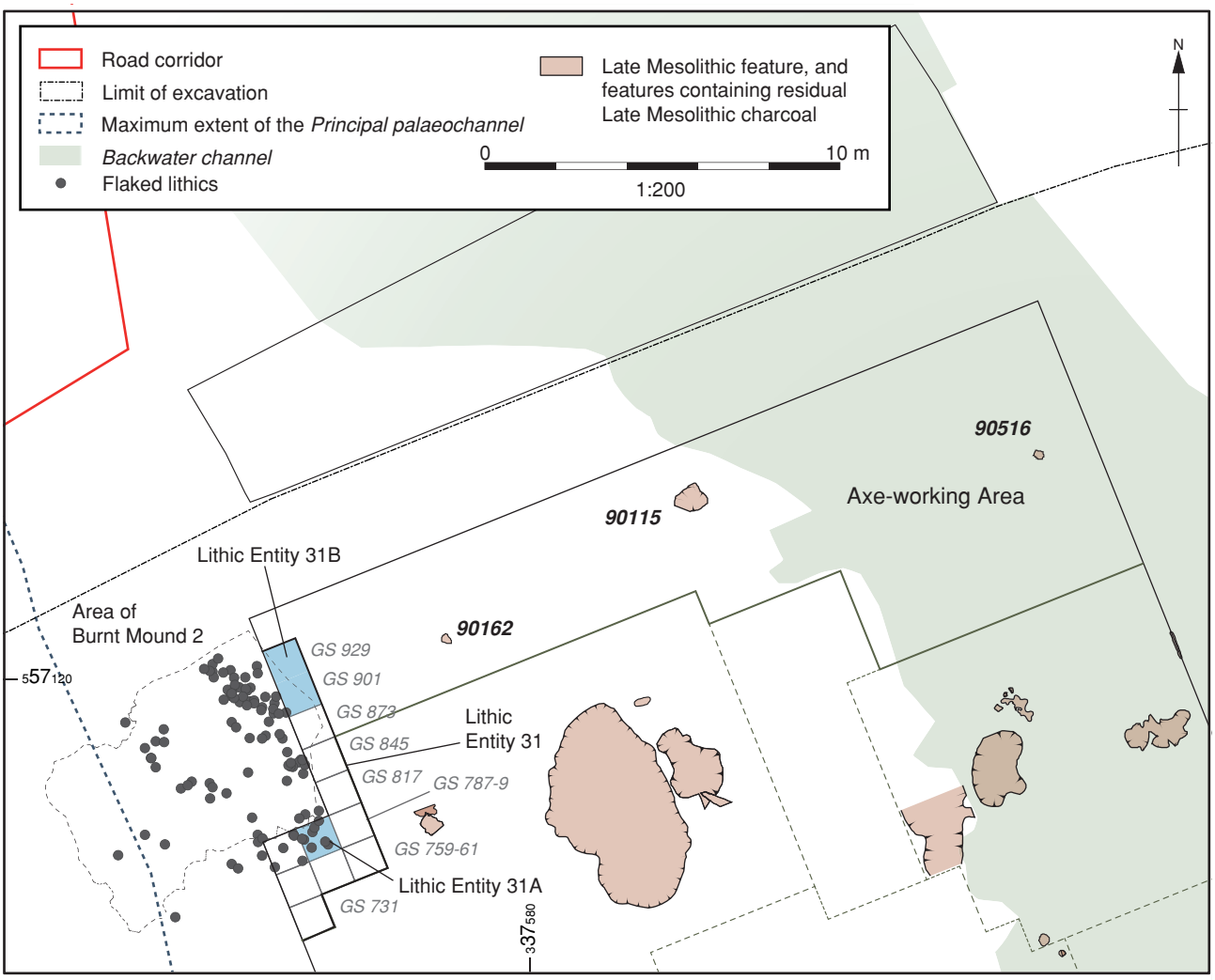

Figure 577: The flaked lithics from beaneath Burnt Mound 2

The overall assemblage contains a relatively small number of microliths but these show some variation between the two chert and pebble-flint activity areas (*above*). For instance, microlith fragments and geometric triangles dominated Lithic Entity 31A, while backed bladelets, fine points, scalene triangles, and microlith fragments were present in Lithic Entity 31B. Given the amount of debitage in both areas, the relatively small amount of microliths is surprising, perhaps implying that other tools were removed from the area after production. The variation in microlith numbers and classification types could also suggest that different activities were taking place. For example, the relatively large number of microlith fragments in Lithic Entity 31A, and adjacent grid-squares (761, 789, and 817), could suggest an emphasis on tool production, use, and maintenance, whilst the variation in microlith types in Lithic Entity 31B, and adjacent grid-square 873, appears to suggest that, alongside tool production, use, and maintenance, tasks using backed bladelets and fine points were also undertaken.

Other retouched tools also formed a small element of the items recovered from the two activity areas. Two pieces, an edge-retouched flake and a scraper-resharpening flake, were associated with Lithic Entity 31A, whilst Lithic Entity 31B produced five pieces, three edge-retouched blades and flakes, an awl, and a notched blade, three from grid-square 929. Nearly all the other retouched tools are made from pebble flint. In addition, three retouched tools were recorded from the palaeochannel deposits, one from adjacent to the northern stone-working area, while an awl was found immediately adjacent to grid-square 845.

Coarse-stone tools

A relatively large assemblage of coarse-stone tools (Lithic Entity 35) was recovered from that part of the Axe-working Area containing the *Backwater channel* (Fig 578), including items from both within and at the base of this feature. The items in the channel's base came from natural deposits, probably forming elements of the *Basal sands and gravels*, and, given their stratigraphic location, they are likely to have been associated with Late Mesolithic activity dated to during, or after, the early fifth millennium cal BC. These include two ground stones, two flaked tools, a hammerstone, and an unworn cobble (*Appendix 2*). Other items were from the *Mesolithic overbank alluvium* (***90181***) filling the *Backwater channel*, which accumulated in the mid-fifth millennium cal BC. Again, it is likely that these were Late Mesolithic artefacts. In addition, it also appears that they were

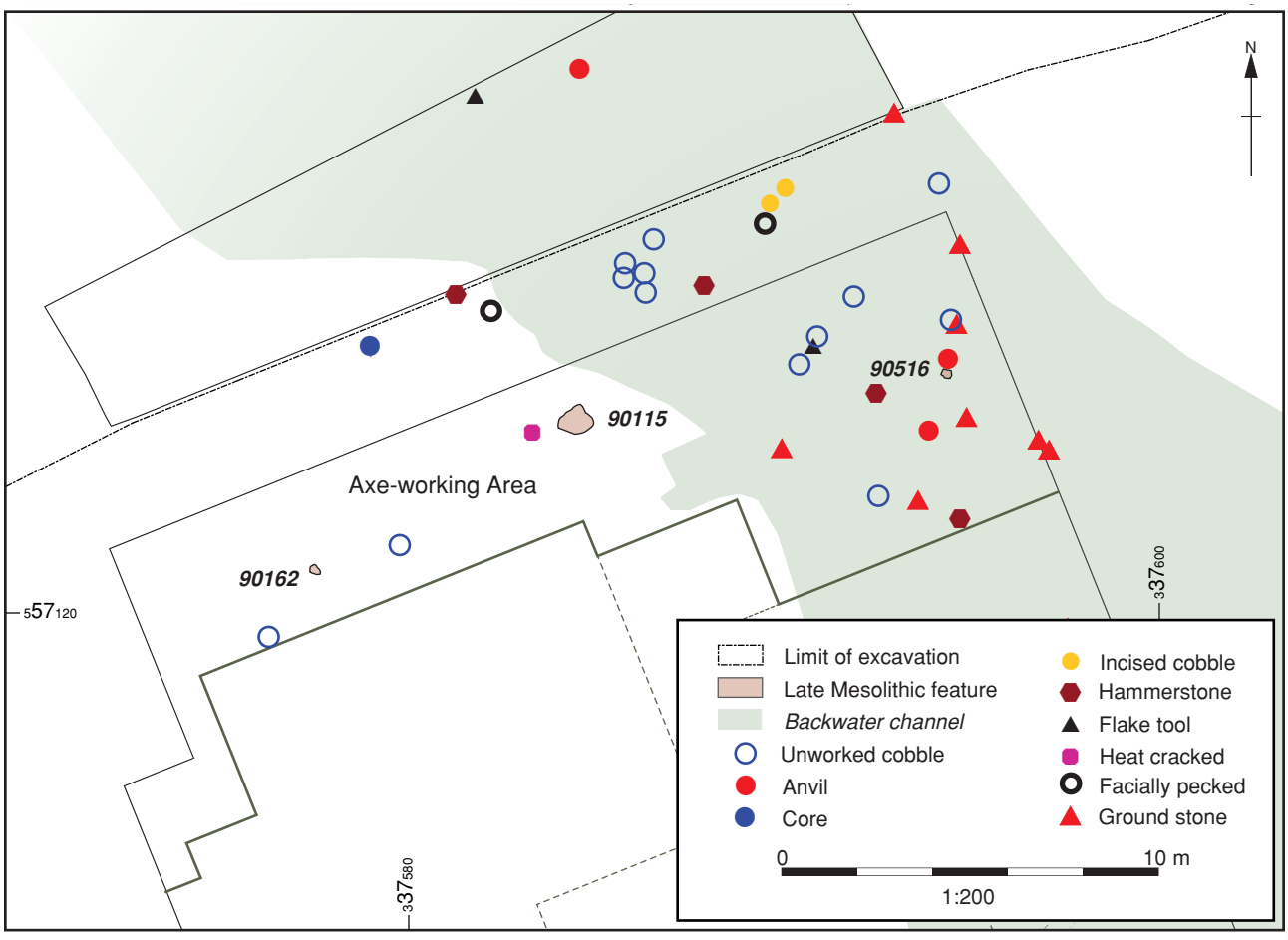

Figure 578: Distribution of coarse-stone tools in the Axe-working Area

related to a smaller group of coarse-stone tools from the *Backwater channel*, immediately to the south, in the Butchery Area.

Although it is not clear what activities made use of these tools, small hand-held stones were likely to have been used for grinding, or perhaps polishing, whilst the larger slabs may have been used in grinding, or as anvils. Indeed, these activities may have been intimately linked with the production or reworking of ground-stone tools within the *Backwater channel*.

Discussion: flaked lithics

The distribution of the worked stone indicates that four spatially discrete spreads of flaked lithics existed in the Axe-working Area. One, from the *Mesolithic alluvium* spread (*above*; Lithic Entity 31), may relate to a comparatively early phase of occupation, as it is suspected that material within the *Mesolithic alluvium* originally derived from a land surface on the banks of the *Principal palaeochannel* that was sealed by this alluvial deposit.

A second was identified in western part of the activity area (Lithic Entity 27). The technological character and spatial distribution of this material, along with the presence of several knapping groups, suggest that it predominantly related to the widespread *in-situ* knapping of chert and pebble flint, with more occasional knapping of brown/grey flint in the north-west corner of the spread. In terms of the chert and pebble-flint knapping activity, several clusters of cores, core-dressing, and blade and flake debitage were present, with a focus on the reduction of chert nodules.

A collection of microliths and other retouched tools was also associated with the debitage in the western spread. The number of microliths suggests short-lived occupation and/or that tools were removed from this part of the site. This aside, the microliths include many fragments, and their presence adds to the evidence for *in-situ* stone-working, and also indicates that activities associated with this spread included the production, use, and/or retooling of composite implements. More specifically, the microliths include similar amounts of backed bladelets and scalene triangles, along with limited numbers of a few other classifications. Microwear analysis, on items from the wider site, implies their use in a wide range of tasks, with backed bladelets often used in cutting activities, whilst scalene triangles may have formed points in fishing equipment, or have been used as cutting tools (*Appendix 7*). The presence of a few rods also implies the use of projectile weaponry. The macro-tools include a limited range of types, consisting predominantly of simple edge-retouched pieces, along with smaller numbers of awl/borers, denticulates, knives, notches, and scrapers; these also suggest a variety of tasks being performed.

In terms of the other worked-stone items from this area, these merely include two unworn cobbles and a few fragments of ochre.

The third spread was identified in the central part of the activity area (Lithic Entity 28) and, although larger in extent, this was essentially similar in character to that in the western area (*above*). In this respect, it was associated with comparable Late Mesolithic knapping activity, which involved the reduction of a similar range of raw materials (chert and pebble flint), to produce a similar range of microliths and other retouched tools. In addition, within this central spread, clusters of flaked pebbles, cores, and debitage, some associated with material assigned to knapping groups, indicate *in-situ* stone-working.

Pebble flint formed the dominant raw-material type subjected to reduction, clustered in the south-eastern and eastern parts of this spread, where it overlapped with a concentration of chert; it was also present to the north of these areas. Pebble-flint microlith fragments and backed bladelets, along with a smaller number of scalene triangles, were the more common microlith tools present, tending to be located on the periphery of the clusters of cores and debitage, suggesting the possibility of spatial patterning in the production and use of flaked lithics in this part of the site.

Chert reduction was focused on the eastern edge of the central spread and large numbers of microlith fragments, backed bladelets, and scalene triangles were probably associated with this activity. Again, the microliths tended to be found on the periphery of the cores and debitage. Beyond the large concentration of chert, smaller clusters dotted throughout the wider spread could relate to short-term occupation, as they were spatially discrete and often contained all elements of a generalised reduction sequence. A similar repertoire of pebble-flint and chert microliths is apparent, to those associated with occupation in the western spread, suggesting that a similar range of occupation activities was undertaken (*above*). The other retouched tools were also similar to those from the western area, although the number of scrapers is greater, suggesting that there was more of an emphasis on possible hide working in the central area.

Beyond the pebble flint and chert, there is clear evidence for the working of a variety of other types of raw materials in the central spread, such as tuff and, to lesser extent, brown/grey flint, pitchstone, and Scottish Southern Uplands chert. The reduction of tuff was focused on the south-eastern and central parts of the spread. The former material, which continued into the eastern margins of the spread in the western area, appears to represent specialised knapping activity. This material includes flaked tuff assigned to two knapping

groups (112 and 113), one of which contains a flake from a ground-stone tool, suggesting that activity there included the reduction of these tools. The cluster of tuff also contained many chunks, which could be further debitage from ground-stone tool-reduction, and several microliths.

The majority of the tuff in this part of the site was associated with the Late Mesolithic *Stabilised land surface*. Significantly, therefore, given its stratigraphic provenance and its association with microliths, it appears that the reduction of ground-stone tools was related to Mesolithic occupation.

Knapping activity associated with the reduction of brown/grey flint and Scottish Southern Uplands chert was limited within the central area. Some of this material clustered in specific parts of the spread, and included material assigned to knapping groups, although these are not representative of complete reduction sequences. This either signifies that the material could be a product of secondary deposition, or represent activity that had been disturbed by later occupation, or even that material had been removed during or after the knapping activity. A small assemblage of worked pitchstone was associated with the wider spread, including small collections on the south-eastern periphery and one to the south-west, which was also adjacent to clusters of Late Mesolithic chert and pebble-flint flaked lithics. These imply that the pitchstone was also associated with Late Mesolithic occupation activity.

The fourth spread was in the *Backwater Channel*; however, in this instance, no clusters of any raw-material type indicative of *in-situ* knapping could be identified. In addition, although there are several groups of flaked lithics that contain material assigned to specific knapping groups, no complete reduction sequences were recognised. For example, a dispersed spread of flaked lithics in the north-eastern corner of the site comprised a large amount of small flakes, along with a smaller amount of cores, blade, flake, and chunk debitage, and microliths, with other retouched tools. This material was mainly associated with the reduction of chert and pebble flint, although a relatively large amount of brown/grey flint was also present. Material associated with chert and brown/grey-flint knapping groups was included in this spread, although both comprise incomplete reduction sequences. Nevertheless, the stratigraphic distribution of this material is of interest.

The majority of the flaked lithics making up this spread came from the *Mesolithic overbank alluvium* (***90572***/***90181***) filling the *Backwater channel*, with only small amounts of material recorded from the same area in the underlying natural deposits. A peaty subsoil (***90571***) within the *Backwater channel* (overlying the *Mesolithic overbank alluvium*) also yielded a small, but significant, collection of flaked lithics, suggesting that the spread is likely to be representative of, or derived from, activity occurring late in the stratigraphic sequence in the channel. In this respect, it could represent sporadic occupation, which was potentially later in date than the main phases of Late Mesolithic settlement (*'Mesolithic encampment I'* and *'Mesolithic encampment II'*; *Ch 4*) in the *Grid-square area*. Several scenarios relating to the formation of this assemblage can be posited: it is possible that it was secondary deposition of material; it could represent a discrete phase of *in-situ* occupation, where some of the worked stone was removed and used elsewhere; or it could have been derived from an earlier phase of occupation, which had been disturbed by later activity.

Two other collections of flaked lithics are worthy of comment. The first comprises a collection of tuff (Lithic Entities 28B and 28C), consisting of two single-platform flake cores, several flakes, a few blades, and nine microliths. The second consists of a cluster of chert flaked and whole pebbles (Lithic Entity 32), mainly comprising relatively large chunks of minimally flaked black chert. It is possible that the flaked and the unworn pebbles represent a cache of raw material and these, alongside further collections of worked and unworked cobbles in the channel, suggest that the *Backwater channel* may have been the focus of specialised tasks.

Lithic-free Activity Area

There was a notable lack of flaked lithics in the north central part of the site (Fig 579), only 2091 pieces being recorded. Given the size of the area (43 m^2), this number is in sharp contrast to other parts of the site where, in some instances, individual grid squares contained more material (for instance, grid-square 269 in the Midden Area, which produced 2483 flaked lithics).

Most raw-material groups are represented, although, in a similar fashion to the larger assemblages from the other activity areas, chert and pebble flint dominate. There is also a significant amount of small flakes with a 'cannot determine' lithology, of which 67% are burnt.

All flaked-lithic classifications are represented, though small flakes make up the majority of the material (61%), with irregular and regular flakes forming the next most dominant types. A relatively few microliths were found (35 in total), dominated by fragments (13 items) and backed bladelets (12). Non-microlithic tools comprise two awl/borers, a burin, three simple edge-retouched pieces, and four scrapers.

A small chert-knapping group (14) was also confined to this area. This was found in grid-square 606, consisting of an amorphous core and several blades and flakes. Interestingly, several of the flakes and blades refit with the core; however, it is not clear whether the

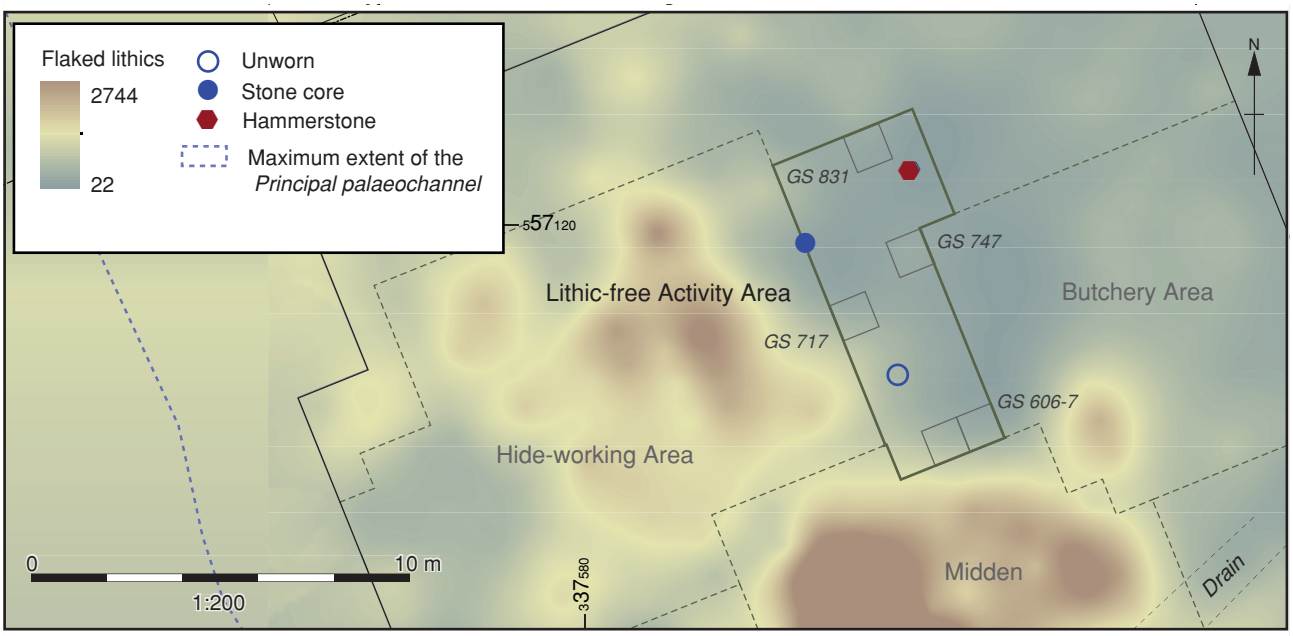

Figure 579: Distribution of flaked lithics and coarse-stone tools in the Lithic-free Activity Area

material had been intentionally struck or represents the natural disintegration of a chert nodule.

Only two coarse-stone tools were recovered from this part of the site, along with an unworn cobble. These were a core and a hammerstone.

In spatial terms, lithic concentrations included groups of ten or more regular flakes in grid-squares 606, 607, 717, and 831. However, these grid squares were on the periphery of spreads and clusters of flaked lithics, associated with the surrounding activity areas, and in that respect, they relate to occupation in those areas.

At least two scenarios can be posited for the relative lack of flaked lithics in this area. One is that it was cleared of lithics in order to perform an activity that has left no archaeological signature, which might have involved the use of organic materials. The other scenario is that this area was simply never used during the Late Mesolithic occupation of the site.

Northern English and southern Scottish chert-knapping groups: spatial distribution

The spatial distributions of the lithics associated with 17 chert-knapping groups sourced to northern England (chert source IG1 sub-groups 1-5; *Appendix 6*) and seven knapping groups sourced to the Scottish Southern Uplands (chert source IG2; *Appendix 6*) were analysed to see if any links existed between the different activity areas identified in the *Grid-square area*. In terms of the northern English cherts, the items from knapping group 1 were particularly informative. This group was made on a distinctive grey chert forming part of IG1 sub-group 4, and elements were found in all of the Late Mesolithic activity areas. This therefore suggests some links between these areas, though most of the material was spatially associated with those activity areas from which the chert-sourcing samples were derived. Specifically, these were the Habitation Area, the Hide-working Area, the Midden Area, and the Axe-working Area, and it seems that these possessed the strongest spatial links, at least in terms of the distribution of this knapping group.

Similar links between multiple Late Mesolithic activity areas were also apparent in several of the other sourced northern English chert-knapping groups, which, significantly, relate to the four other IG1 sub-groups (2, 3, and 5). Specifically, knapping group 3 (IG1 sub-group 2) linked the Habitation Area, Hide-working Area, and Midden Area; knapping group 29 (IG1 sub-group 5) was present in the Tool-production Area, Peripheral Area, and Axe-working Area; knapping group 42 (IG1 sub-group 1) linked the Tool-production Area, Hide-working Area, Butchery Area, and Midden Area; knapping group 49 (IG1 sub-group 3) was identified in the Tool-production Area and Midden Area; and knapping group 97 (IG1 sub-group 1) was present in the Tool-production Area, Hide-working Area, and Midden Area.

The remaining 11 northern English knapping groups, from IG1 sub-group 1 (knapping groups 95, 104, and 105), sub-group 2 (knapping groups 92, 99, and 102), sub-group 3 (knapping groups 37 and 121), sub-group 4 (knapping group 24), and sub-group 5 (knapping groups 36 and 51), were only associated with a single activity area. However, it is worth noting that most of the sub-groups identified contain at least one knapping group which links activity in the Tool-production Area with at least another one. The exception is IG1

sub-group 4, which comprises knapping group 24 and also knapping group 1 (*above*); neither of these exhibit a strong relationship with the Tool-production Area.

In terms of the Scottish Southern Uplands chert, the distribution of the knapping groups (44-5, 82, and 117-20) comprising IG2 indicate that this had a strong spatial relationship with the Tool-production Area, the Hide-working Area, and the Midden Area, and it is therefore likely that it links activity across these areas (Fig 580). However, it should be noted that knapping group 82 comprises a discrete assemblage within the

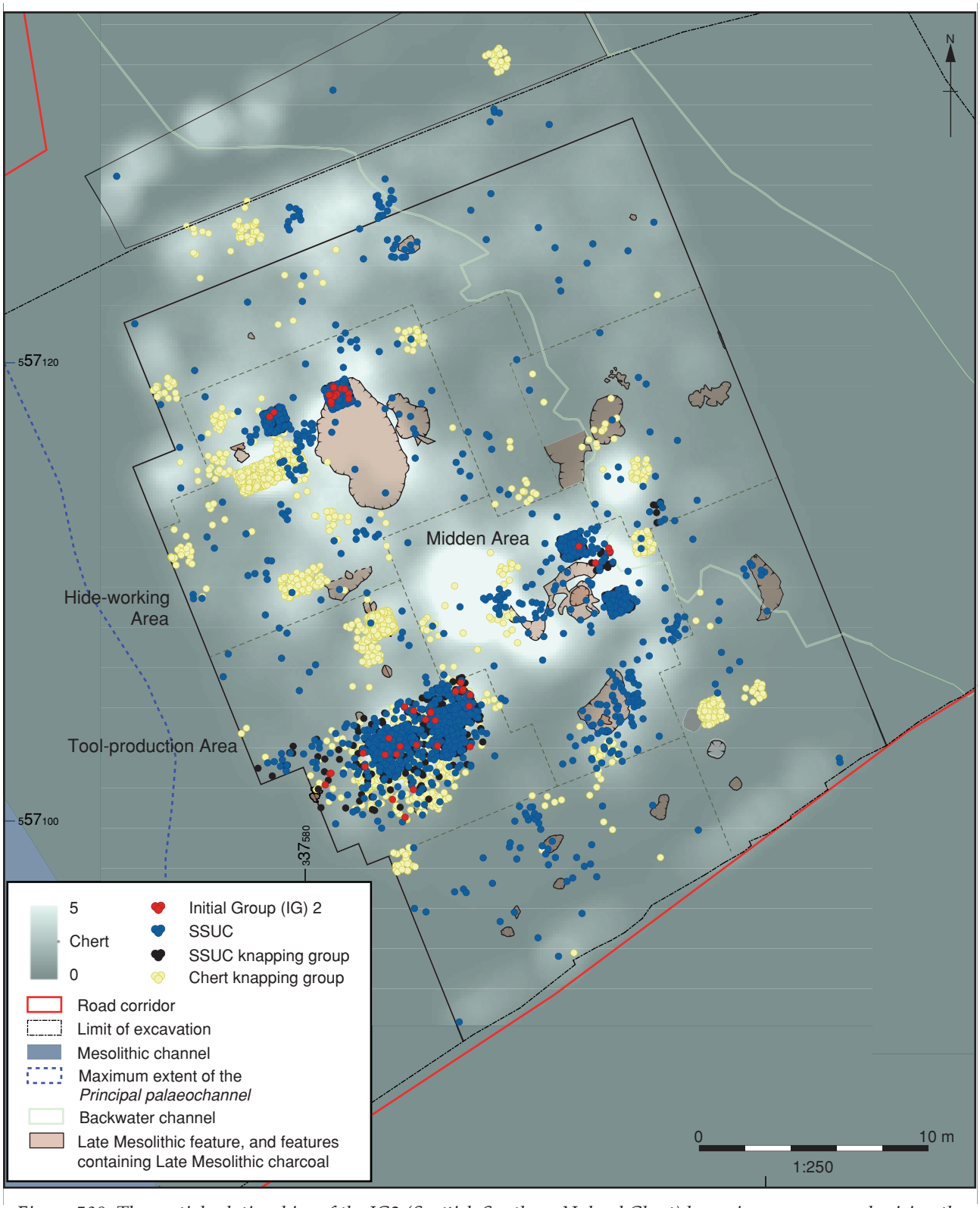

Figure 580: The spatial relationships of the IG2 (Scottish Southern Upland Chert) knapping groups, emphasising the Hide-working, Midden, and Tool-production Areas

midden and could relate to sporadic activity from an earlier phase of occupation, prior to its creation.

Neolithic/Early Bronze Age worked stone in the Grid-square Area

In addition to the large assemblage of Late Mesolithic worked stone, the *Grid-square area* also contained limited evidence for tools and stone-working that could be dated to the Neolithic and Early Bronze Age. This material included implements, as well as cores and debitage, which were scattered throughout the Late Mesolithic activity areas. Most of this material was associated with Late Mesolithic knapping areas, suggesting that some of the pieces, particularly the cores and debitage, were probably associated with Late Mesolithic, as opposed, to Neolithic/Early Bronze Age activity. Although this may have been the case, these ambiguous items have been grouped into a series of lithic entities (Lithic Entities 38-50; Table 250), in relation to the northern and southern parts of the *Grid-square area*.

Northern area

Neolithic features

It is clear that the northern part of the area witnessed some form of Neolithic activity, given the presence of charcoal dating to this period, contained in several tree-throws. These comprised three (***90508***, ***90522***, and ***90531***) in the *Backwater channel*, and one large tree-throw (***90262***) to the west (Fig 581).

Of those in the *Backwater channel*, tree-throw ***90522*** was a Late Neolithic feature (*Ch 10*), dating to the late fourth millennium cal BC, and this partially disturbed another, earlier Neolithic tree-throw (***90531***). This was dated to the first half of the fourth millennium cal BC (*Ch 8*). Tree-throw ***90508*** to the north also contained charcoal which dates to the first half of the fourth millennium cal BC (*Ch 8*; *Appendix 20*). All produced flaked lithics, and while a large proportion (Lithic Entities 36 and 37) is probably Late Mesolithic again, and thus residual, some items might be Neolithic in date. These include a pebble-flint leaf-point blank and two awl/borers produced on large brown/grey-flint blades, from tree-throw ***90522***. In chrono-technological terms, the two awls are likely to be Late Mesolithic/Early Neolithic and, while leaf points are known from middle Neolithic contexts in East Yorkshire (Manby 1988), the Stainton West leaf point is probably associated with Early Neolithic occupation activity. In addition, the lithic assemblage from the two intercutting Neolithic tree-throws (***90522*** and ***90531***) contained several large cores and core fragments, and large pieces of blade and flake debitage, which could be associated with a Neolithic stone-working technology. However, most of the lithics within the vicinity of the tree-throws have not been the subject of a detailed analysis, so there has been no precise appraisal of their technological character.

Tree-throw ***90262*** has been dated to the first half of the fourth millennium cal BC (*Ch 8*; *Appendix 20*). Although this feature contained a large worked-stone assemblage, this had Late Mesolithic technological affinities (Lithic Entity 11) and represents material

Lithic Entity	Description
38	Neolithic arowheads/tools from the northern part of the *Grid-square area*. Includes leaf-shaped and kite-shaped arrowheads; awls/borers; and bifacial tools
39	Possible Neolithic cores from the northern part of the *Grid-square area*
40	Possible Neolithic debitage from the northern part of the *Grid-square area*
41	Neolithic arrowheads/tools from the Midden Area. Includes leaf-shaped and transverse arrowheads; a knife; awls/borers; other retouched pieces; bifacially flaked fragments; and scrapers
42	Early Bronze Age barbed-and-tanged arrowhead from the Midden Area
43	Possible Neolithic cores from the Midden Area
44	Possible Neolithic arrowheads/tools surrounding the Midden Area in the southern part of the *Grid-square area*. Includes leaf-shaped and transverse arrowheads; an awl/borer; modified flakes; bifacially flaked fragments; and scrapers
45	Possible Neolithic cores surrounding the Midden Area in the southern part of the *Grid-square area*
46	Possible Neolithic blade from the southern part of the *Grid-square area*
47	Dehafted leaf-shaped arrowhead from the *Earlier Neolithic organic deposit* in the *Principal palaeochannel*
48	Broad blades from the *Earlier Neolithic organic deposit* in the *Principal palaeochannel*
49	Mesolithic flaked-lithic assmeblage from beneath Burnt Mound 1
50	All-round scraper from Burnt Mound 6

Table 250: Neolithic/Earlier Bronze Age Lithic Entities

Figure 581: Neolithic tree-throws **90508**, **90522**, **90531**, *and* **90262** *in the northern part of the* Grid-square Area

derived from the Mesolithic occupation of the site, which was deposited within the tree-throw when it was uprooted (*Ch 4*). The only exception was a possible Neolithic opposed-platform flake core with larger than average dimensions; however, this piece could also relate to Late Mesolithic stone-working activity, and represent a block of chert/quartzite that was abandoned after initial flaking, as a result of the intractable nature of the raw material.

Scattered artefacts

Beyond the tree-throws, the technological analysis of the flaked-lithic assemblage identified several pieces as having possible affinities with Neolithic and later lithic technologies. These include diagnostic implements, cores, and large pieces of debitage.

Several diagnostic Neolithic arrowheads and tools (Lithic Entity 38) were recovered from the northern part of the *Grid-square area* (Fig 582). They include leaf-shaped arrowheads, and a broken kite-shaped arrowhead. One of the former was a complete specimen, from a peaty subsoil (***90571***) in the *Backwater channel*, which also contained a chronologically mixed assemblage of worked-stone. It has technological similarities with another similar arrowhead from the *Earlier Neolithic organic deposit* in the *Principal palaeochannel*. Two other leaf-shaped arrowheads were associated with the Late Mesolithic Hide-working Area, one from the north-eastern part, and the other from west of tree-throw ***90262***. Although both were associated with clusters of flaked lithics made from the same raw material, these clusters also contain several microliths, suggesting that they relate to earlier episodes of stone-working. Finally, a brown/grey-flint leaf-shaped arrowhead of relatively large dimensions was associated with a concentration of flaked brown/grey flint, ostensibly of a Late Mesolithic technological character, within the Butchery Area. This therefore provides another instance of the close spatial association of a diagnostic Neolithic implement within a concentration of Late Mesolithic flaked lithics.

Several awls/borers were also recovered, produced on large broad blades, similar to those from tree-throw ***90522*** (*above*), though it is possible that these

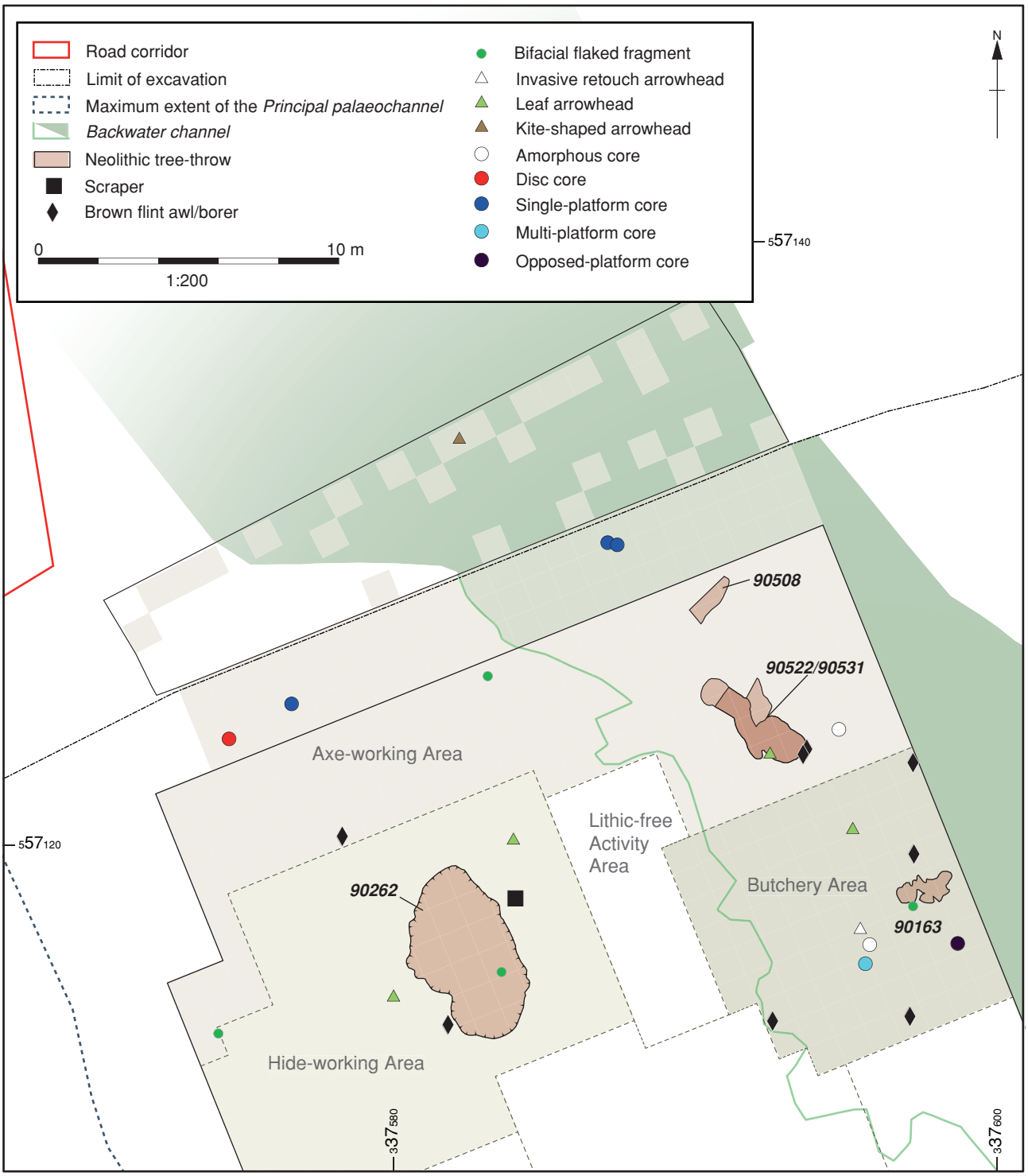

Figure 582: Distribution of possible Neolithic flaked-lithic diagnostic tool types and cores from the northern part of the Grid-square Area

date to the Late Mesolithic period. These include four specimens from the *Backwater channel*, to the south of the tree-throw ***90522***, within the Butchery Area, and a brown/grey-flint awl borer from the eastern part of the spread of Late Mesolithic lithics associated with the Axe-working Area. An awl/borer made from brown/grey flint from the spread of lithics associated with the Late Mesolithic Hide-working Area could also be a Neolithic artefact. That said, it might conceivably be Late Mesolithic in date, as several pieces of a similar form and technology are associated with Mesolithic cores and debitage.

Other potential Neolithic items included a possible fragment from a bifacial tool, made from brown/grey flint, recovered from the central Late Mesolithic lithic spread in the Axe-working Area (Lithic Entity 28). Whilst this piece could be Neolithic in date, it was

associated with a dispersed distribution of debitage from the reduction of brown/grey flint, which bears technological affinities to Late Mesolithic stone-working traditions. In this respect, the piece could support the evidence for the use of ground and flaked bifacial tools during the Mesolithic period in north-west England. Another flake with indeterminate invasive retouch could also be a fragment from a larger bifacial implement. This was recovered from the Late Mesolithic Hide-working Area and, again, it is unclear whether it was associated with Neolithic or Late Mesolithic activity. In addition, a possible bifacially flaked fragment, made from brown/grey flint, was spatially associated with tree-throw ***90163*** and a wider concentration of Late Mesolithic brown/grey-flint flaked lithics in the Butchery Area. It may therefore relate to Mesolithic stone-working.

The morphology and flaking trajectories of the cores (Lithic Entity 39) differ from those displayed on the comparatively smaller, blade and narrow flake cores that are part of a Late Mesolithic technology. They chiefly represent flaked-based reduction schemas, characterised by negative-flake scars with relatively large dimensions, which are sometimes associated with poorly defined striking platforms (*Appendix 4*).

Three cores of a possible Neolithic technology have been identified in that part of the site which contained Late Mesolithic lithic spreads associated with the Axe-working Area, consisting of a tuff amorphous core located adjacent to tree-throw ***90522***, and a chert disc core and a relatively large tuff single-platform core, both located in the western spread of flaked lithics (one from the area containing Lithic Entity 27). The amorphous core is an irregularly flaked tuff cobble, which bears technological similarities to the coarse-stone core tools. The chert disc core has technological and morphological similarities with keeled cores, which are common to later Neolithic stone-working traditions (Butler 2005). However, in comparison to examples made from flint recorded in other parts of northern Britain, where raw material was more readily available (*cf* Dickson and Edmonds 2009), it is relatively small, and hence it could represent a tested Late Mesolithic nodule, which was discarded at an early stage of reduction. The tuff single-platform core has been chiefly worked off one partial irregular platform and technologically it appears to have more in common with the coarse-stone core tools.

Other possible cores that may relate to Neolithic stone-working were recovered from the spread of Late Mesolithic lithics associated with the Butchery Area. All were composed of brown/grey flint and were associated with a cluster of this material within the main Late Mesolithic knapping area, and also with more dispersed spreads of brown/grey-flint flaked lithics to the north and south of tree-throw ***90163***.

The spread of Late Mesolithic lithics associated with the Axe-working Area also contained a collection of relatively large pieces of debitage (Lithic Entity 40), which potentially relate to Neolithic or later flaking trajectories (Pitts and Jacobi 1979). This material included a scatter of tuff flakes (Fig 583), and a single large chert flake situated in the central knapping zone (Lithic Entity 28). However, the *Backwater channel* contained relatively few pieces, and the tuff flakes exhibit very little in the way of spatial agreement with the tuff cores and the flaked coarse-stone tools, suggesting that they were unrelated, whilst the large tuff flakes from the central knapping area were associated with a concentration of tuff, which has been interpreted as being generated by Late Mesolithic reworking of ground-stone tools. Indeed, one of the large tuff flakes has been assigned to a knapping group associated with this activity and, as such, probably dates to the Late Mesolithic period.

A few brown/grey flint flakes with larger than average length/breadth dimensions were also recovered from the spread of Late Mesolithic lithics associated with the Hide-working Area (Lithic Entity 11). However, it is equally possible that these related to earlier stone-working, particularly as some were found within a Late Mesolithic brown/grey-flint knapping area. In addition, substantial numbers of brown/grey-flint flakes, with larger than average dimensions, were recovered from the Late Mesolithic lithic spread associated with the Butchery Area. The majority came from the primary and secondary stages of reduction and probably relate to Late Mesolithic core preparation (Lithic Entity 14).

Southern area

Although there were no Neolithic features within the southern part of the *Grid-square area*, a collection of scattered artefacts was recovered which might relate to Neolithic or later stone-working technologies (Fig 584). These were comparable to those to the north (*above*) and included diagnostic implements, cores, and debitage. Significantly, some came from the Late Mesolithic Midden Area, and it is quite possible that this still formed a feature during the Neolithic period and Bronze Age that continued to be referenced during these later periods.

The diagnostic tools include a variety of arrowheads from both the Midden Area and other parts of the southern *Grid-square area*. It is of note that most were made from brown/grey flint, and the possibility that some were imported artefacts should be considered. From the Midden Area (Lithic Entity 41), a leaf-shaped

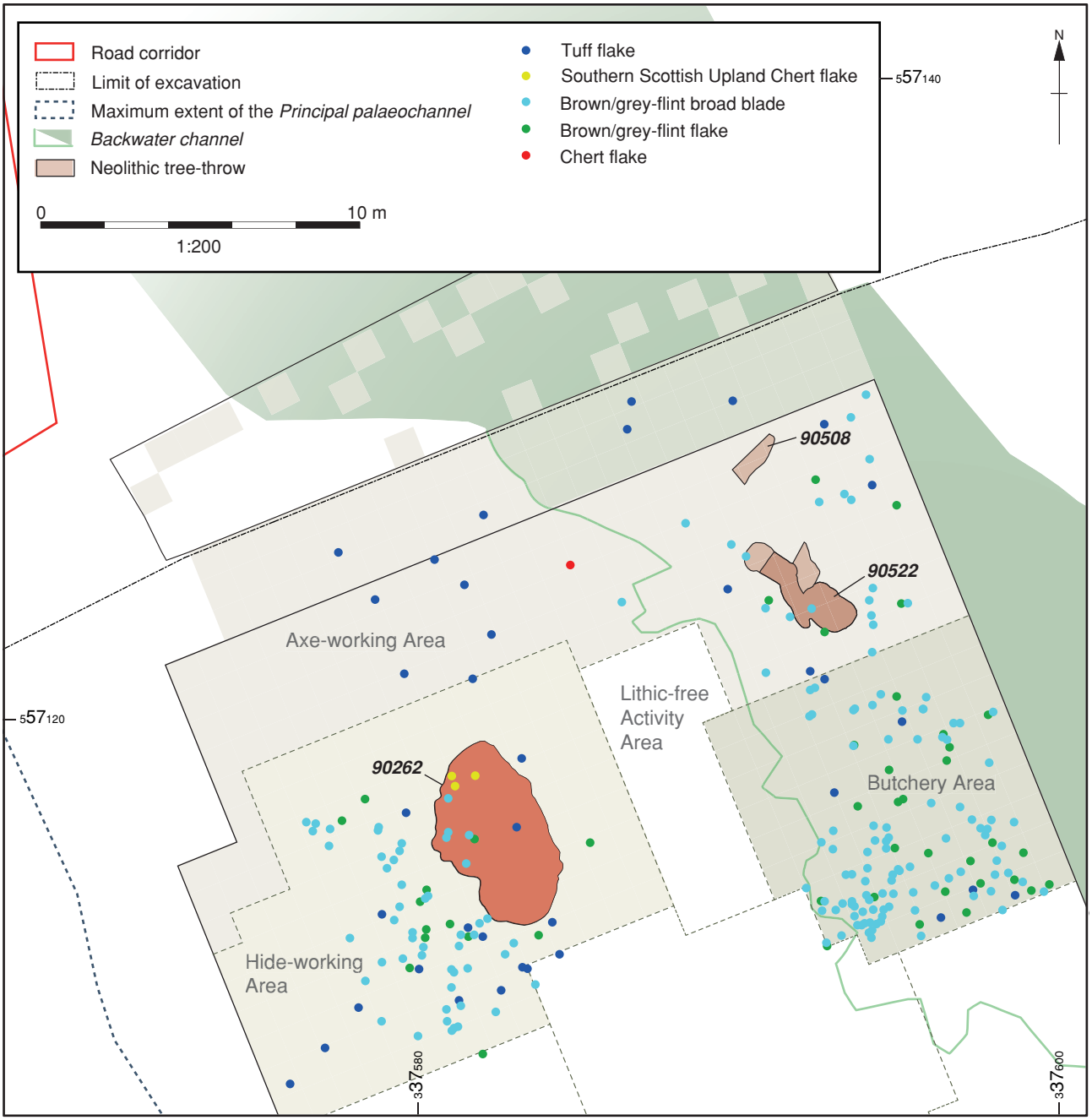

Figure 583: Distribution of possible Neolithic debitage from the northern part of the Grid-square Area

item was adjacent to tree-throw ***90526***, while another small example was found to south-west of hollow/hearth ***90314***/***90593***, which could have been an unfinished piece. Both were made from brown/grey flint and, in terms of form and retouch style, both differ significantly from the larger examples recorded in other parts of the site; indeed, it may be significant that they were associated with Late Mesolithic flaked lithics. Two transverse arrowheads were also found adjacent to tree-throw ***90526***. These consist of a *petit tranchet* and chisel form and are probably of a Late Neolithic date (Green 1980; Butler 2005). Finally, a barbed-and-tanged arrowhead (Lithic Entity 42) was recovered from a post-medieval ditch (***90599***/***70223***; *Ch 14*), which bisected the centre of the midden; this artefact relates to Early Bronze Age activity at the site.

Beyond the midden, the arrowheads (Lithic Entity 44) include a possible unfinished leaf-shaped example, made from brown/grey flint, adjacent to Burnt Mound 1. This is of comparatively large dimensions (greater than 20 mm in length) and is similar to others from the *Principal palaeochannel* and the northern part of the *Grid-square area*. A possible transverse arrowhead was from the area containing the Late Mesolithic reverse C-shaped lithic cluster. However, its classification is ambiguous, as it is comparatively

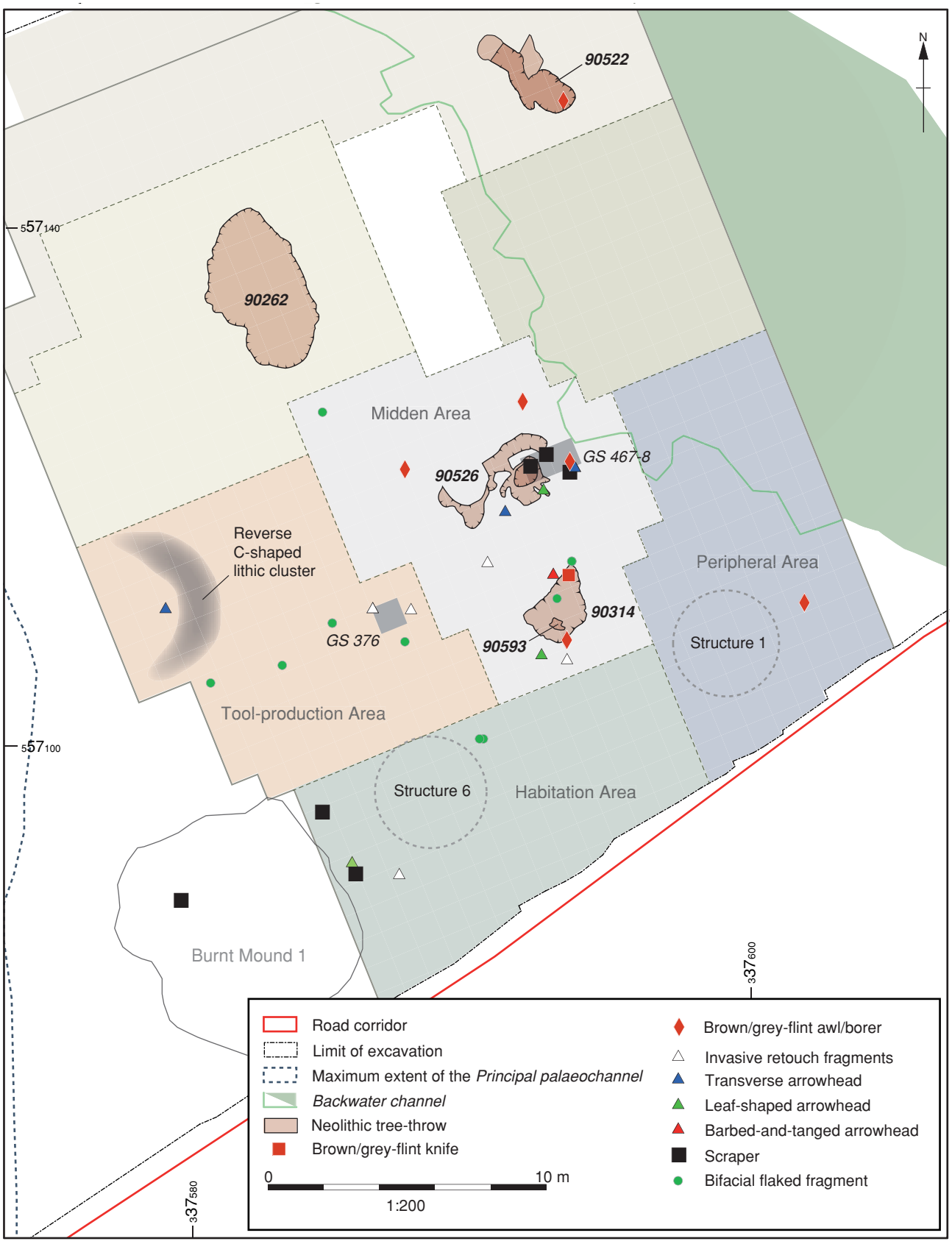

Figure 584: Distribution of possible diagnostic Neolithic and Early Bronze Age flaked-lithic implements from the southern part of the Grid-Square Area

small in relation to the other transverse arrowheads from the site, and its technological character suggests that it could be attributed to a different tool type, such as an awl (Lithic Entity 5).

Five modified flake fragments are classified as having indeterminate invasive retouch, perhaps being fragments from leaf-shaped arrowheads, some of which could have been damaged during manufacture (Coles 2011a), although two are associated with the Late Mesolithic knapping area focused on grid-square 376 in the Tool-production Area. Of the other three, two were from the southern part of the midden, whilst the third was from the Habitation Area.

Along with the arrowheads, several other retouched pieces came from the southern part of the *Grid-square area*, which are seemingly diagnostic of later reduction technologies. They include a Neolithic or later knife form, with edge-use gloss, used in cutting fibrous materials such as grasses, and made on a large, robust brown/grey-flint blade, from the southern part of the midden (Lithic Entity 41). A large brown/grey-flint awl/borer could also be Neolithic or later in date, as it also has edge-use gloss. Significantly, this was found in the same grid square as the *petit tranchet* arrowhead, directly adjacent to tree-throw ***90526*** (*above*). Three other awl/borers made on brown/grey-flint broad blades also came from the Midden Area, one from the south, while the others were in the vicinity of tree-throw ***90526***. However, although these might be Neolithic, it is also possible that they were associated with Late Mesolithic activity. Similarly, a single brown/grey-flint awl/borer came from the Late Mesolithic Peripheral Area. Although this has a similar technological character to those associated with the Neolithic tree-throw (***90522***) in the northern area, in this instance, the piece is probably related to the collection of brown/grey-flint lithics associated with Structure 1, and is likely to be Late Mesolithic in date.

The technological analysis also identified the potential for several flaked lithics to be fragments from larger bifacial implements (*Appendix 3*), with nine being present in the southern area. Three of these were from the Midden Area, two made from brown/grey flint and pebble flint, while the third, which is made from chert, was located at its northern edge, within an area that was relatively devoid of chert. That made from brown/grey flint is pressure-flaked off either side of a dorsal ridge and resembles a biface trimming flake. The other bifacial pieces were found to the west and south of the midden and of these, one was relatively large, which could be a fragment from a large arrowhead, as it has ripple flaking on its dorsal face, while the others comprise fragments with bifacially flaked ridges, indicating that they may have come from bifacial implements. Indeed, one is probably a reworked piece from a larger implement. This was made from brown/grey flint, from the same grid square as another fragment from a brown/grey-flint large bifacial implement (Lithic Entity 1). Although technologically most of these pieces can be assigned to Neolithic stone-working traditions, they are associated with Late Mesolithic knapping areas. Specifically, four came from the Tool-production Area and two were associated with Structure 6. In addition, there is evidence from other parts of the site, such as the Axe-working Area, for the Late Mesolithic use of ground-stone axe blades, and as such a Late Mesolithic date for these pieces cannot be ruled out.

More concrete evidence for a Neolithic/Early Bronze Age presence in the southern area takes the form of six scrapers. Three of these were from the Midden Area, both within and directly adjacent to tree-throw ***90526***. Two are of side-and-end form, whilst the other is an all-round form, which could be Early Bronze Age in date. Of the remaining three scrapers, one came from Burnt Mound 1 (*Ch 10*), the others being adjacent to this feature. The latter comprise an end scraper and a possible thumbnail form, while the piece from the burnt mound is a side-and-end scraper. All can be reconciled with similar forms recorded from lithic sites elsewhere in the region (*cf* Cherry and Cherry 1987b).

In addition to the arrowhead, awls, scrapers, and retouched items, several cores and items of debitage from both the Midden Area (Lithic Entity 43) and other surrounding areas within the southern part of the *Grid-square area* (Lithic Entity 45) may tentatively be associated with Neolithic activity. The cores possessed larger than average dimensions and within the Midden Area included two amorphous cores that were both made on chert (Fig 585). Both could also have been associated with the testing of raw materials, as one comprises a piece of poor-quality material containing several inclusions, which appear to have been flaked around, whilst the other is a partially flaked piece.

Two possible Neolithic disc cores were also present in the midden, as was an opposed-platform core. Of these, the disc cores are made from pebble flint and tuff, and both have been worked from a plane of intersection, in a centripetal fashion and, in some respects, they display flaking trajectories similar to those on mid/Late Neolithic *Levallois*-type cores (Ballin 2011); however, they are relatively small in dimensions in relation to pieces recorded from other regions (Dickson and Edmonds 2009; Dickson forthcoming). The opposed-platform core was made from red basalt. This has been worked from a main platform and a ridge at one end, and exhibits some large negative flake scars, thus displaying convincing evidence for a Neolithic stone-working technology.

Possible Neolithic cores from beyond the Midden Area include several amorphous cores from the

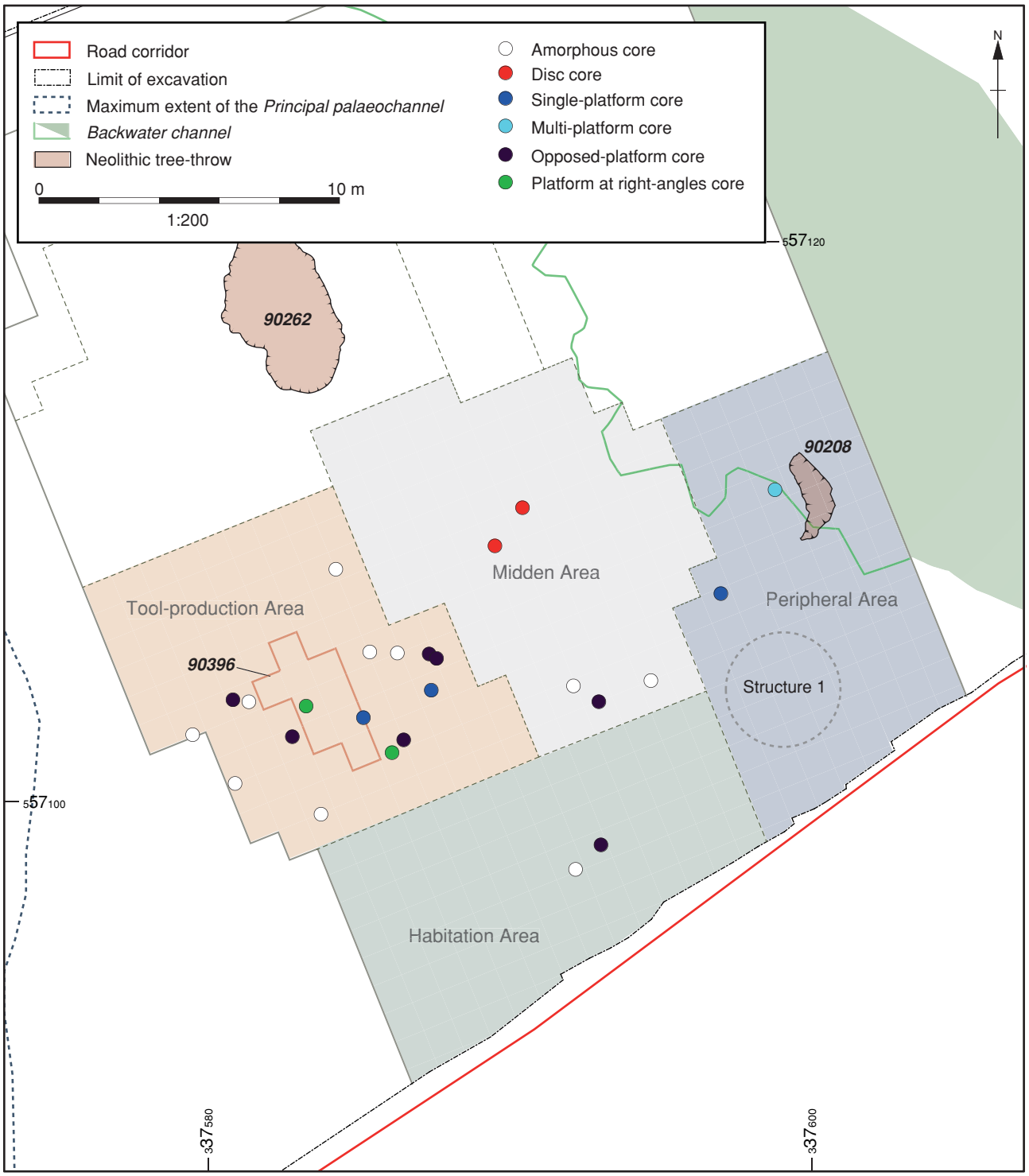

Figure 585: Distribution of possible Neolithic cores from the southern part of the Grid-Square Area

Tool-production Area, including chalcedony/agate (red chert?), chert, and pebble-flint specimens. These have been flaked on ridges and, again, as with the disc cores from the midden (*above*), these have similarities with *Levallois*-type cores from mid/Late Neolithic contexts in other parts of the British Isles (Ballin 2011), although, in a similar way to the disc cores, these are also of relatively small dimensions when compared with examples from other areas.

The other cores comprise opposed, platform at right-angles, and single-platform types, mostly again from the Tool-production and Habitation Areas, which represent partially flaked nodules of chalcedony/agate (red chert?), brown/grey flint, pebble flint, Scottish Southern Uplands chert, and tuff. These tend to be comparatively larger than the majority of the blade/narrow flake cores, and often have large inclusions. In addition, most were discarded before the full potential of the nodule had been realised. It is therefore likely

that they reflect tested and discarded material and thus they could be associated with the Late Mesolithic knapping activity, particularly in the case of those from the Tool-production Area.

Several possible Neolithic cores were also recovered from the Late Mesolithic Peripheral Area. These comprise a tuff multi-platform flake core, which may be a reworked cobble tool, from adjacent to tree-throw ***90208*** (*Ch 3*), and a tuff single-platform flake core to the north of Structure 1 (*Ch 3*). The single-platform core could also be a reworked fragment from a ground-stone tool and, given that it was situated in an area where flaked tuff was virtually absent, it could be representative of a Neolithic reduction strategy.

The debitage that might relate to Neolithic activity includes those flakes with above-average dimensions made from pebble-flint, brown/grey flint, chert, Scottish Southern Uplands chert, and tuff (Fig 586). It

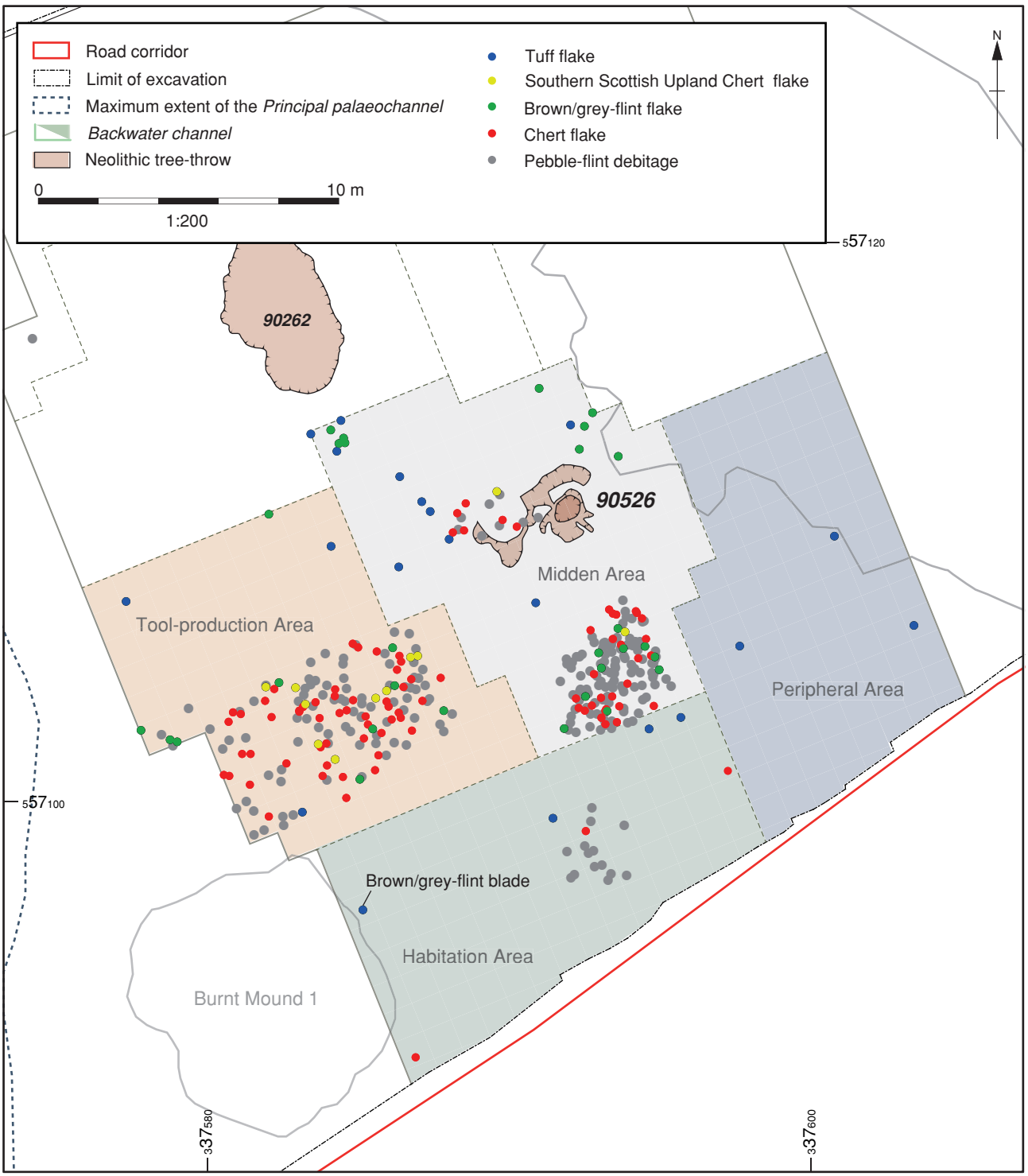

Figure 586: Distribution of possible Neolithic debitage from the southern part of the Grid-Square Area

is of note that the collection of pebble-flint large flake debitage in the Midden Area (Lithic Entity 44) is from the primary and secondary stages of reduction, and may represent a dump of flakes associated with the opening and preparation of flint pebbles for use as cores. Therefore, the material might instead have been derived from Late Mesolithic stone-working activity. Several large tuff flakes were also situated in the vicinity of tree-throw ***90526***, associated with a scatter of flaked tuff, suggesting that they were related to this material. A scatter of brown/grey flint in the southern part of the midden also consists mainly of secondary flakes, and it is probable that they were associated with the secondary dumping of waste lithic material.

Beyond the midden, most of the debitage with larger than average dimensions probably relates to later Mesolithic activity, given its close association with the Late Mesolithic lithics from the Habitation Area and Tool-production Area. However, the distal end of a possible large overshot/plunging brown/grey-flint blade (Lithic Entity 46) was found adjacent to Burnt Mound 1, in the Habitation Area. This has a striking platform at the distal end, associated with several large, parallel broad-blade negative scars, so it could be representative of an Early Neolithic reduction strategy.

Principal palaeochannel

The successive organic and alluvial deposits within the *Principal palaeochannel* dating from the Mesolithic period to the Bronze Age produced coarse-stone tools, stone implements, and flaked lithics. The coarse-stone tools and stone implements were recorded during the excavation, whilst approximately half of the flaked lithics from the palaeochannel were recovered during manual excavation, whilst the other half was obtained by sieving bulk samples. Therefore, as not all of the spoil excavated from the palaeochannel was subjected to sieving, this may have introduced a bias in the amounts of material recovered, particularly with regards to the smaller fractions of the flaked-lithic assemblage (*ie* small flakes, small pieces of blade and flake debitage, and possibly microliths/fragments). In addition to the worked and flaked stone, the channel also contained a collection of unworked stone. The majority of these were fragments of burnt rock, probably derived from burnt-mound activities adjacent to the channel, but complete and apparently unburnt cobbles and pebbles were also present.

Late Mesolithic worked stone in the Principal palaeochannel

The few coarse-stone tools and flaked lithics recovered from natural deposits underlying the *Principal palaeochannel* comprised a facially pecked cobble and anvil, from within 1 m of each other on the eastern edge of the channel, and a flake further to the south. The flaked lithics were mainly dispersed in two groups, again along the eastern edge of the channel, and comprise a core; several pieces of blade, flake, and chunk debitage; and a single edge-retouched flake. It is likely that all the material derived from activity associated with overlying stratigraphic units, given its position on the edge of the palaeochannel, where the deposits filling this feature thinned out.

Beyond this concentration, along the north-western edge of the *Grid-square area* (Lithic Entity 31), flaked lithics from Mesolithic-age deposits (*Mesolithic organic deposit*, *Mesolithic alluvium*, and *Mesolithic/Neolithic alluvium*) in the channel were relatively few and generally exhibited a dispersed distribution (Fig 587). That said, a spread of material at the south-eastern end of the channel was spatially associated with the beaver lodge, which dates to the latter part of the sixth millennium cal BC ('*Mesolithic organic deposit I*' phase; *Ch 3*). This comprises partial reduction sequences (cores, core fragments, and pieces of debitage) of several different types of raw material (pebble flint, chert, tuff, grey flint, and 'cannot determine' lithology), and it perhaps relates to small-scale occupation at the site. Significantly, taking the flaked-lithic assemblage from the Mesolithic-age deposits as a whole, it includes Scottish Southern Uplands chert and Yorkshire flint. This therefore indicates that people visiting the site during this period had established connections with the wider region. The coarse-stone tools in the Mesolithic-age deposits were probably intrusive Neolithic items (*below*), however.

Neolithic worked and unworked stone in the Principal palaeochannel

The worked stone from the Neolithic-age deposits in the *Principal palaeochannel* comprises a wide and varied range of coarse-stone tools and flaked lithics, with some stone implements. Much of this material was recovered from the *Earlier Neolithic organic deposit* (Fig 588; Table 251), which also contained wooden structures, worked wood, and wooden artefacts (*Appendix 13*). Significantly, spatial analysis has identified six depositional zones (1-6; *Ch 8*) and the Neolithic worked-stone items were recorded with reference to these.

The *Earlier Neolithic organic deposit* contained the greatest number of coarse-stone tools, along with a large concentration of unworked stones, consisting of complete, unburnt, and seemingly volcaniclastic cobbles, which were presumably brought onto the site and deposited within the channel. Within this deposit, there was also some patterning in the deposition of the cobble tools, with the greatest number recorded

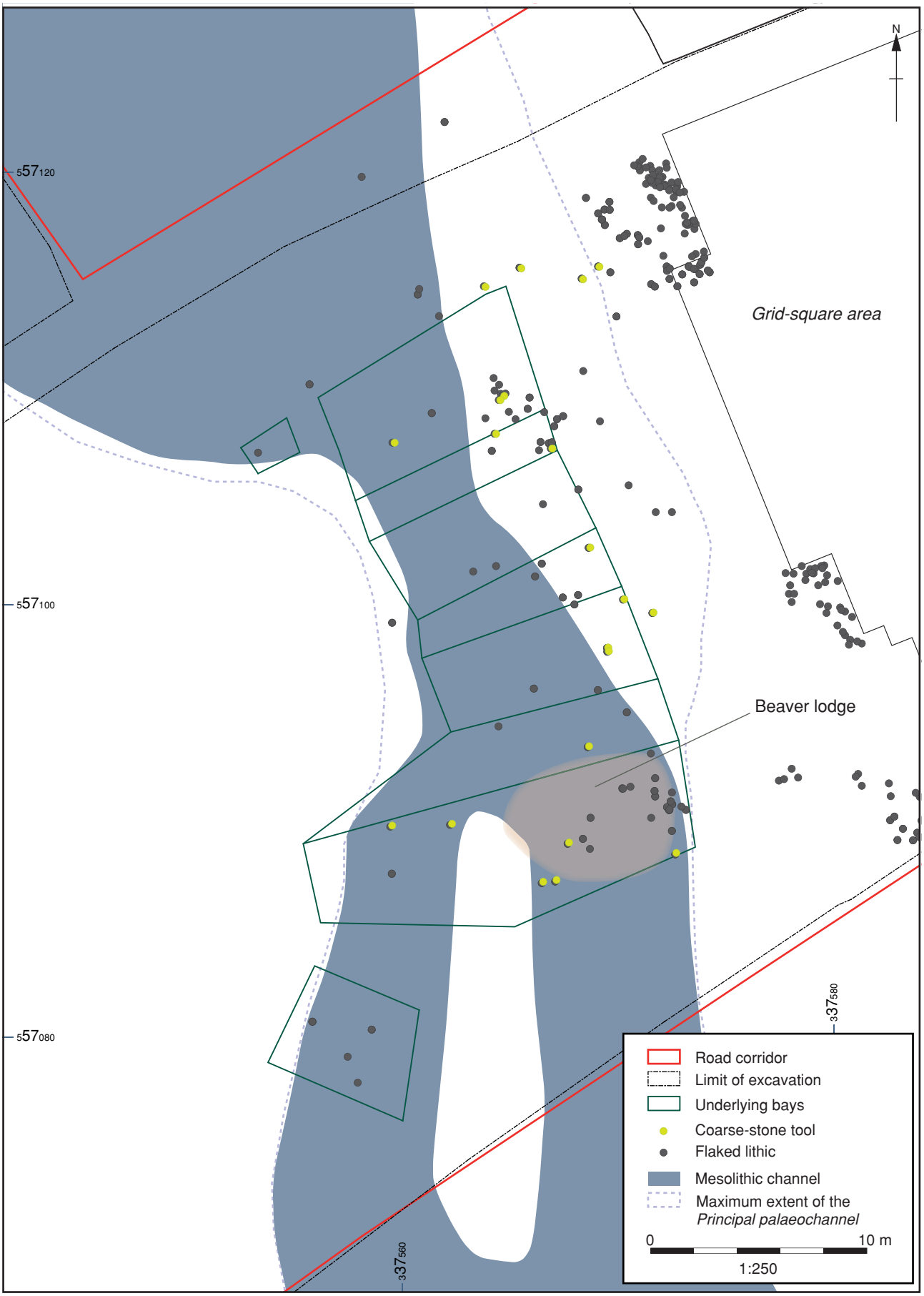

Figure 587: The distribution of flaked lithics and coarse-stone tools from Mesolithic-age deposits in the Principal palaeochannel

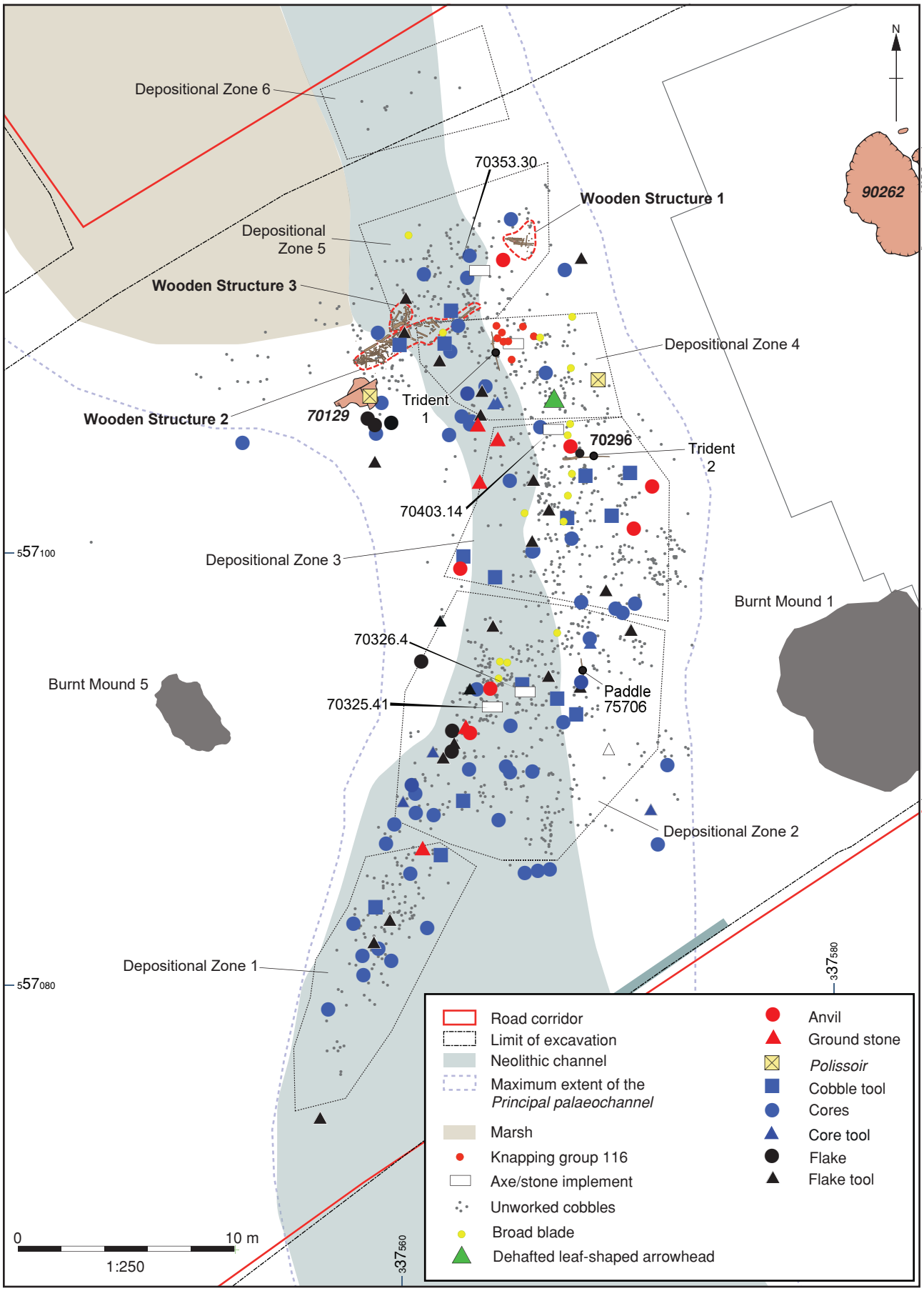

Figure 588: The distribution of coarse-stone tools, stone implements, unworked cobbles, and flaked lithics probably deriving from Neolithic-age deposits in the Principal palaeochannel

	Anvil	Broad blade	Cobble tool	Core	Core tool	Faceted hammerstone	Facially pecked	Flake tool	Flaked cobble	Ground stone	Heat-cracked	Irregular flake	Multi-hollowed	Plain hammerstone	*Polissoir*	Pounder	Regular flake
Later Mesolithic organic deposit			1		1												
Later Mesolithic alluvium	1			5	2		1	1	1			1		1			2
Mesolithic/Neolithic alluvium		2			3					1							1
Earlier Neolithic organic deposit/ Earlier Neolithic alluvium	1	8	1	6	15	1	4	2		1				3		1	7
Later Neolithic organic deposit		4		3	4	1	3	1		2	1		1	1	1		4
Chalcolitihc alluvium		1		2	1			1		1							
Bronze Age/Iron Age alluvium					2			2						3	1		2

Table 251: The frequency of coarse-stone tools, flaked lithics, and stone implements from each stratigraphic phase in the Principal palaeochannel

at the southern end of the channel (from Depositional Zones 1 and 2; Table 252). It is likely, however, that the assemblage associated with the *Earlier Neolithic organic deposit* was once denser and more extensive. For instance, there is ample spatial evidence and similarity in tool types to suggest that cobble tools from the *Earlier Neolithic organic deposit* may have been disturbed by natural and post-depositional processes and redeposited in earlier and later stratigraphic layers. However, whilst this may have been the case for a large proportion of the coarse-stone tools, it probably did not apply to all. For instance, the *Early Neolithic alluvium* contained some of the largest implements, compared with those from the other main Neolithic stratigraphic units (Table 253), and this may indicate that the deposition or use of cobble tools was also associated with this unit.

Notwithstanding this, when considering the distribution in the palaeochannel of the coarse-stone tools which probably derived from Neolithic-age deposits (*ie* including those from all Neolithic deposits, as well as earlier and later deposits), the distribution of certain types is of interest in terms of the spatial patterning of earlier Neolithic activity. The majority of the cores and core tools, for example, were distributed along the edges of the channel and also close to the wooden structures, and possible clusters of these tools

	Coarse-stone tools			Flaked lithics			Stone implements
Depositional zone	***Earlier Neolithic organic deposit***	***Earlier Neolithic alluvium***	***Later Neolithic organic deposit***	***Earlier Neolithic organic deposit***	***Earlier Neolithic alluvium***	***Later Neolithic organic deposit***	***Earlier Neolithic organic deposit***
1	9	0	0	5	0	2	0
2	13	7	11	8	7	12	1
3	4	1	3	13	0	4	1
4	7	1	2	54	0	0	0
5	3	0	0	2	0	0	1
6	0	0	0	1	0	2	0

Table 252: The distribution of coarse-stone tools, flaked lithics, and stone implements within the depositional zones in the Earlier Neolithic organic deposit*, the* Earlier Neolithic alluvium*, and the* Later Neolithic alluvium

Palaeochannel phase	n=	Average length (mm)	Average width (mm)	Average thickness (mm)
Early Neolithic organic deposit	30	103.13	76.93	46.9
Early Neolithic alluvium	14	128.93	92.43	58.71
Later Neolithic organic deposit	22	106.68	77.23	42.64

Table 253: Average dimensions for the coarse-stone tools from the Neolithic-age deposits in the Principal palaeochannel

were also present in Depositional Zones 1-3. Flakes and flake tools were concentrated along the centre line of the palaeochannel, presumably following the main course of the stream at this time, being more prevalent in its middle section (Depositional Zone 2), although the flake tools were concentrated within the northern and southern parts of their distribution. The *polissoirs*, ground stones, and anvils exhibited a varied distribution, with the *polissoirs* and anvils being mainly concentrated along the edges of the channel, while the ground stones were confined to its centre, suggesting that they could have been associated with the flakes/flake tools. However, it should be noted that the *polissoirs* may originally have comprised a single earlier Neolithic grinding slab, which was reappropriated in the Late Neolithic period and then symbolically burnt and smashed into several fragments, and deposited in tree-throw ***70129*** (*Ch 10*). The cobble tools, including faceted hammerstones, plain hammerstones, and facially pecked cobbles, were also found at the edges of the palaeochannel, many in Depositional Zone 2 (particularly the hammerstones) and to a lesser extent Depositional Zone 3 (where facially pecked cobbles were more common; *Ch 8*).

Therefore, based on the observed distributions, it appears that the coarse-stone tools interpreted as being involved in woodworking (cores/core tools; *Appendix 2*) were generally deposited along the edge of the channel, and tended to exhibit a spatial distribution related to the wooden platform and other wooden structures (*Ch 8*). The cobble tools, interpreted as being associated with grinding/polishing/smoothing, and to a lesser extent pecking, also tended to be distributed along the edges of the channel. In contrast, the coarse-stone tools possibly associated with butchery (some of the flakes and flake tools) were largely focused on the stream in the centre of the channel.

It is also quite likely, given the lack of debitage, from both the palaeochannel and the *Grid-square area*, and the fact that some of the items had been placed on, or near to, certain pieces of worked wood, that the coarse-stone tools relate to deliberate acts of deposition. Indeed, the evidence for such deposition is strengthened when the three Group VI ground-stone axeheads from the *Earlier Neolithic organic deposit* are considered, as all three had been dehafted prior to deposition, rendering them all but useless. Two (70325.41 from Depositional Zone 2 and 70403.14 from Depositional Zone 3) had also been reworked extensively, while the third, a Cumbrian Club (70353.30 from Depositional Zone 5), exhibited evidence for limited modification, suggesting that these objects had been in circulation for some time, perhaps, allowing them to be imbued with extensive biographical and symbolic histories. It is also possible that a quartz dolerite stone-axe blade (70326.4 from the *Later Neolithic organic deposit*) was another implement that had originally been deliberately placed into the *Earlier Neolithic organic deposit* within the channel. Other objects which may have been deliberately placed were a dehafted leaf-shaped arrowhead (from Depositional Zone 4; Lithic Entity 47), with traces of the resin used to fix the piece to the shaft on its principal faces (*Appendix 8*), a smashed chert nodule (knapping group 116 from Depositional Zone 4), and several broad blades (Lithic Entity 48; *below*). Finally, many, it not all, of the unworked cobbles had probably been deliberately placed into the channel.

The technological characteristics and morphology of the cores and the core-dressing pieces, and the presence of several microliths, and a small number of diagnostic retouched flakes and blades, indicate that some of the flaked lithics from the Neolithic deposits have strong affinities with Late Mesolithic stone-working traditions. In this respect, it is possible that many of those from the Neolithic deposits are residual and relate to the later Mesolithic phase of occupation within the adjacent *Grid-square area*. However, there are exceptions, especially in the *Earlier Neolithic organic deposit*, where the dehafted leaf-shaped arrowhead and the blackish-brown chert comprising knapping group 116 suggest the intentional deposition of contemporary flaked lithics. Indeed, knapping group 116 stands out from the rest of the assemblage from the Neolithic channel deposits, as, given the occurrence of cones on the striking platform on two of the pieces, the reduction of the chert nodule was probably undertaken with a hard hammer, effectively smashing it into a series of large flakes and irregular chunks, some of which were flaked further. Several fragments were then placed in and around one of the wooden tridents (Trident 1; *Ch 8*; *Appendix 13*) that had been placed within the channel, possibly as a means of referencing and framing this item.

It may also be significant that 14 broad blades (Lithic Entity 48) were recovered from Neolithic-age deposits (Table 254). However, given that broader and larger blades are recognised as a component of Early Neolithic assemblages (Butler 2005, 119-22), it is possible that most relate to earlier Neolithic activity within the channel. One other pebble-flint example was recovered from the overlying *Chalcolithic alluvium*, which, given its typology, was again probably residual to this deposit and, as such, may well be another broad blade that was originally associated with earlier Neolithic activity in the channel. It is also worth noting that half of the broad blades from Neolithic-age deposits are made from grey flint, probably derived from Yorkshire. Furthermore, the lack of other types of debitage made from grey flint indicates that the broad blades were not the product of knapping

Flaked lithic type	Cannot determine	Chert	Good-quality brown chert	Grey flint	Pebble flint	Pitchstone	Quartz	Southern Scottish Upland chert	Tuff	Total
Broad blade		1		7	1	1		1	3	***14***
Chunks	1	5		1					1	***8***
Core		6	1	1	3		4	2	1	***18***
Irregular flake		6		1	2		1	1	2	***13***
Microlith		1			1					***2***
Narrow blade		1		1	2					***4***
Pebble					1					***1***
Regular flake	4	4		6	15			2	6	***37***
Retouched blade				1	1					***2***
Retouched flake		2		3	1					***6***
Small flakes		5			20					***25***
Utilised blade				6						***6***
Utilised chunk					1					***1***
Total	***5***	***31***	***1***	***27***	***48***	***1***	***5***	***6***	***13***	***137***

Table 254: Quantification of flaked-lithic types from the Neolithic deposits in the Principal palaeochannel*, by raw material*

activity within the palaeochannel and they were probably intentionally introduced; whether this was for specific tasks or related to esoteric depositional practices is not clear.

Without recourse to microwear analysis, the use that the flaked lithics in the palaeochannel were put to is also unclear. The prevalence of debitage over formal tools and simple edge-retouched pieces suggests that they were not extensively used, although it should be noted that use of unmodified debitage is a distinct possibility. Furthermore, there appear to be differences in the numbers of flaked lithics in relation to coarse-stone tools in the Early Neolithic depositional zones, with the latter being more common at the southern end of the channel, while the flaked lithics potentially had peaks of deposition, or use, in the southern and middle reaches. While this could simply mean that different parts of the channel were used for different tasks, with different tools, it could also indicate that many of these items were intentionally deposited within this natural feature.

Worked stone from the Chalcolithic, Bronze Age, and Bronze/Iron Age alluvium

The latest deposits filling the palaeochannel can be attributed to flooding events dating to the Chalcolithic period and the Bronze/Iron Age (*Ch 11*). These produced coarse-stone tools and flaked lithics (Fig 589). The coarse-stone tools have technological and morphological parallels with those from the Neolithic deposits and include a fragment from a *polissoir* (70069.12), two comparable fragments having been found in the *Later Neolithic organic deposit* (*Ch 10*), whilst the flaked lithics comprise pieces made on a similar range of raw materials to those associated with the Late Mesolithic occupation in the *Grid-square area*. The technological character of the flaked-lithic cores and debitage also parallels that from the *Grid-square area*, while the range of macro- and microlithic tools can be attributed to a Late Mesolithic technology. In this respect, it can be postulated that most of the worked stone from these deposits of alluvium was derived from earlier phases of activity at the site.

Burnt Mounds

Neolithic burnt mounds

Two burnt mounds (1 and 5) to the east and west of the *Principal palaeochannel* have been dated to the Late Neolithic period (*Ch 10*; *Appendix 20*). Although only two flaked lithics came from Burnt Mound 5, deposits associated with Burnt Mound 1 produced two coarse-stone tools, a relatively large assemblage of flaked lithics, and a small collection of ochre (Fig 590). However, this was recovered from deposits of *Mesolithic alluvium* (***70303***, ***70457***, and ***70458***) beneath the burnt mound, and the composition and technological character of the flaked lithics indicate that the bulk can be attributed to a Late Mesolithic stone-working tradition. The exception to this is a leaf point, although this was probably an isolated Neolithic artefact.

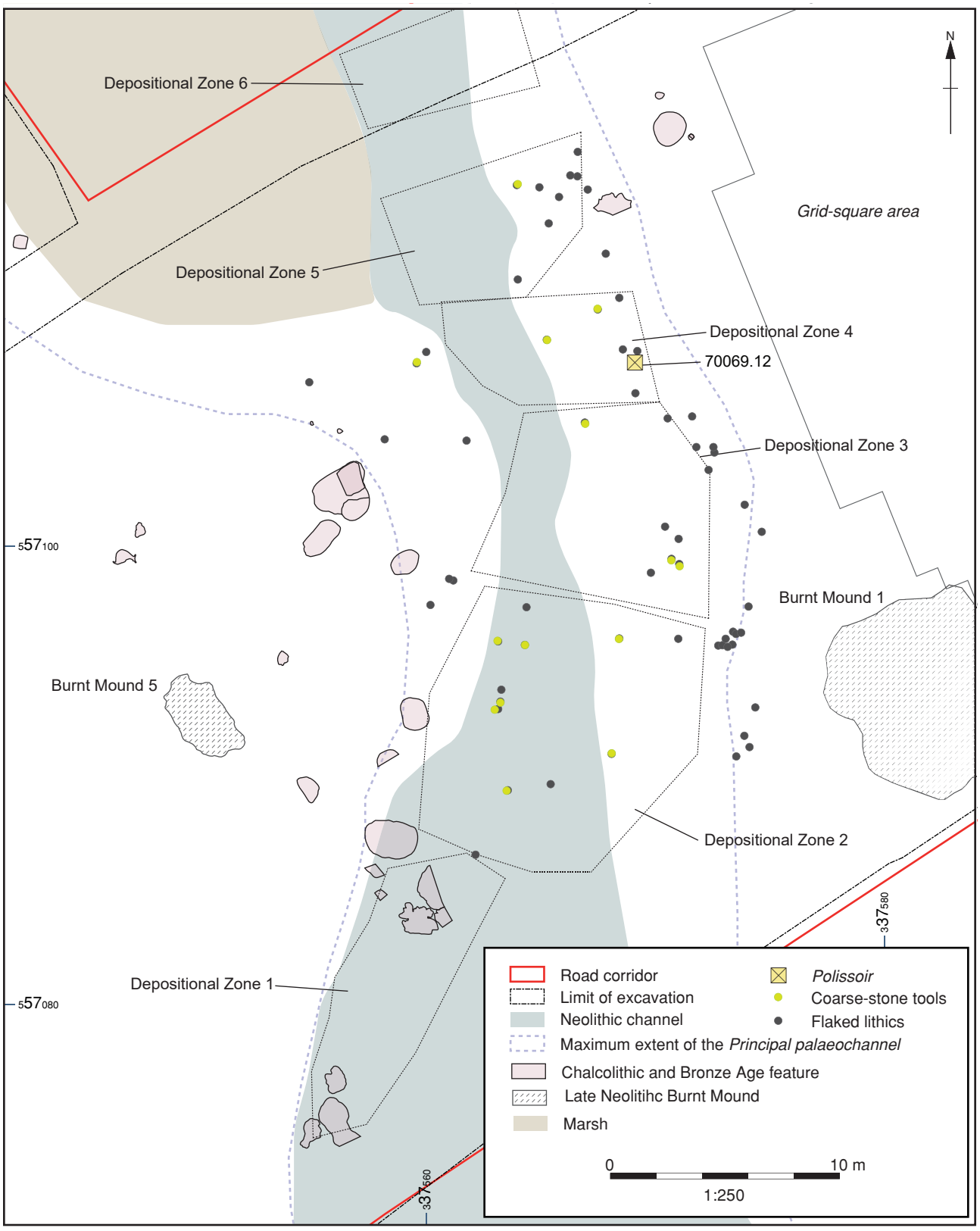

Figure 589: The distribution of coarse-stone tools and flaked lithics from the Chalcolithic and Bronze Age deposits in the Principal palaeochannel

The Mesolithic flaked-lithic assemblage (Lithic Entity 49) was composed of a dispersed group of 26 artefacts from adjacent to the *Grid-square area*, with a smaller group situated *c* 2 m to the west, made up of three flakes and a chunk. All stages of the reduction sequence were represented, and pebble-flint flakes dominate. A pebble-flint single-platform blade core was present, and the maintenance of cores during

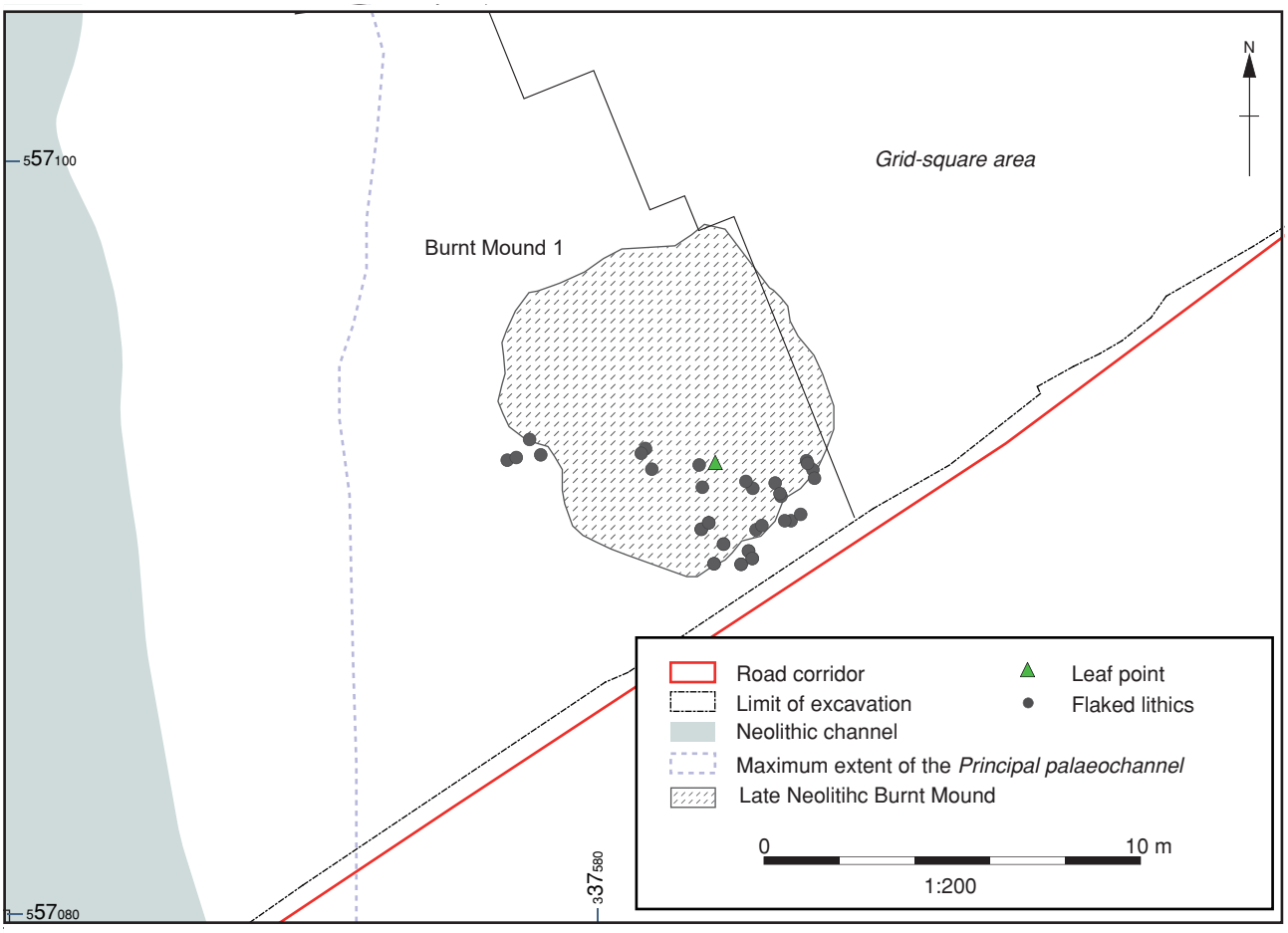

Figure 590: Distribution of flaked lithics beneath Burnt Mound 1

reduction is represented by a chert core-trimming flake taken from a core face. The unmodified debitage includes six blades. The majority of the blades represent the reduction of chert nodules, with only two pieces associated with the knapping of pebble flint. While the various blade types indicate that all stages of a general reduction sequence are present, they also imply that it is limited and only partial in composition. The blade debitage also shows a random distribution within the main group of artefacts. Flake debitage comprises 15 pieces and, contrary to the evidence from the blades, the majority have been struck from pebble-flint cores. Only four chunks are present, mainly reflecting the reduction of chert/chalcedony. Of note is the presence of only a single small flake, and the fact that small-flake debitage is under-represented could be significant. Only two retouched pieces were recorded, comprising a microlith fragment and a backed bladelet. Both are made on chert, with the backed bladelet made from Scottish material.

Given the small size of the Late Mesolithic flaked-lithic assemblage from Burnt Mound 1, that only partial reduction sequences of any one raw-material type were represented, and that there were no significant concentrations of lithic material in the grid squares adjacent to this, it is unlikely that the material reflects *in-situ* stone-working. That said, it could have been a discrete dump of flaked lithics derived from activity elsewhere on the site.

Chalcolithic and Bronze Age burnt mounds

Four burnt mounds were created in the Chalcolithic period and earlier Bronze Age (*Ch 11*). Of these, Burnt Mound 2 was associated with a relatively small assemblage of flaked lithics, all of which lay beneath the mound and probably relate to Late Mesolithic occupation. In total, 103 pieces were recovered, including elements from all stages of the reduction sequence; it is dominated by chert and pebble-flint raw materials. This material probably related to a larger spread of flaked lithics within the *Grid-square area* (in the Axe-working Area), suggesting that those beneath the burnt mound represented a discrete assemblage of worked stone, associated with Late Mesolithic occupation. In that part of the *Principal palaeochannel* covered by Burnt Mound 2, the lithics were derived from the *Mesolithic alluvium* (***70097*** and ***70321***), whilst at the channel edge they were within the *Mesolithic overbank alluvium* (***90202***) and the *Basal sands and gravels* (***90039***). In addition, a grey-flint all-round scraper was recovered from Burnt Mound 6 (Lithic Entity 50). This probably relates to its use, being likely to date to the late third millennium BC (*Ch 11*).

Retention Pond Area

A relatively large assemblage of flaked lithics was identified in features and deposits in the retention pond area (*Ch 11*). The majority were associated with a Middle Bronze Age hearth (***100020***; Fig 591) and ring-gully (***100031***), and alluvial deposits (Table 255), although they were also present in natural feature ***100044*** and hearth ***100050***.

The flaked lithics associated with hearth ***100020***, as with the material from the other Bronze Age features, were likely to be residual, particularly as technological analysis has indicated that the majority from the retention pond area is Late Mesolithic in date. However, that said, natural feature ***100044*** perhaps dates to the Late Mesolithic/Early Neolithic occupation, as it was sealed by *Bronze Age alluvium* ***100008***, and thus the lithics may have been contained within a secure context. Similarly, this layer of alluvium also sealed hearth ***100050***, which again produced a small collection of material, though this is considered to date to the Bronze Age (*Ch 11*). The flaked lithics from ***100044*** chiefly consists of chert and pebble-flint unmodified debitage; however, two core-trimming pieces, of a similar technological character to examples from Late Mesolithic deposits in the *Grid-square area*, were present, along with a *lamelles à cran*/microburin.

It is probable that the material contained in *Bronze Age alluvium* ***100008*** was associated with Late Mesolithic/Early Neolithic occupation, but it had been subsequently dispersed from the primary context. They include a flaked pebble; an opposed-platform blade and flake core and a core fragment; a core-trimming flake; blade, flake, and chunk debitage; and two retouched pieces, one of which is a side scraper. Various raw materials are represented, mainly chert and pebble flint, supplemented by smaller amounts of tuff, brown/grey flint, and Scottish Southern Uplands chert.

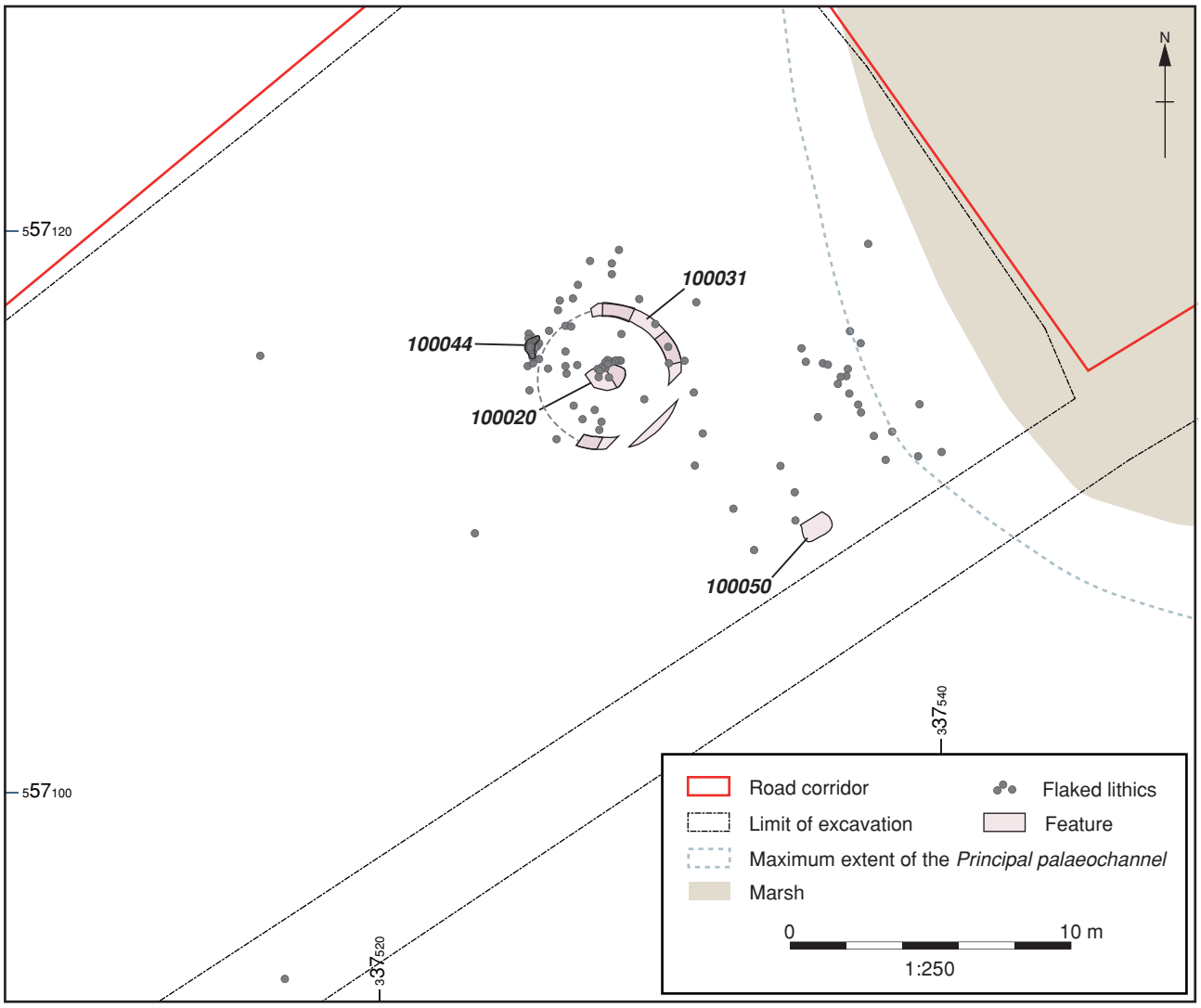

Figure 591: The spatial distribution of selected flaked lithics in the retention pond area

Context	Category	Number of lithics	Feature	Feature description	Diagnostic lithics
100006	fill	1	***100007***	natural geology	
100008	layer	58		alluvium	microlith, side scrapers
100010	layer	1		alluvium	
100015	fill	2	***100016***	undated hearth	
100019	fill	48	***100020***	Middle Bronze Age hearth	microlith
100021	fill	6	***100022***	Middle Bronze Age ring gully	microlith
100023	fill	22	***100024***	Middle Bronze Age ring gully	microliths
100025	fill	3	***100026***	Middle Bronze Age pit	
100027	fill	8	***100045***	natural geology	
100028	fill	22	***100044***	natural geology	microlith
100032	fill	10	***100033***	Middle Bronze Age posthole	
100034	fill	26	***100020***	Middle Bronze Age hearth	awl
100037	fill	1	***100038***	Middle Bronze Age ring gully	
100039	fill	4	***100040***	Modern ditch	microlith
100043	fill	2	***100031***	Middle Bronze Age ring gully	microlith, coarse-stone tool (anvil)
100049	fill	3	***100050***	undated hearth, possible early prehistoric feature	debitage
100051	fill	3	***100050***	undated hearth, possible early prehistoric feature	debitage

Shading denotes lithics with spatial data

Table 255: Quantification of the flaked lithics from the retention pond area, and their association with features and deposits