Stage 3 and 4 Archaeological Excavation
of the
Huson Site (AgGt-111)
Mountain Road,
City of Thorold, Regional Municipality of Niagara, Ontario

Submitted to

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ASI File #: 01WB-02 & 01WB-03
Archaeological Licence # 2001-025
MCL CIF # 2001-025-020

February 2004

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**STAGE 3 AND 4 ARCHAEOLOGICAL EXCAVATION
OF THE
HUSON SITE (AgGt-111)
MOUNTAIN ROAD,
CITY OF THOROLD, REGIONAL MUNICIPALITY OF NIAGARA, ONTARIO**

1 INTRODUCTION

Archaeological Services Inc. (ASI) was contracted by *Walker Industries Holdings Limited*, to conduct a Stage 3 and 4 salvage excavation of the Huson site (AgGt-111), located in mature woodlot west of Beechwood Road, City of Thorold in the Regional Municipality of Niagara, Ontario. The Huson site was found in the course of Stage 2 test pitting (Archaeological Services Inc. 2002) along the proposed realignment of Mountain Road, from Beechwood Road to Townline Road in the City of Thorold (Figures 1.1 to 1.3).

The Stage 3 and 4 assessments were completed in accordance with the Ontario Heritage Act under the project direction of Dr. Ronald Williamson and the field direction of Dr Shaun Austin under an archaeological consulting licence 2001-025-020. The field work occurred from October to December, 2001. Permission to access the study area and carry out the activities necessary for the completion of Stage 3 and 4 assessments was granted by Walker Industries Holdings Ltd.

2 BACKGROUND

2.1 Environment and Geological Context

The Huson site is located in a depression, at 180 m above msl, about 500 m south of the Niagara Escarpment on the Haldimand Clay Plain (Chapman and Putnam 1984; Feenstra 1984) (Figures 1.3 and 2.1). It lies 150-200 m south of Ten Mile Creek, which, since the construction of the Welland Canal, flows west into the canal, approximately 1.5 km west of the site. More recently, the site environment has been completely altered by open pit quarrying immediately to the west of the site (Figure 1.3). Canalization and quarrying has likely lowered water tables at the site since its formation.

The site substrate is deep-water clays and silts resulting from extensive innundation of the Niagara peninsula during the Late Glacial and early Post-Glacial period (14,000 to 10,000 BP). Rhythmites, alternating dark and light bands of clay, associated with deep water sedimentation, were documented at the Huson site approximately one metre below ground level during trenching for soil and sediment studies as part of Stage 4 investigations. They are likely the upper part of an upper glaciolacustrine unit, overlying Halton till, that has been identified in boreholes in the Niagara peninsula (Menzies 2001). During the early part of the Holocene (ca 10,000-6,000 BP), Lake Wainfleet, located on the Niagara peninsula between Lakes Erie and

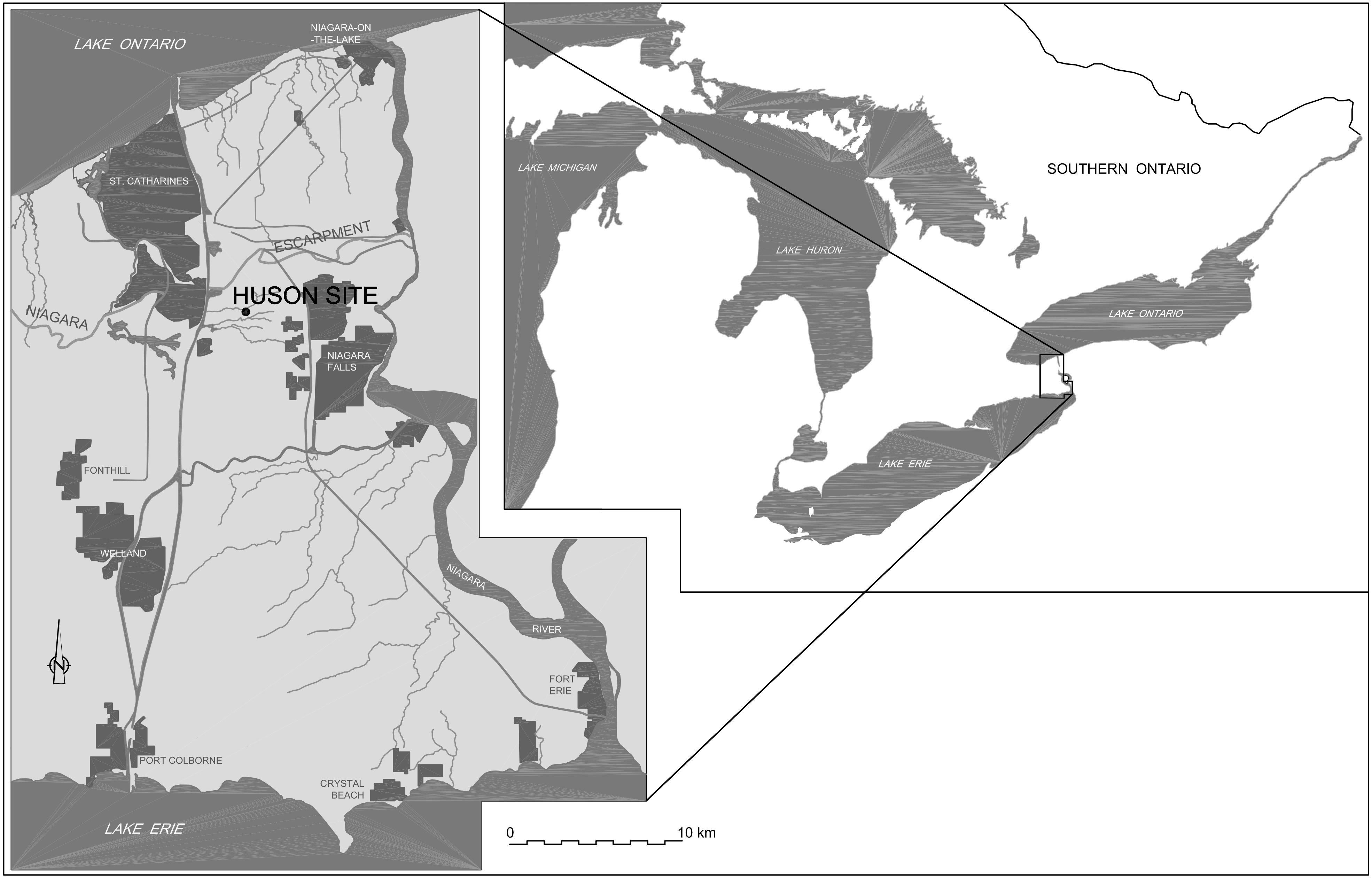

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Figure 1.1 Location of the Huson Site (AgGt-111) on the Niagara Frontier

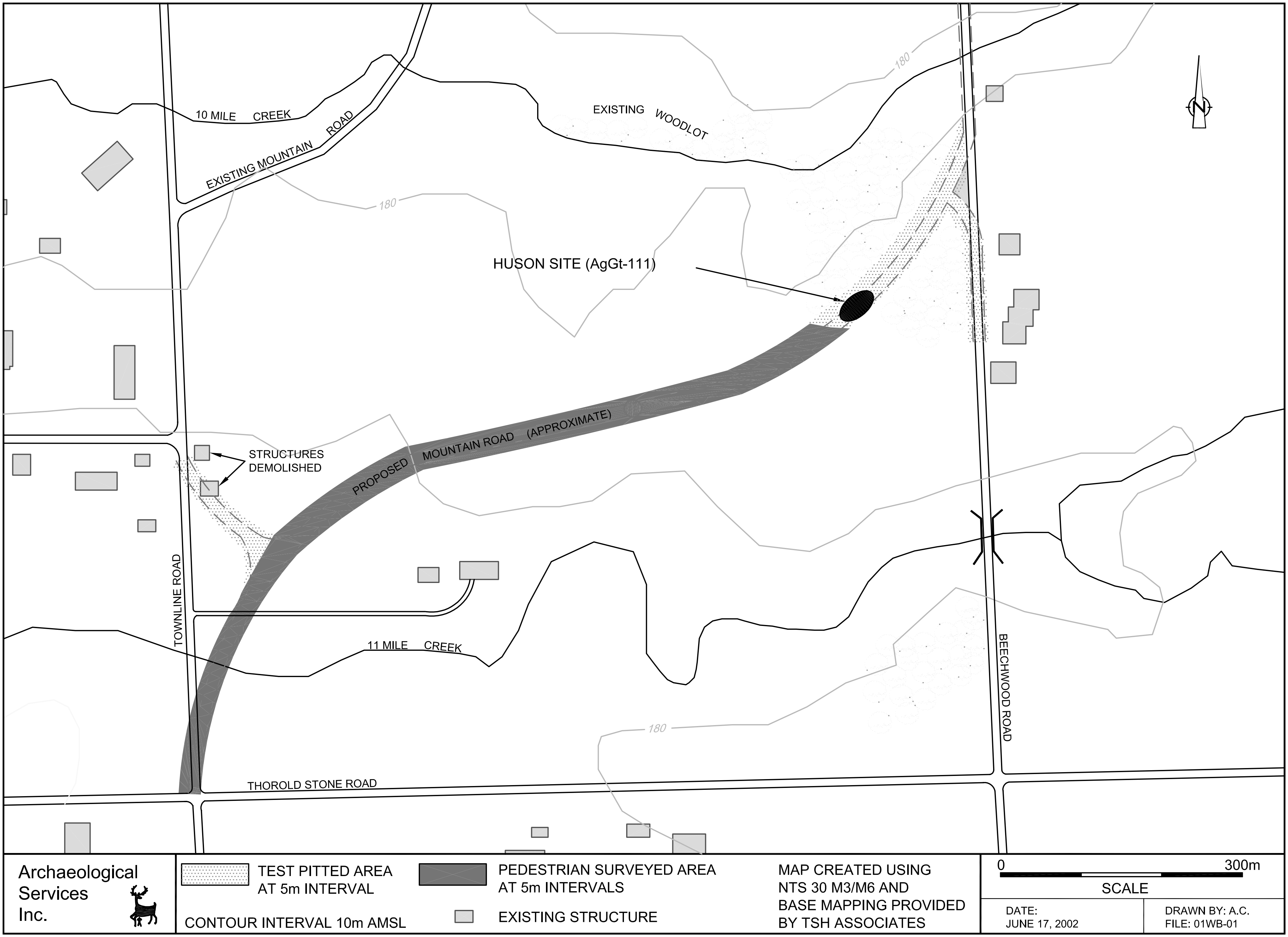

FIGURE 1.2: Location of the Huson Site in relation to forest cover, Ten Mile and Eleven Mile Creeks, and to road realignment

HUSON SITE (AgGt-111) : SITE AREA

Archaeological Services Inc.

NOTE
CONTOUR LINES ARE METERS ABOVE SEA LEVEL
AERIAL PHOTO PRODUCED BY TRIATHLON MAPPING CORPORATION, 1995

0 125m
SCALE

DATE: ARPIL 8, 2002

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Figure 1.3: Location of the Huson site in relation to forest cover, Ten Mile Creek, and topography, at the west edge of open pit mine

Ontario, emptied through spillways to the north (Figure 2.1), likely affecting the area of the Huson site (Menzies and Taylor 1998:298-9; Tinkler 1994). River diversions occurred throughout the Holocene, a result of blockages, caused by treefalls and ice, and changing stream gradients. (Gradients of rivers flowing west increased due to faster isostatic rebound of eastern over western portions of the peninsula – see Tinkler 1994:38-40).

The Huson site area may therefore have been subject to innundation throughout the Holocene as part of a post-glacial lake system that contained an ever-decreasing lake and series of ponds and wetlands. The purported Early Archaic age of the archaeological material (Archaeological Services 2002) is, therefore, of particular significance – indicating an early and probably seasonal occupation within this wet landscape.

2.2 Recent Landscape History

The Huson site is located in the east part of Lot 66 in the former Township of Stamford. The township was surveyed after the Niagara peninsula was ceded to the Crown by the Mississauga Indians in 1784. According to the *1876 Illustrated Historic Atlas of Lincoln & Welland Counties*, Lot 66 was owned by Mr. George Hoover, whose homestead and orchard were located at the base of the existing Mountain Road in the west side of Lot 66. The east part of Lot 66 where the Huson site is located, was mature hardwood forest as of fall 2001. Survey records, current land use, and preliminary Stage 3 archaeological test excavations suggested, at the outset of Stage 4 investigations, that the Huson site had not experienced sustained ploughing or severe disturbance associated with land clearance and agriculture. The wet nature of the land throughout the Holocene (see above) might explain why this woodlot was left relatively undisturbed.

3.0 STAGE 3-4 INVESTIGATION OF THE HUSON SITE

A variety of methods were employed to investigate the Huson site in response to two observations from earlier investigations of the site: 1) landscape history of the property suggested that the Huson site experienced fewer impacts from Euro-Canadian land clearance than typical for this region, implying greater archaeological potential for preservation of remains and patterns interpretable in terms of cultural behaviour; and 2) high densities of chert flakes in the topsoil – in the range of 800 to 1000 flakes per square metre – suggested the existence of cultural features below. The recovery of a drill and an end scraper during Stage 2-3 investigations reinforced the impression of relative integrity of archaeological remains from a very early period of pre-ceramic occupation. In particular, the artifacts suggested the presence of an Early Archaic occupation, ca. 10,000 to 8,000 BP (Archaeological Services Inc. 2002).

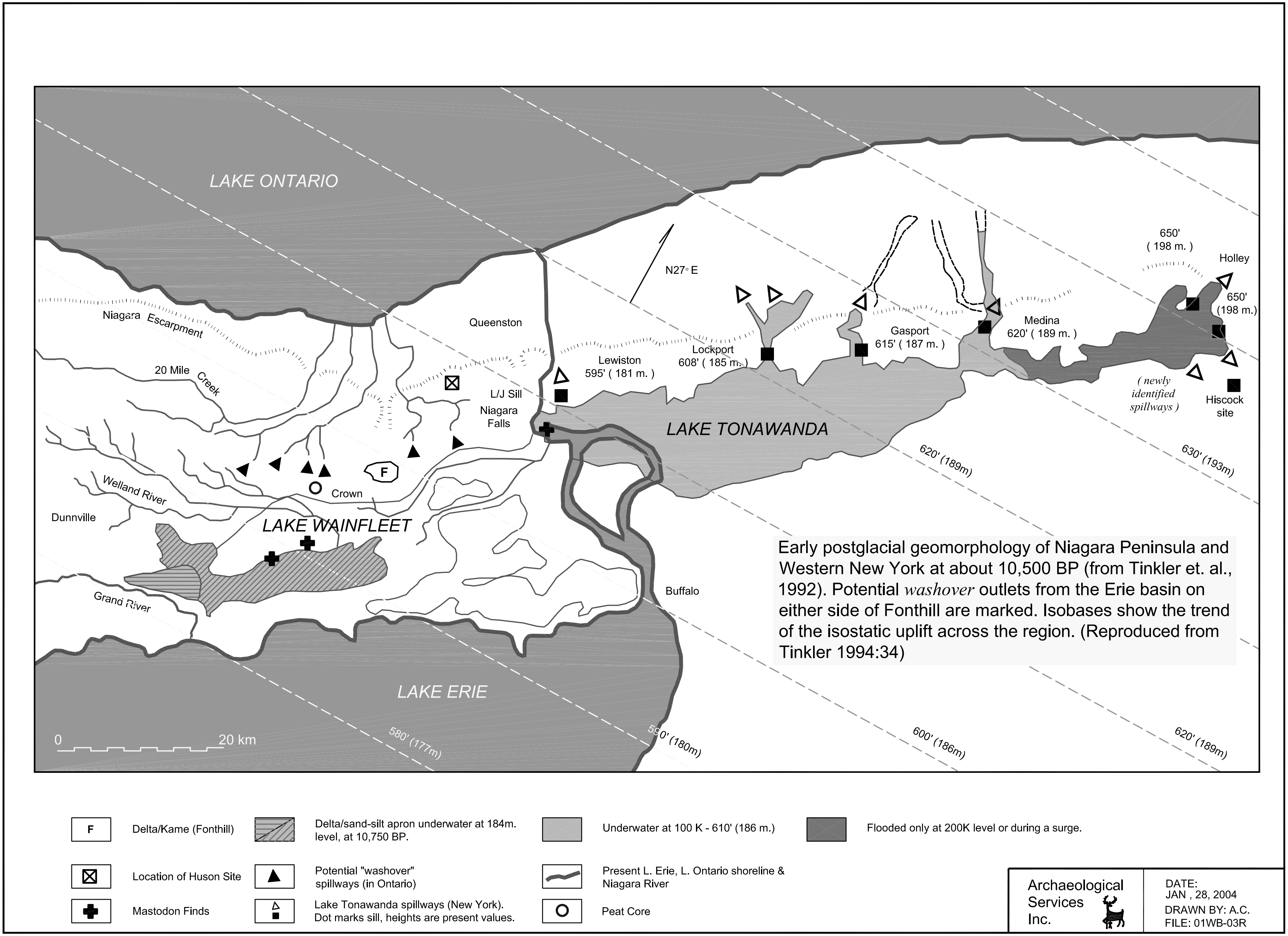


Figure 2.1 EARLY POSTGLACIAL GEOMORPHOLOGY OF NIAGARA PENINSULA AND WESTERN NEW YORK

Field and analytical methods were therefore devised to address the potential for recovering behavioural information from an early Holocene, relatively undisturbed occupation:

- The excavation of subsoil was done entirely by trowel and finds recorded in three dimensions; subsoil was excavated until finds were exhausted; and all soils were screened through 6 mm mesh;
- Spatial and formal dimensions of finds were plotted, using spatial and statistical software, to investigate cultural and natural formation processes of features;
- Worked artifacts were described and samples of debitage were typed to characterize potential behavioural differences among features;
- A soil profile located outside the site was described and sediment samples were taken for particle size analysis in order to characterize the recent geological history of the site, including possible recent disturbances to the site environment;
- Soil micromorphology samples were taken from the soil profile as well as from one of the potential cultural features to determine post-depositional disturbance;
- Pollen analysis and plant macro-fossils were analysed to determine site palaeo-environment and post-depositional disturbance;
- Radiocarbon dating of a fish vertebra was used in an attempt to date the cultural occupation.

3.1 Archaeological Excavation and Recording Methods

The grid that was laid out for Stage 3 investigations was used and expanded for Stage 4 excavations (Figure 3.1). This grid was laid out in square metres relative to a datum stake that was labelled 500 N-200 E, located at the 1 +200 chainage marker for the proposed road. This allowed for site mapping on the existing plans. A GPS reading (UTM NAD27) taken for the datum was: 649236 m E; 4775530 m N.

Piece-plotting of artifacts (worked tools as well as unworked debitage), to the nearest centimetre, occurred in the central part of the site. This area is defined by a heavy outline around 19 units in Figure 3.1. Piece-plotting occurred for all artifacts from the subsoil in all 19 units. For 13 of these units, piece-plotting also occurred in the topsoil (see Figure 3.1 for excavation history of each square). For the remaining six units, the topsoil was removed by shovel and screened through 6 mm mesh. All units and layers (topsoil and subsoil) that were piece-plotted were hand-excavated, using trowels, and were also screened.

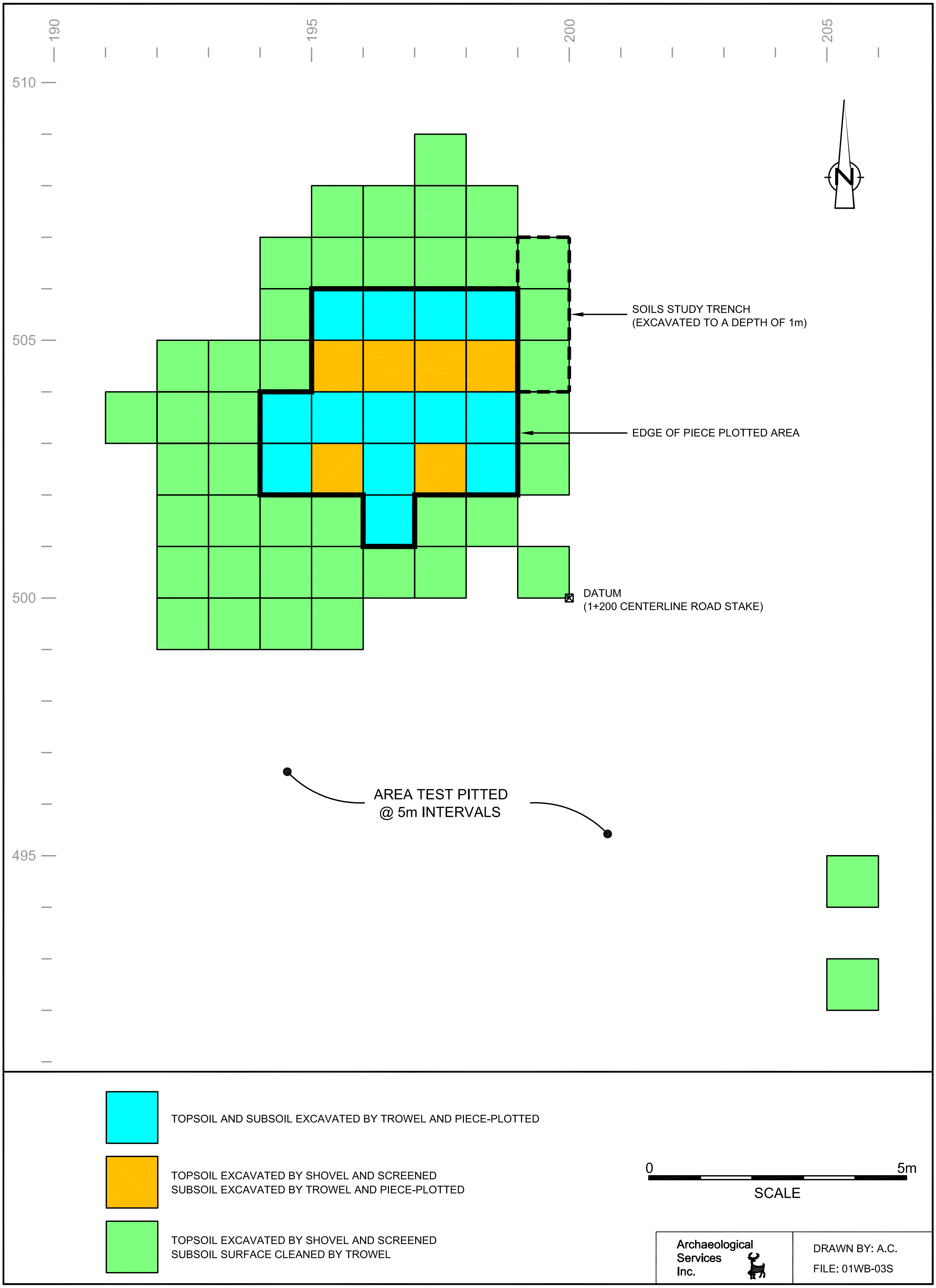


Figure 3.1 EXCAVATION HISTORY OF THE SITE

Figure 3.2: Piece plotting using the Huson Scale.

Piece-plotting was done using a portable grid with a rolling crossbar (Figure 3.2), built to measure the x, y, and z coordinate of each item recovered (including worked artifacts and debitage). This apparatus, known as the Huson Scale, is a square metal frame with a 100 cm scale on opposite sides of the frame, providing the y-coordinate, and a perpendicular, 100 cm scale on a rolling crossbar, providing the x-coordinate. The distance below the top of the crossbar, z-coordinate, was measured using a plumb bob attached to the end of a tape measure. The scale was levelled over each unit to be excavated.

In piece-plotted units, as artifacts were exposed by trowel, the location of each item was marked with a nail. Artifacts were removed, numbered, and bagged individually after measurement. A piece plot form was used to record artifact number, easting (x), northing (y), depth (z) (below measuring bar), and comments. Depth of measuring bar below datum is recorded at the top of the form page, or start of numbered artifact sequence, for each unit. Vertical datum was set at 20 cm above ground surface at datum.

After completely excavating the dark topsoil (roughly corresponding to the A soil horizon), the subsoil (roughly corresponding to a lighter Ae (elluviated) or, at greater depths, B soil horizon) was hand excavated by trowel in the central part of the site (Figure 3.1). Artifacts encountered were piece-plotted in the same manner as in the topsoil. Excavation into the subsoil continued until culturally sterile subsoil was reached. Units around the edge of the grid were excavated by shovel and screen to the surface of the subsoil, which was then cleaned by trowel.

The depth of distribution of artifacts below subsoil surface and the high density of artifacts in plan distribution in both topsoil and subsoil constitute evidence for three features with possible cultural significance. Spatial and cultural definition of these features is considered in Section 4.1 along with the question of the origin and integrity of features, as well as in Section 5.

A total of 60 m^2 was excavated, including 19 m^2 with piece-plotting. Appendix A contains a catalogue of all archaeological material by excavation unit.

3.2 Artifact Analysis

Artifact analysis followed standard practices of lithic analysis used at Palaeo-Indian and Archaic sites in southern Ontario – preceramic sites with large lithic assemblages dominated by bifacial and unifacial tools and unworked debitage (Lennox 2000; Storck 1997; Timmins 1996; Williamson and MacDonald 1997). At the Huson site, as in other sites in the Niagara Peninsula, the assemblage is comprised of local Onondaga chert.

3.2.1 Worked Artifacts

Most bifacially and unifacially worked artifacts were identified in the field. All recovered items were washed and examined in the lab for evidence of working. "Worked" is defined as modification of the stone through invasive or marginal flaking consistently along edges: it is not meant to include damage from use or manufacture, which can only be addressed reliably through microscopic use-wear analysis (Shen 1999; Young and Bamforth 1990).

Artifacts are described individually in Appendix B and are considered further in section 4.1.1.

3.2.2. Debitage

This study employed a typological approach to the analysis of debitage. Flakes were typed with the objective of revealing: 1) the kinds of objective pieces being worked (e.g., bifaces, unifaces, cores); and 2) various stages of bifacial reduction. The lithic analyst with flintknapping experience can infer, or at least plausibly suggest, specific techniques and reduction strategies used by knappers at the site (Andrefsky 1998:111; Whittaker 1994). For example, the presence of uniface retouch flakes suggests the resharpening of scrapers (Frison 1968). The presence of distinctive notching flakes indicates the final stages of manufacture of a notched projectile point (Titmus 1985). These are just two examples of diagnostic flake types that have been identified in debitage assemblages from sites in southern Ontario (Jackson 1998:47; Stewart 1997:363).

Knowledge and recognition of types is dependent, in part, on the analyst's knapping experience. It is also cumulative and specific to cultural traditions and regions. Regional or site studies within North America describe some distinctive types of flakes, reduction techniques, and reduction strategies, particularly for Palaeo-Indian sites and traditions of tool-manufacturing (e.g., Bradley 1982, Callahan 1979, Flenniken 1985, Storck 1997).

Bifacial reduction can be conceptualized in terms of stages along a continuum (Callahan 1979, Whittaker 1994). Analysis of the Huson site assemblage uses a stage approach to classify debitage resulting from core and bifacial reduction. Stages and codes used to type flakes during analysis are defined in Table 3.1. This approach was refined as analysis of the Huson debitage assemblage proceeded. Additional input was recorded as observations (see Section 4.1.2) rather than as additional codes within the existing series of codes (see Stewart 1998 for an example of the latter).

Table 3.1: Genera1ized typological approach to classifying debitage resulting from core bifacial reduction

Bifacial Reduction Stage	Definition	Code
1	Core and unifacial reduction	100 series
2	Bifacial edge preparation	200 series
3	Bifacial thinning, mostly percussion	300 series
4	Bifacial reduction, mostly pressure (e.g., retouch)	400 series

Core reduction and unifacial retouch (100 series flakes) are inferred from unfacetted platform flakes. Interior flakes resulting from core reduction tend to exhibit the following characteristics: long, linear, parallel-sided, terminating in a point; angular in cross-section; platforms are unfacetted and may retain cortex. Uniface retouch flakes also have flat platforms, without facets or evidence of grinding (Shott 1995). Heavy step-fracturing is often present above platforms – the purpose of retouch being to rejuvenate these use-damaged edges. Platforms are rarely isolated and often broad. Larger flakes may be longitudinally curved (cf Jackson 1998:47). Uniface retouch flakes have been observed in Palaeo-Indian and Archaic assemblages in southern Ontario (Deller and Ellis 1992:86-87; Jackson 1998:47; Timmins 1996).

Bifacial thinning (200, 300, 400 series) is indicated by alternate flaking (platform occurs 'off-centre'), multi-facetted platforms, longitudinal curve and multiple dorsal scars (where flake size permits observation).

Early bifacial reduction (200 series) is inferred from bifacial thinning flakes that have characteristics of edge preparation (thick, wide platform relative to flake length; J-curve in longitudinal section). Early bifacial thinning flakes may also have one or more of these characteristics: angular in plan view; lumpy dorsal surface; longitudinal curve; unprepared platforms. Alternate flakes (Whittaker 1994:137) are produced from right-angled edges, which are a common problem to overcome early in the bifacial reduction process but appear later in the reduction sequence as well.

Later bifacial thinning (300 series) is inferred from bifacial thinning flakes that have these characteristics: higher number of platform facets; greater length in proportion to platform size; larger, longer flakes retaining more dorsal scars; ground or otherwise prepared platforms.

Pressure flakes, or flakes with low dynamic loading (400 series), tend to have diffuse bulbs, long dorsal ridges parallel to flake margins, multi-facetted abraded and narrow platforms. They are sometimes twisted (but not, for example, in Clovis traditions of knapping). Dog-leg scars may be present: in plan view, the flake may curve in either direction.

3.3 Palaeobotany

Two subsurface bulk samples, one each from Features 1 and 3, were recovered from the Huson site for analysis of both plant macrofossils and pollen content. Evaluation of results was aided by collection of surface samples, from moss and litter on the forest floor, for comparison of subsurface and surface pollen.

In addition, carbonized organics encountered during excavation were piece-plotted. The distribution of these organics is discussed along with the distribution of artifacts in the discussion of features (Section 4.1.3).

The fill from bulk samples (Features 1 and 3) was water-screened to collect seeds and wood charcoal. This involved the double-bucket method using a 300 micrometre (micron) screen, for recovery of the light fraction, and a 2 mm screen, for the heavy material. Light fractions were dried for 24 hours and then inspected under a stereoscope at magnifications of from 7 to 40x.

Several grams of each sample were retained for pollen analysis before flotation. Soil particles were dispersed using potassium hydroxide (KOH), which dislodged pollen grains and spores from the soil matrix, aided by the use of a plastic pestle to crush larger clods of soil. Samples were then passed through a 150 micron screen to remove larger particles and then through a 10 micron screen to capture pollen grains while allowing the KOH solution to drain when rinsed. Hydroflouric acid (HF) was used to digest the remaining silicates. Residues were screened again to further concentrate the material. This material was then washed with glacial acetic acid dyed with Safranine and mounted in glycerine.

In addition to feature bulk samples, a number of organic finds were piece-plotted and catalogued (Appendix A).

3.4 Pedology and Sedimentology

A 3-by-1 m trench was excavated to the west of the site (Figure 3.1) to a depth of about 1 m – below the active layer of weathering – to investigate the history of natural (off-site) soil formation and sedimentation. The north face of this trench was described according to standard field methods (Birkeland 1999:Table A1.3). Bulk sediment samples for granulometry were collected from all soil horizons and lithological units observed. Bulk samples were processed in the Department of Geography at the University of Toronto (St George campus) to determine grain size. The coarse fraction (>63 microns) was processed by disaggregation and dry-sieve methods (Black et al. 1965). The fines (clays and silts) were processed by sedigraph.

Evaluation of soil and sediment characteristics and age was aided by on-site consultations with Dr. John Menzies and Dr. Keith Tinkler, Dept of Earth Sciences, Brock University, and by correspondence with Dr. Bert VandenBygaart, Research Branch, Eastern Region, Agriculture and Agri-Food Canada, Ottawa.

3.5. Soil Micromorphology

Soil micromorphological studies aim to eludicate and distinguish geologic, pedologic and anthropogenic events by examination of intact, undisturbed (as opposed to bulk) samples of soil and sediment in petrographic thin-section (Courty et a. 1989; Goldberg 1992). These studies are employed increasingly in archaeology because soil, sediment and boundary features can be linked to the processes which formed them; an understanding of these processes is often critical to the interpretation of archaeological site formation and features within sites (Evans and O'Connor 1999). For example, anthropogenic activities might be distinguished by the following features identified in thin-section: more organic matter, diatoms, shells, especially in middens; less organic matter in cleaned areas (e.g., house floors, away from edges); greater porosity in previously excavated areas (e.g., pits or hearths); reduced porosity in filled-in features (e.g., post-holes) (Goldberg and Whitbread 1993:166). These measures are meaningful only in the context of an understanding of site environment (off-site soil formation and sedimentation) and processes operating through modern analogues.

Micromorphology was intended to address two issues at the Huson site:

- to characterise the extent of disturbance of the solum (soil horizons above unweathered Ck) in order to assess environmental disturbance to the archaeological site since its original formation (e.g., through dessication, tree wind-throws, bioturbation, forest clearance, erosion, cultivation) – assumed to have occurred during the Early Archaic, 8,000 to 10,000 years ago;

- to assess any differences (in contents, texture, fabric) between on-site, feature soil and off-site soil, from samples collected at comparable depths (near-surface).

Soil micromorphology sample collection and analysis was carried out by John Menzies, Department of Earth Sciences, Brock University. Four samples were extracted, one from Feature 1 (Sample H0101) and three from the soil profile wall in the off-site trench (H0102 to H0104, from top to bottom, respectively)(see Figure 4.15 for locations). Samples were collected in metal (Kubiena) boxes (8x6x4 cm) and processed according to standard methods (http://www.micromorphology.brocku.ca/tech.html).

Analysis is limited to qualitative observations of samples. This application of micromorphology contributes to the development of the technique in southern Ontario. Micromorphology can be used, here, as elsewhere, to address questions of identification of cultural activity areas and features as well as post-depositional disturbance.

4.0 RESULTS

4.1 Lithic Analysis

A total of 9407 items – 27 worked stone tools, 9380 pieces of chert debitage and one fish vertebra – was recovered from the 60 excavation units (see catalogue, Appendix A). Most of this material was recovered during trowel-excavation of the central part of the grid, using piece-plotting. The distribution of piece-plotted material is shown in Figure 4.1a. The distribution of debitage, by excavation unit counts, is shown in Figure 4.1b. All piece-plotted items were washed and examined in the lab for evidence of working. A total of 27 worked pieces are described individually in Appendix B. All artifacts and flakes examined were found to be Onondaga chert.

4.1.1 Worked Artifacts

Four bifaces and a bifacial drill were recovered, most from near Feature 1.

The bifacial drill (Figure 4.2), which has a squared base and is missing its tip, resembles drills from the Early Archaic Nettling site in southwestern Ontario (Ellis et al. 1991:Figure 6h). The Huson specimen falls within the size range of rod-like bifacial tools, or drills, found in the Early Archaic in Ontario (Ellis et al. 1990:75; Lennox 1993:Figure 9) and is considerably smaller than similar tools, reworked from points, that are associated with the Broad Point tradition of the Late Archaic period (Ellis et al. 1990:103).

Figure 4.2: Obverse and reverse sides of the drill.

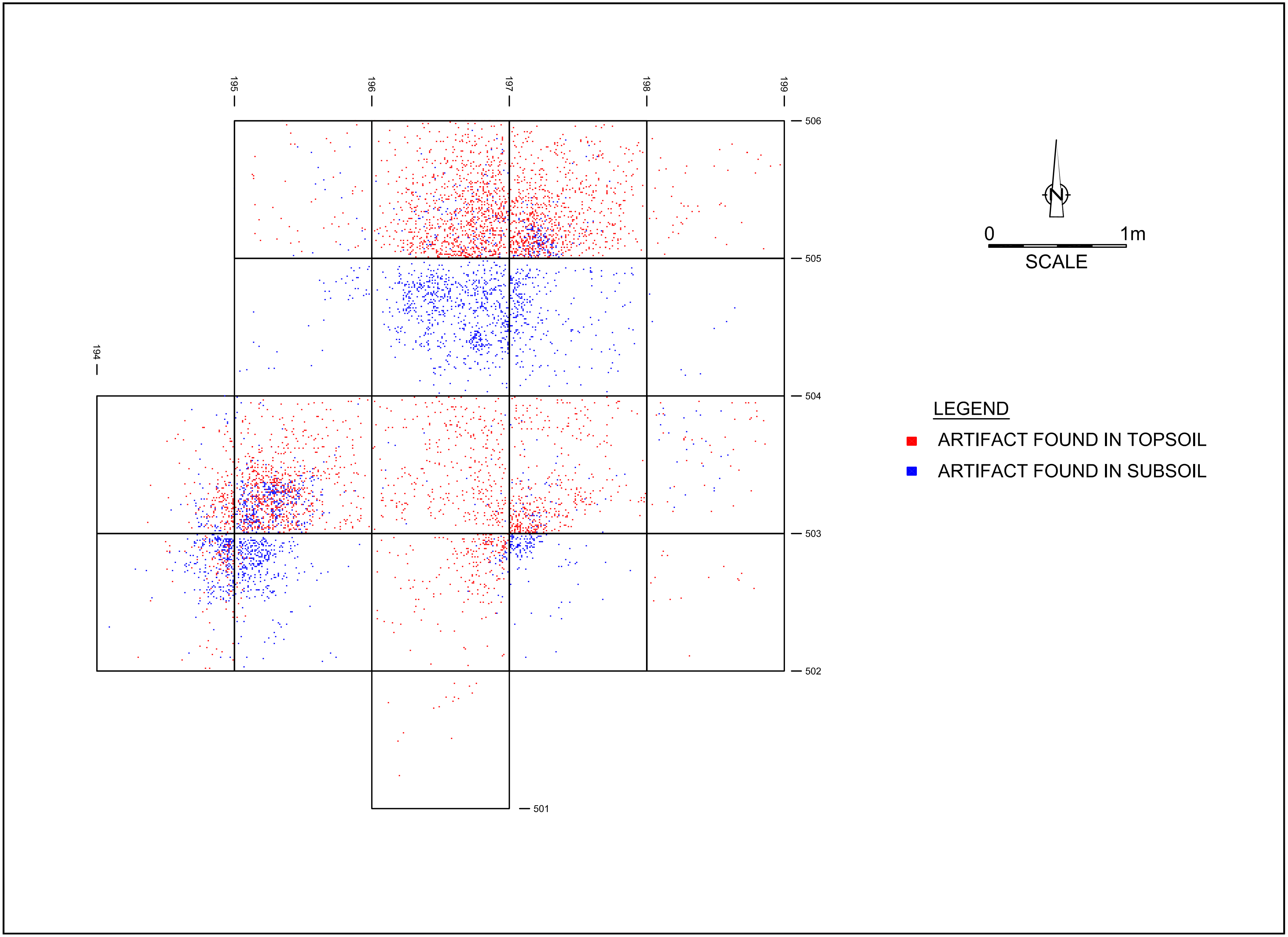


Figure 4.1a: Distribution of piece-plotted items

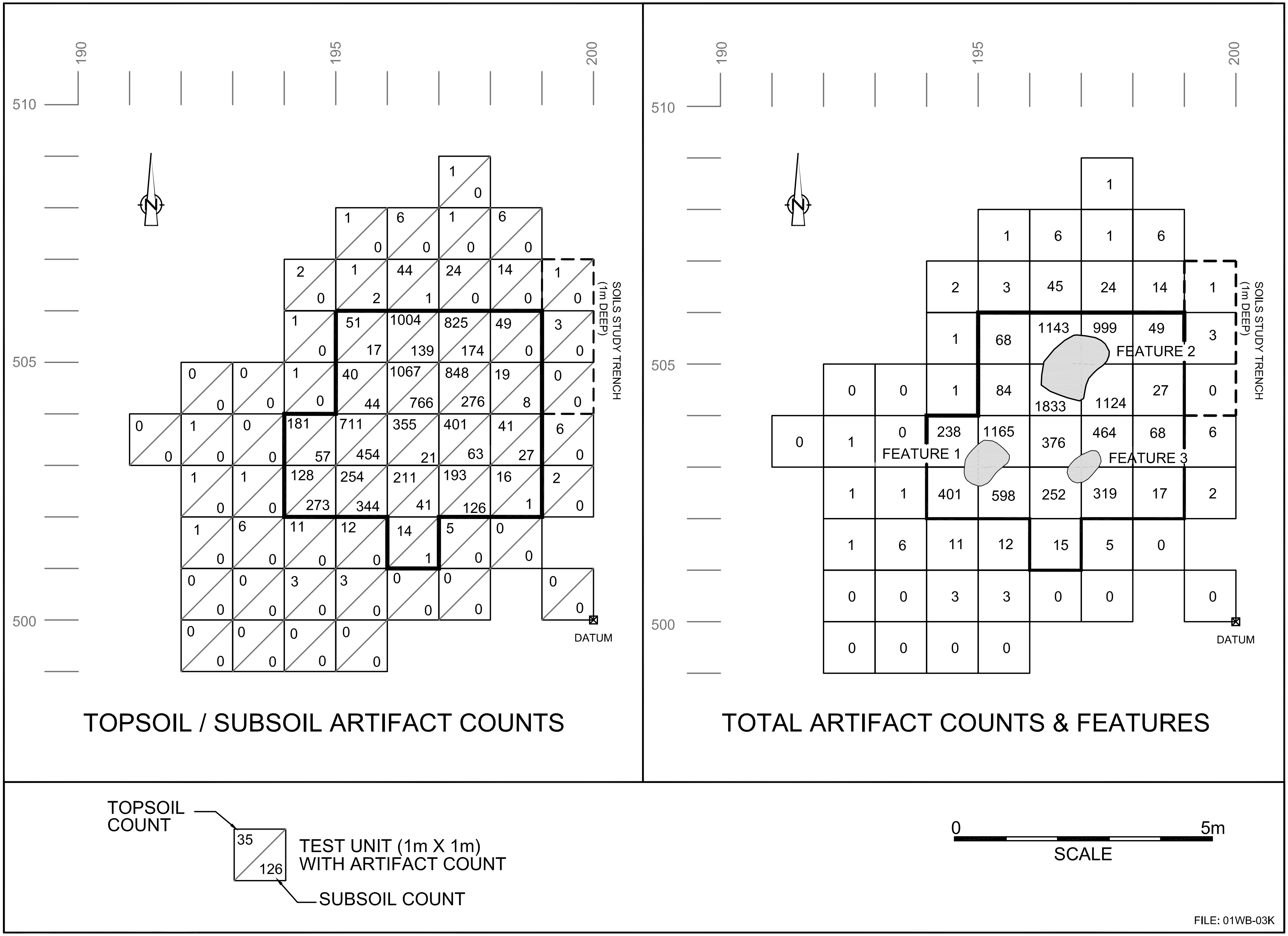


Figure 4.1b: Distribution of debitage

The four bifaces (Figure 4.3a and 4.3b) are all base or tip fragments and are small – the maximum width of the most complete specimen (#2648) is 35 mm. The bases (or tips), in all specimens, tend to be pointed or flat, not rounded, indicating an absence of shaping. They are of an early manufacturing stage (Callahan 1979). All appear to have broken by snap or hinge-fracturing through the middle. Two of the specimens (#2648 and 2277) each retain a single deep, long flake scar that was driven from the end of the biface, ending in step or hinge-fractures (Figure 4.3a). These scars may indicate that the bifaces were being used as bifacial cores for the production of useable flakes.

Figure 4.3a: Bifaces, which are shown with breaks at top. Arrows indicate origin and direction of large flake removals from ends of bifaces.

Two end-scrapers (Figure 4.4) were recovered from south of Feature 1, and six unifacial artifact fragments from the central site area. One single-spurred end scraper (Figure 4.3a), well-made, with expanding sides and a steeply worked bit, recovered from unit 501-193, is similar to end scrapers from the Early Archaic Nettling site (Ellis et al. 1990:74, 76; Ellis et al. 1991:12) in size and form. Its 'thumbnail' (as opposed to elongate) shape, steeply-worked edges and associated step-fracturing all suggest exhaustion or at least extensive resharpening.

Figure 4.3b: Bifaces.

A total of 14 unifacially worked flakes was recovered from the east-central part of the site. One of these is a beaked scraper-like, graver-like or piercer-like tool (see description in Appendix B under Feature 2, unit 504-197, non-piece-plotted; and Figure 4.5a), resembling specimens that have been reported for Palaeo-Indian and Early Archaic sites (e.g., Ellis and Deller 1990:48-50; Lennox 2000:45-47). Some other unifacial tool form fragments are illustrated in Figure 4.5b, showing the extent of unifacial flaking around edges of tools. The distribution of tool forms in relation to subsoil features is discussed in Section 4.1.3.2.

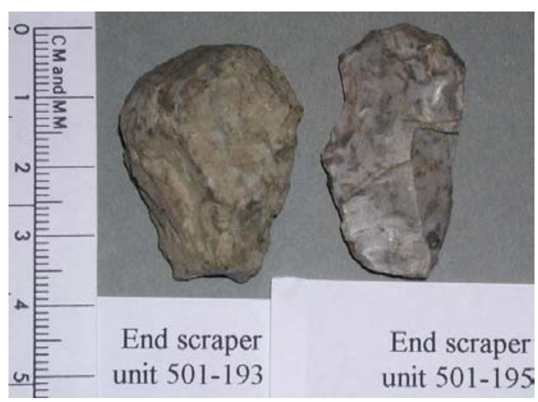


Figure 4.4: End scrapers. The tool on the left has a single spur on right-hand side.

Figure 4.5a: Graver

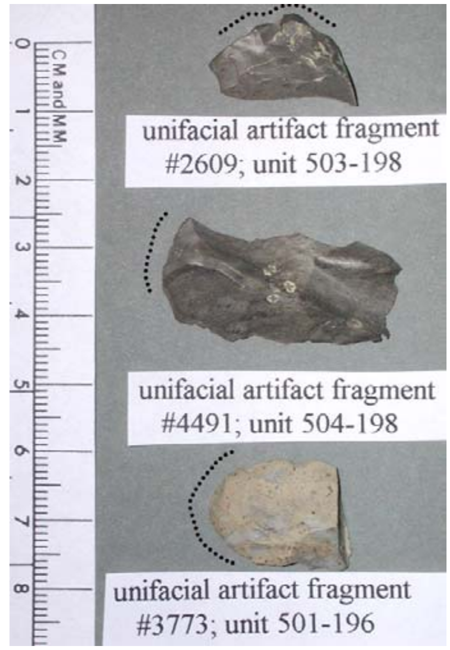


Figure 4.5b: Unifacial tools. The dotted line indicates extent of unifacial flaking around edge of tool.

All of the tools are listed individually, by provenience (excavation unit), in Appendix A and are described individually in Appendix B.

4.1.2 Debitage

The spatial distribution of all debitage recovered from the site, is shown in Figure 4.1a.

A sample of 466 flakes was selected for coding. The debitage assemblage was sampled to allow sufficiently detailed observation of individual flakes for typing. Each of the three subsoil features was sampled by selecting a 5-to-10 percent sample of flakes from two excavation units within each feature. Areas outside features were sampled by selecting a 5-to-10 percent sample of flakes from excavation units located to the east of Features 2 and 3 – squares that are adjacent to squares that contain parts of Features 2 and 3 (see Figures 4.6a and 4.6b for distribution of all analysed debitage by excavation unit). The sample of debitage is assumed to be representative of the debitage population at the site as a whole. The sample size (approaching 10 percent of the total debitage assemblage) is comparable to that for detailed studies of other Archaic sites in the Great Lakes area (e.g., Cook 2002:3-71) and is adequate to make inferences that are drawn in this report.

The debitage codes used in this analysis are:

120 Interior flake
190 Unifacial reduction/retouch flake
200 Early bifacial reduction flake - edge preparation
300 Later Bifacial Reduction flake - bifacial thinning
400 Bifacial pressure flake
996 Shatter: dorsal and ventral faces undistinguishable
999 Undifferentiated flake fragment: dorsal and ventral faces are distinguishable

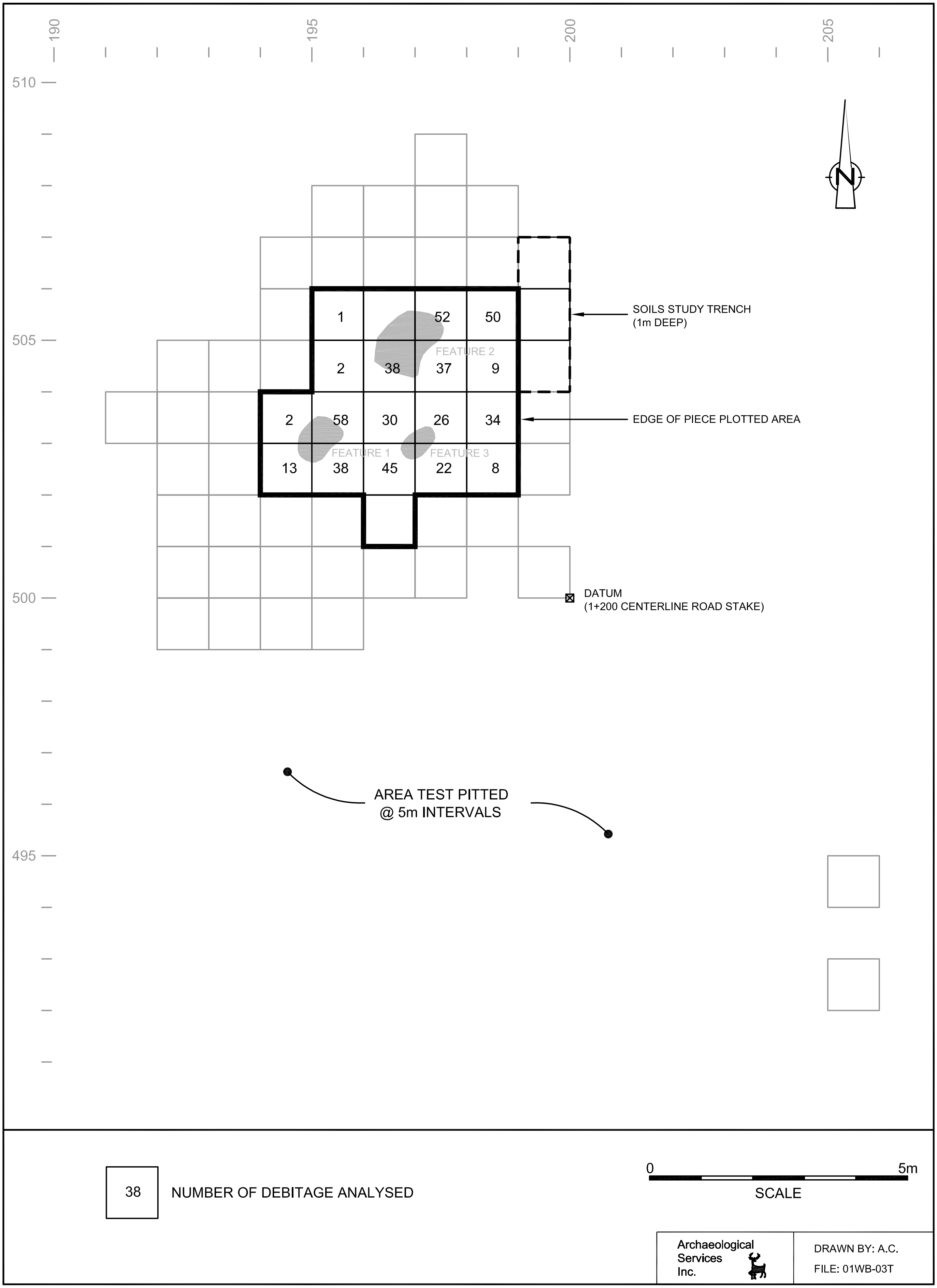


Figure 4.6a Distribution of Analysed Debitage (n=465)

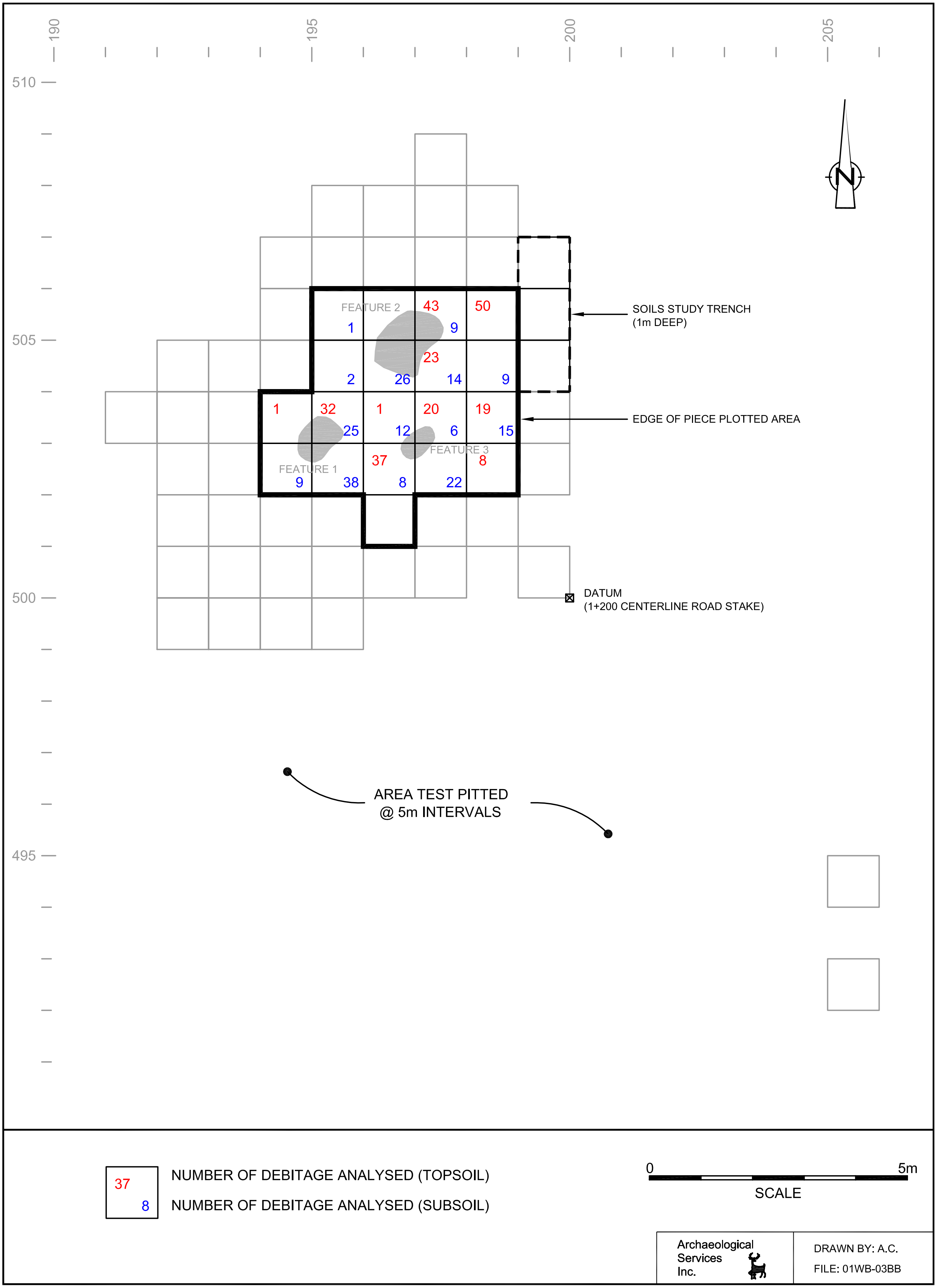


Figure 4.6b: Distribution of analyzed debitage by topsoil / subsoil (n=430)

The distribution of analysed debitage by type, for diagnostic types only (codes 120 to 400), is shown in Figures 4.7a-e.

In addition to this coding, or assignment to types, some observations were made on individual flakes (individual flake numbers are preceded by #), serving to modify and enlarge the definition of types (codes) and uniquely describing the Huson site assemblage, as follows:

Interior flakes (120) include:

- flakes retaining large, unworked surfaces visible on platform, indicating the objective piece was a tabular core which was being reduced (#1913, 2583, 3783);
- cortex is sometimes present on platform (#4535)
- step-fractured platform on a small flake (#6399) - a type of edge preparation of core?
- absent platform (#1872, 1890)

Uniface Retouch Flakes (code 190) include flakes with unfacetted platforms that are pitted or worn, suggesting worn unifacial tool edge prior to retouch (flake #5408). One flake (#4740), with platform largely removed, may be a uniface retouch flake, but also has characteristics of edge preparation and mass-removal – it retains a large, step-fractured mass proximally and feathers distally.

Later Bifacial Reduction (code 300) includes flakes with:

- collapsed platforms (#5148; 5268; 3375; 6369; 6419);
- cortex on platform (#5268);
- characteristics of alternate flaking (#1857; 1865);
- prepared and isolated platforms (#2599);
- ground platforms (#3355)

Pressure Flakes (code 400) include these observations:

- platform abrading/grinding (#4888; 5202; 5860);
- shattered (crushed?) platform with step-fracturing (#6348);
- with dog-leg (#1035);
- wide multi-facetted platform, suggesting retouch of an already heavily worked bifacial edge (#3781)

Shatter (code 996): many of these flakes are microflakes (measuring about 5 mm across or less). Also includes ‘interior’ portion of sheared-cone flakes (#5388)

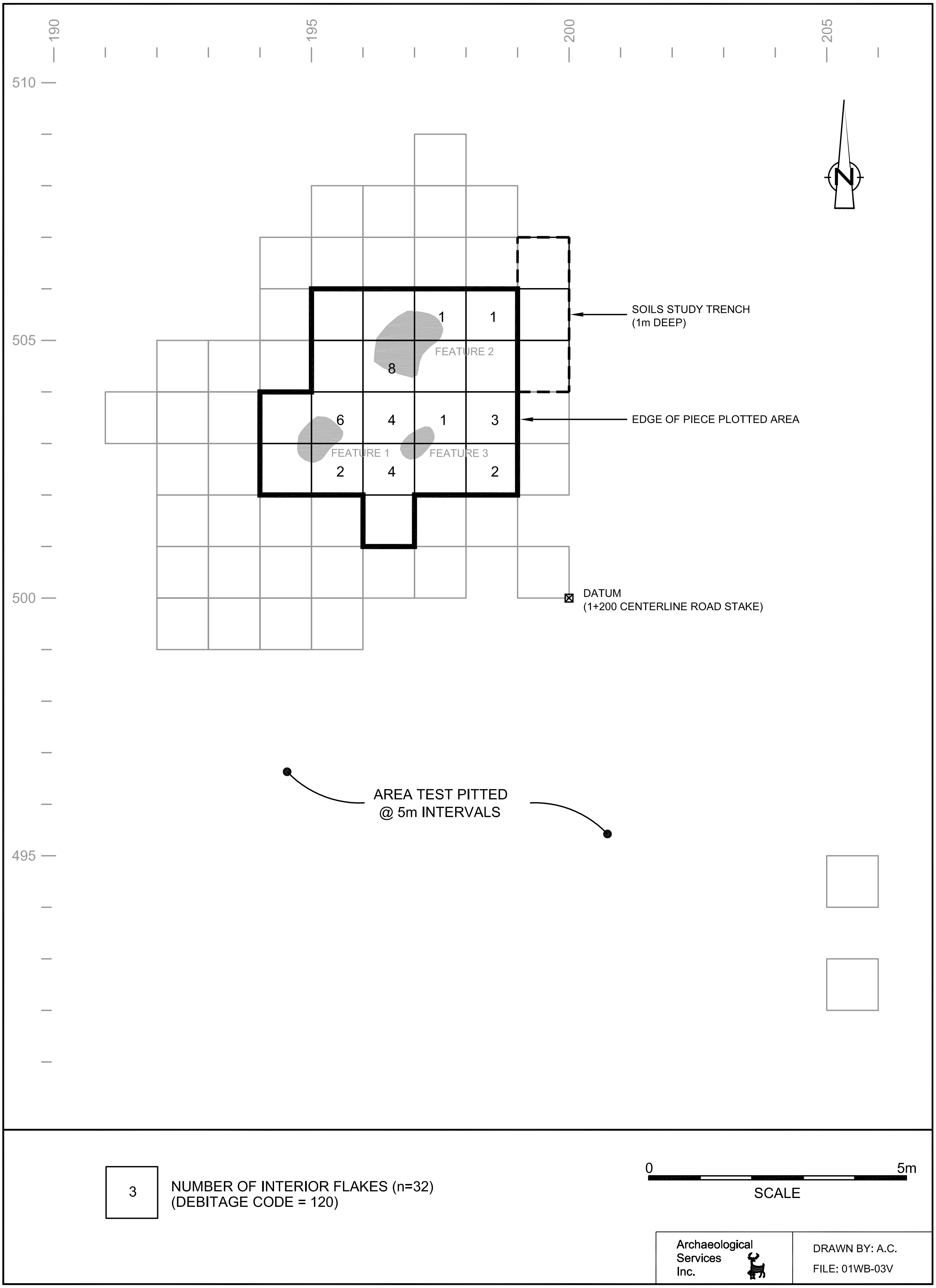


Figure 4.7a Distribution (frequency) of interior flakes (n=32)

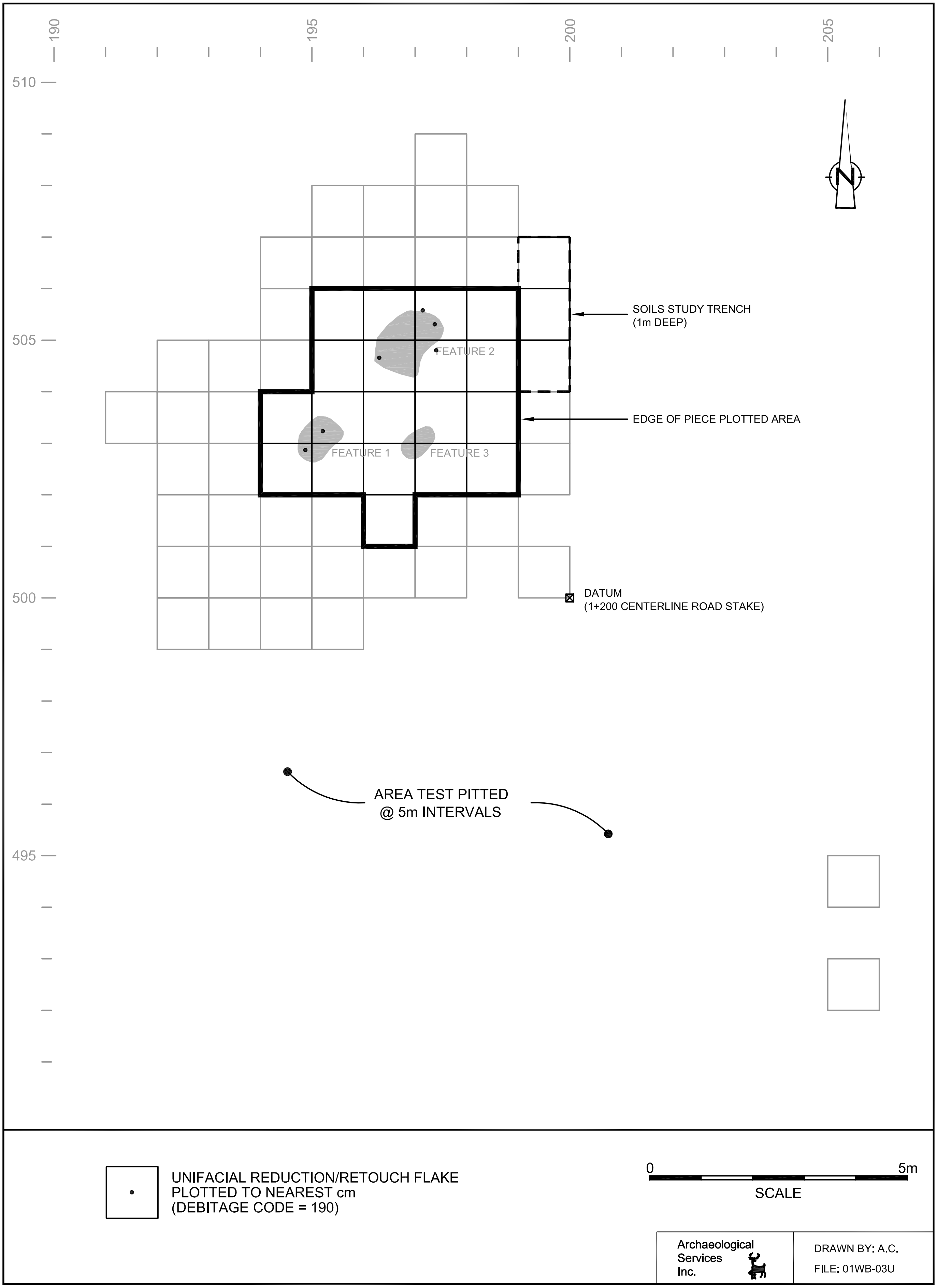


Figure 4.7b: Distribution (frequency) of uniface reduction flakes (n=7)

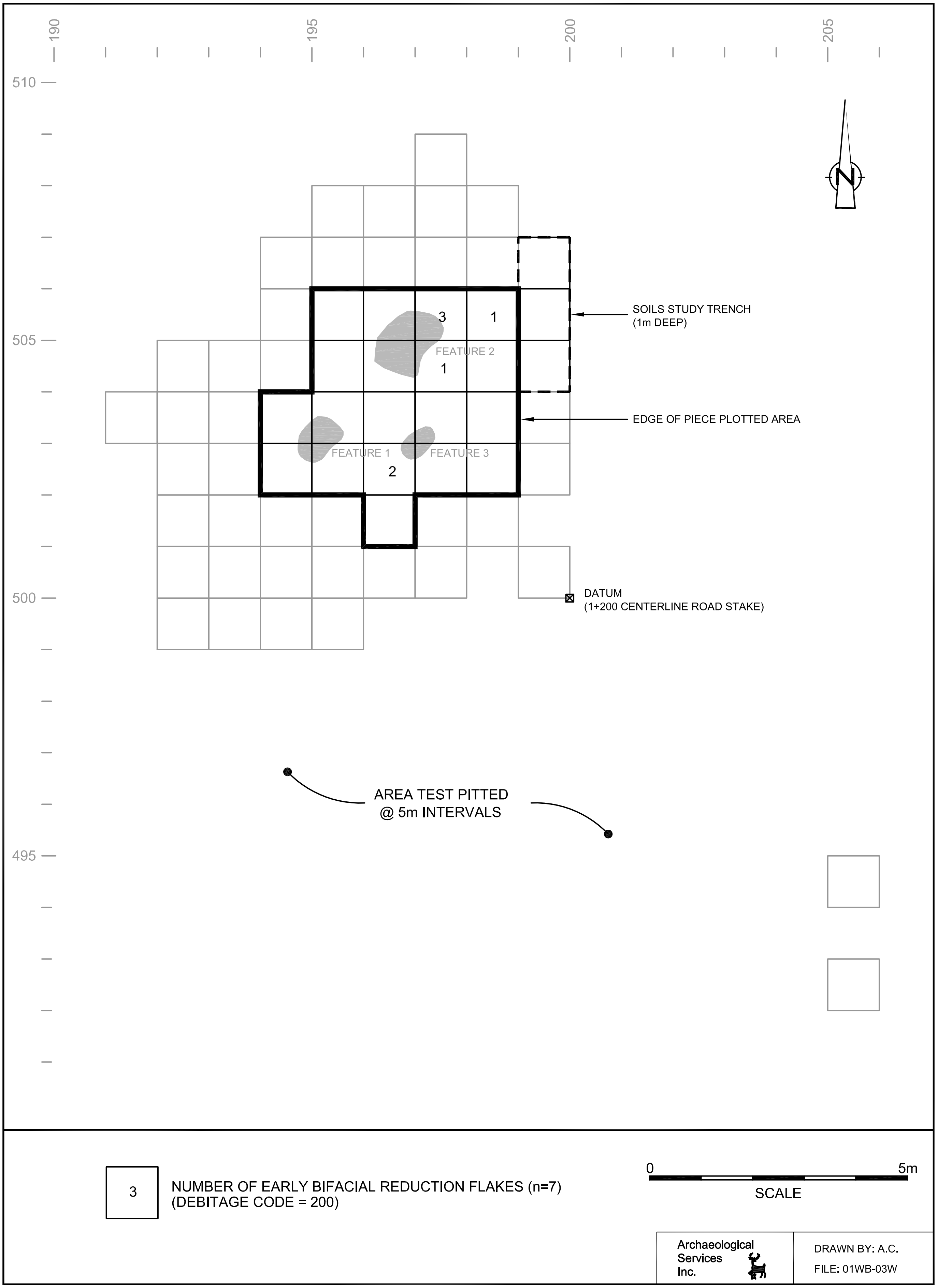


Figure 4.7c Distribution (frequency) of early bifacial reduction flakes (n=7)

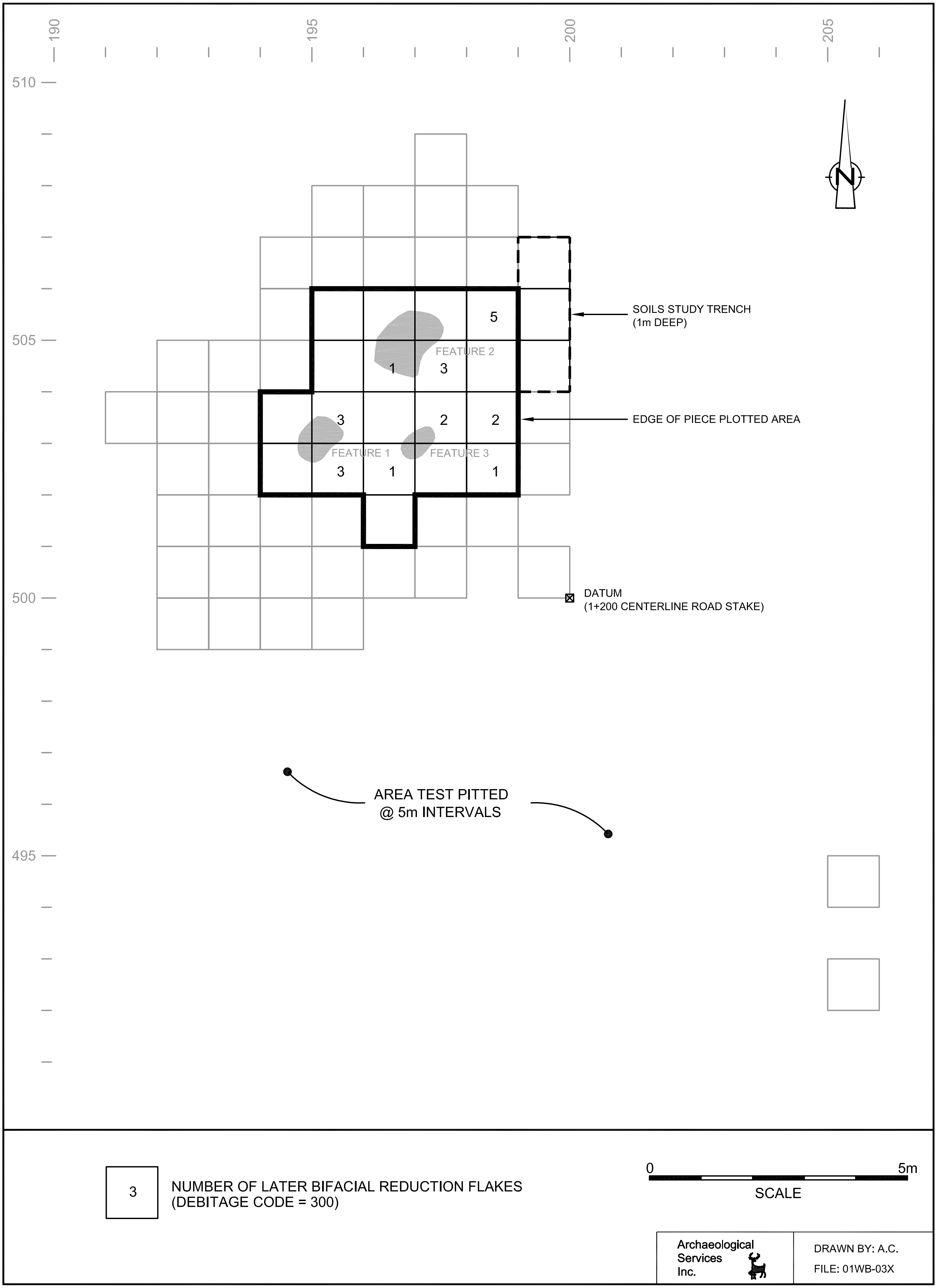
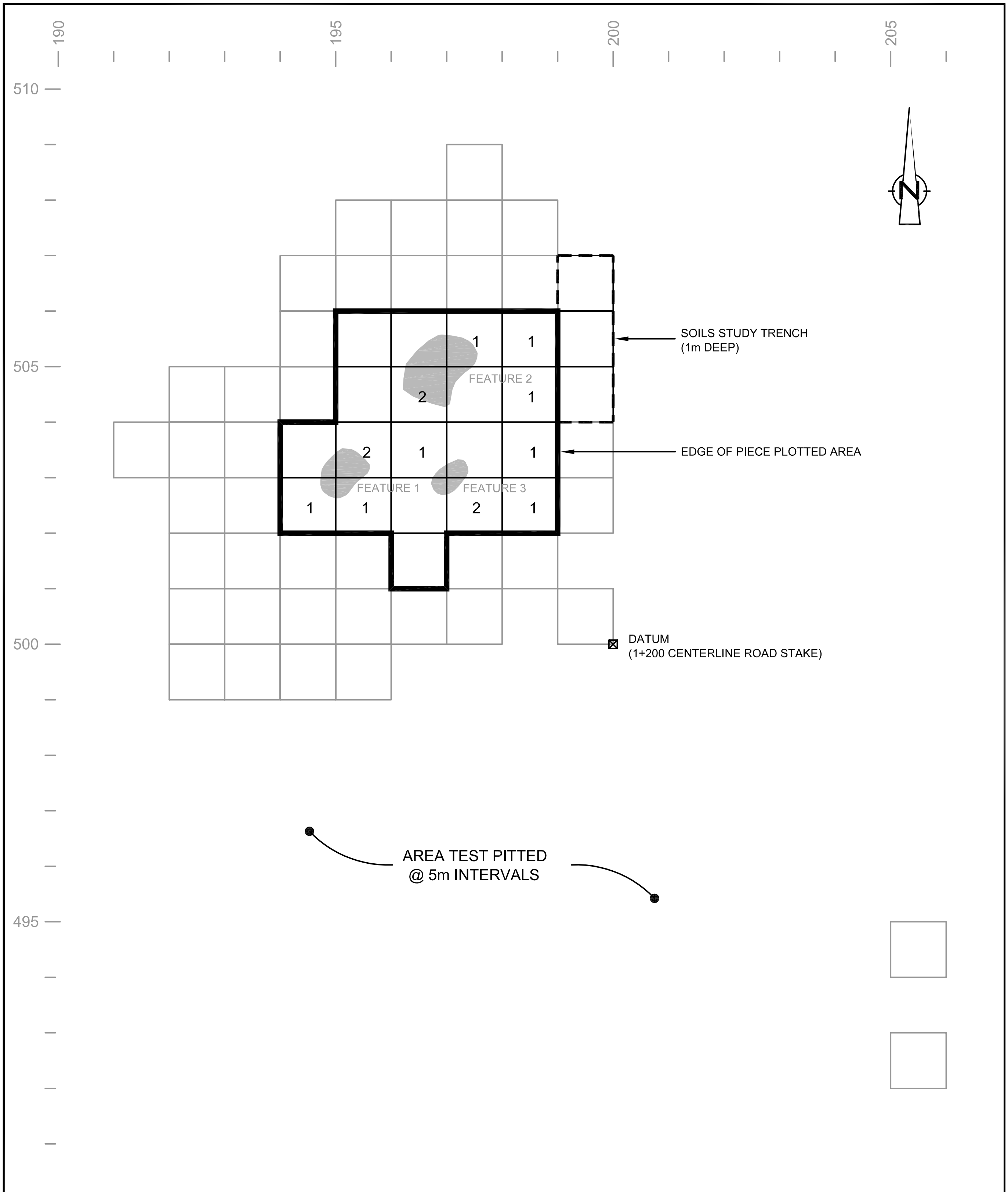


Figure 4.7d: Distribution (frequency) of later bifacial reduction flakes (n=21)



2 NUMBER OF BIFACIAL PRESSURE FLAKES
(DEBITAGE CODE = 400)

0 5m
SCALE

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Figure 4.7e Distribution (Frequency) of bifacial pressure flakes (n=14)

Undifferentiated flakes (999):

- many flakes have missing platforms that have collapsed on top of heavily stepped edges, making it impossible to identify them as either bifacial reduction or core reduction (e.g., #3405).
- many other flakes have collapsed platforms without step-fracturing but with dorsal flake scars that indicate collapse of much of the dorsal surface during flake removal (#3417).
- on others, platforms have snapped cleanly off (#3429), suggesting unprepared, weak platforms.

Table 4.1 shows the association of flake types with the three features and non-feature locations (excavation units that do not overlap a feature). Flake types include interior flakes (code 120) indicating core reduction, unifacial retouch flakes (code 190), stages of bifacial reduction (codes 200 to 400) and undiagnostic flake types (900 series). Percentages are given for core and bifacial reduction types, indicating differences among locations in reduction stage.

Table 4.1:Frequency (f) and percentage (%) of analysed debitage by type and location by feature and for non-feature units.

	Feature 1		Feature 2		Feature 3		Non-Feature units	
Debitage Code	*f*	% (stage-diagnostics only)	*f*	% (stage-diagnostics only)	*f*	% (stage-diagnostics only)	*f*	% (stage-diagnostics only)
120	8	47	9	43	9	53	6	32
190	3		4		0		0	
200	0	0	4	19	2	12	1	5
300	6	35	4	19	3	18	8	42
400	3	18	4	19	3	18	4	21
996	29		46		41		27	
999	48		54		65		53	
Stage-Diagnostic Total (bolded types only)	18	100	21	101	17	101	19	100
Grand Total	95		125		123		99	

The significance of the occurrence of different stages of bifacial reduction in different locations at the site was tested using binomial probabilities (Kintigh 1993). Frequencies and percentages for significance testing are given in Tables 4.2 and 4.3, respectively.

Table 4.2: Frequency of flakes by reduction stage and location.

Code	*f* Feature 1	*f* Feature 2	*f* Feature 3	*f* Non-Feature units	*f* Total
120	8	9	9	6	32
200	0	4	2	1	7
300	6	4	3	8	21
400	3	4	3	4	14
Total	18	21	17	19	74

Table 4.3: Percentage of flakes by reduction stage and location.

Code	% Feature 1	% Feature 2	% Feature 3	% Non-feature units	% Total
120	47	43	53	32	43
200	0	19	12	5	9
300	35	19	18	42	28
400	18	19	18	21	19
Total	100	101	101	100	99

No cell value was found to be significant at a confidence level better than 0.10, though two values might be cited as possibly indicating spatial structuring of knapping behaviour.

Firstly, there were no early bifacial reduction flakes (code 200) in Feature 1 (Figure 4.7c). The probability of getting 0 early bifacial reduction flakes out of a total of 17 flakes that were typed for core and bifacial reduction in Feature 1 (representing 0 percent) is 0.20, given an expected proportion for early bifacial reduction flakes within the site as a whole of 0.90 (as determined from the pooled assemblage of flakes examined from all three features plus non-feature areas).

Secondly, there were as many as four early reduction flakes identified in Feature 2 (Figure 4.7c). The probability of getting as many as 4 (or more) flakes out of a total of 21 in Feature 2 (representing 19 percent) is 0.11, given an expected proportion for early bifacial reduction flakes of 0.90 within the sampled assemblage.

Neither of these probabilities is highly convincing, but they do suggest that: 1) early bifacial reduction tended to occur in or around Feature 2, in the north-central part of the site; and 2) early reduction activity is absent around Feature 1, in the southwest part of the site. All other stages of bifacial reduction, as well as core reduction, occur with equal probability around all features and in both feature and non-feature areas, based on the sample of debitage analysed.

In summary, all diagnostic stage debitage combined for the site indicates a large proportion (almost half of all diagnostic stage debitage analysed) of early stage reduction (Table 4.4).

Table 4.4: Summary of debitage analysis from the Huson site.

debitage code (stage-diagnostic flakes bolded)	*f*	% diagnostic flakes
120	32	43.2
190	7	
200	7	9.5
300	21	28.4
400	14	18.9
996	143	
999	220	
Total diagnostic	74	100
Grand total	444	

Heat alteration and cortex are two characteristics that were specifically coded (presence/absence) for each flake examined. The spatial distribution of these attributes are shown in Figures 4.8a and 4.8b. Characteristics of heat noted in the Huson site assemblage are two types of distinctive fracturing of the rock, pot-lidding and crazing. The former results from rapid heating, and the latter from slow heating, beyond temperatures desired by the knapper (Purdy 1975). Frequencies and percentages of these characteristics are shown in Tables 4.5a and b.

Table 4.5a: Frequency of heat-altered flakes and cortex flakes by location.

flake characteristic	*f* Feature 1	*f* Feature 2	*f* Feature 3	*f* Non-Feature units	*f* Total
heat	2	3	1	3	9
cortex	0	2	1	5	8
Total flakes examined	95	125	123	99	442

Table 4.5b: Percentage of heat-altered flakes and cortex flakes by location.

flake characteristic	% Feature 1	% Feature 2	% Feature 3	% Non-Feature units	% Total
heat	2.1	2.4	0.8	3	2
cortex	0	1.6	0.8	5.1	1.8

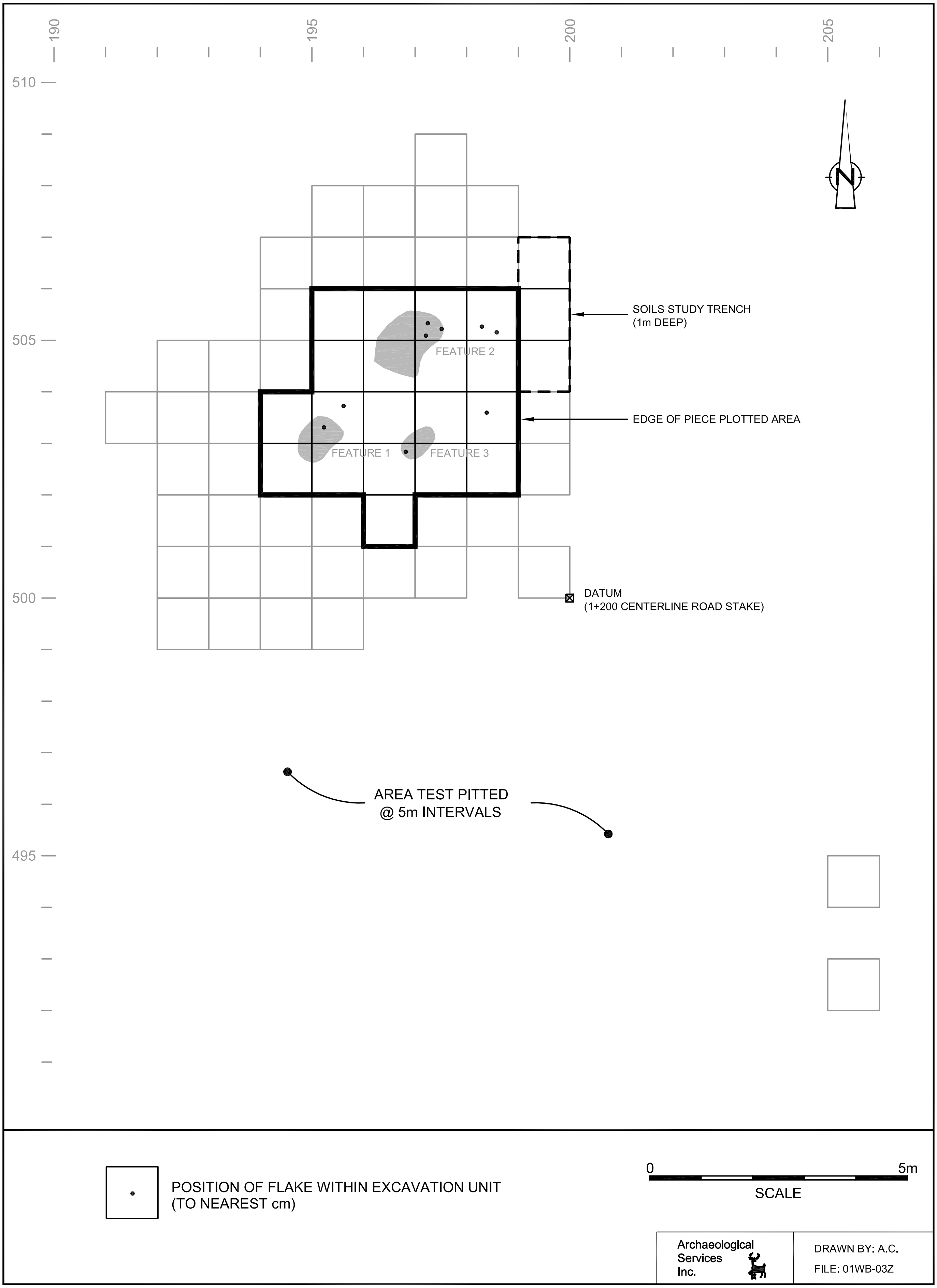


Figure 4.8a Distribution (Frequency) of heat-altered flakes (n=9)

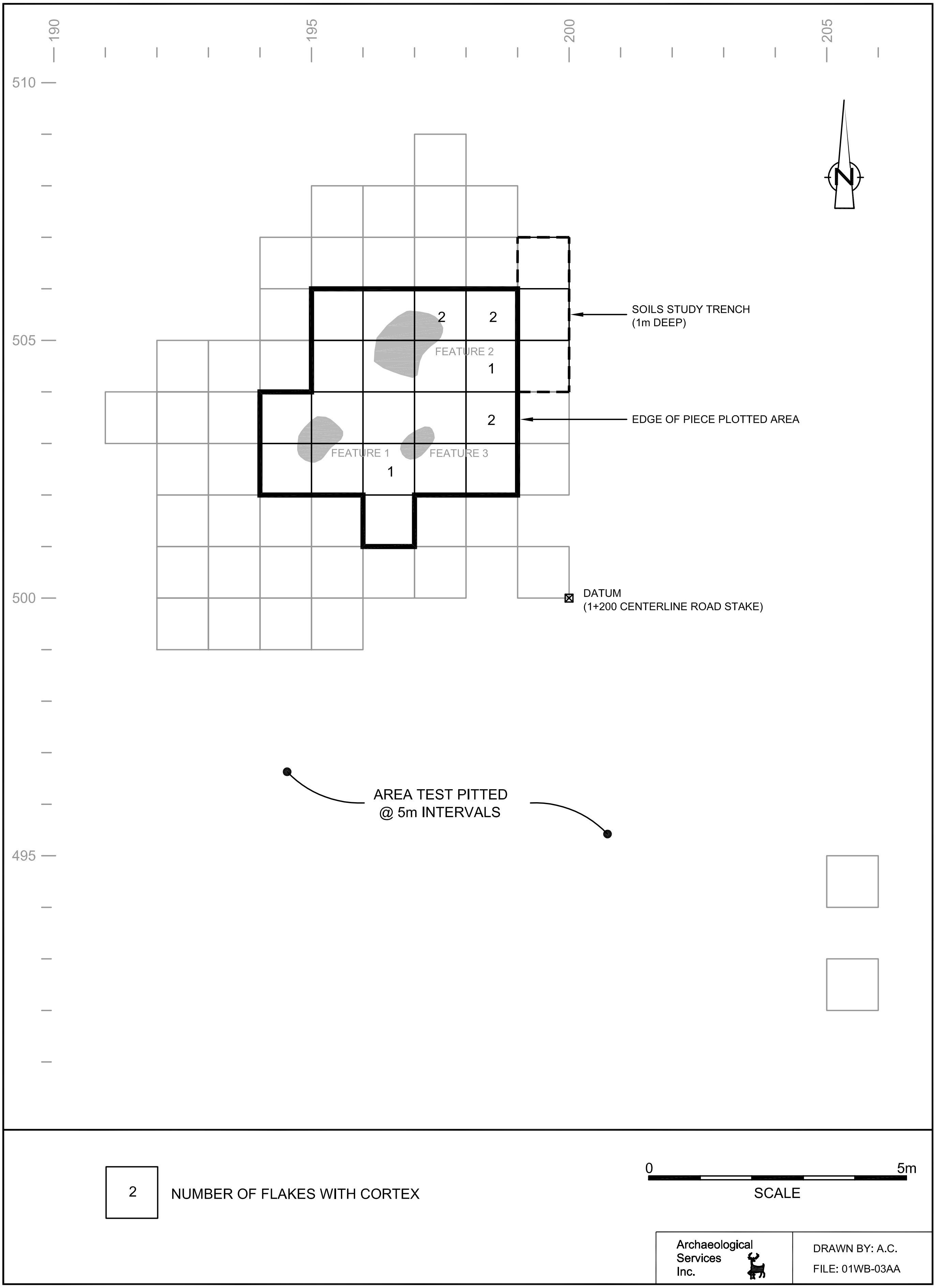


Figure 4.8b Distribution (Frequency) of flakes with cortex (n=8)

No values for heat-alteration are significant at the P=0.20 level. Only two values for cortex might indicate spatial significance: a lower-than-expected number of flakes with cortex occurs in Feature 1 (P=0.17); and a higher-than-expected number of flakes occurs in non-feature areas of the site (west of Features 2 and 3). These results indicate that decortication tended occur in the eastern part of the site and not near Feature 1 (Figure 4.8b).

4.1.3 Identification of Subsoil Features by Artifact Distributions

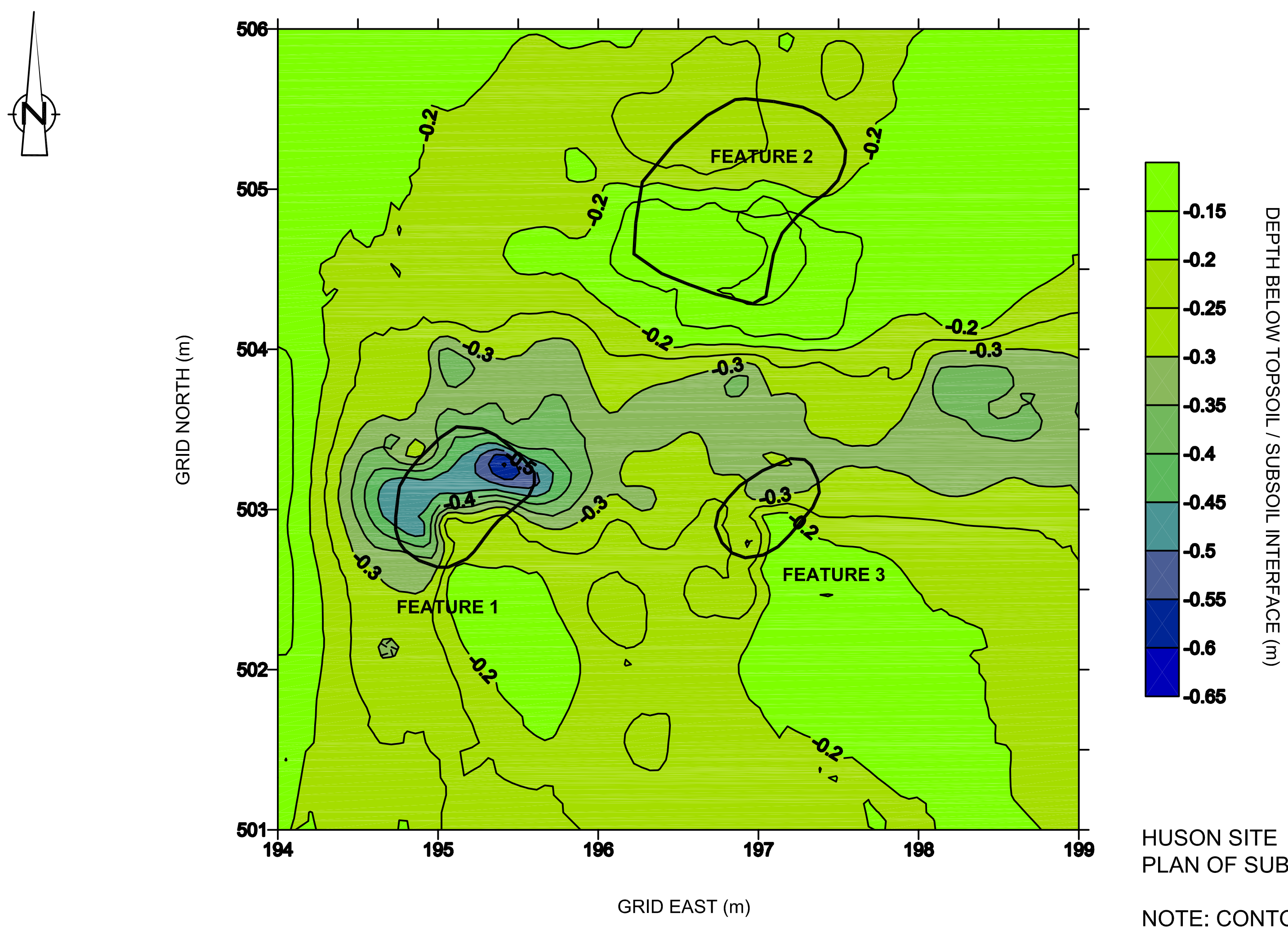
Three concentrations of lithic material (worked artifacts and debitage) were identified in the subsoil during excavation (Figures 4.1a and 4.1b). These concentrations may be a result of cultural or post-depositional (cultural and natural) processes, or both. Natural processes most likely to affect the Huson site include cryoturbation and bioturbation – particularly tree wind-throws, rodent burrowing and invertebrate activity (Rapp and Hill 1998:81-85; Wood and Johnson 1978). In the recent past, even if ploughing was not significant, regional land clearance activities, particularly lumbering and pasturing, probably affected drainage and erosion at the site (Padgett 1994). It was, in part, to investigate these possibilities that 3-D and 2-D imaging of artifact distributions and soil and sediment studies were undertaken at the Huson site.

4.1.3.1 Spatial Distribution of Artifact Distributions

Several images of artifact distributions at the site were generated using Surfer and CAD software from raw spatial data (x,y,z measurements for individual artifacts), allowing 3-D visualization of the depth-distribution of artifacts and 2-D visualization of selected profiles through features.

The distribution of some of the deepest archaeological materials across the site is shown in Figures 4.9a and 4.9b. These maps, which define a 'maximum-depth surface,' show the lowest occurrence (in m below the topsoil/subsoil interface) of a subset of about 700 flakes across the site – a subset representing the maximum z values for each of 19 units in which flakes were piece-plotted. They were generated using Surfer software.

This maximum-depth surface defines a number of archaeological basins within the site. An east-west trench runs though the middle of the site containing a basin at either end. These basins were identified as cultural features, during excavation, based on artifact concentrations within them, and are labelled as Features 1 and 3. A third shallow basin of artifacts is visible in the top of the images (Figures 4.9a and 4.9b), which has been identified as Feature 2. Feature 1 is clearly the deepest, largest, most robust and regular (in plan) pattern of flakes occurring at depth. It is, however, part of a trench of deeply occurring flakes that define an irregular topography between Features 1 and 3. This trench may represent a root system, tree-fall or hollow log connecting and perhaps distorting pre-existing archaeological features at either end. The origin of these features,



HUSON SITE (AgGt-111):
PLAN OF SUBSOIL CONTOURS

NOTE: CONTOUR INTERVAL: 0.05m.

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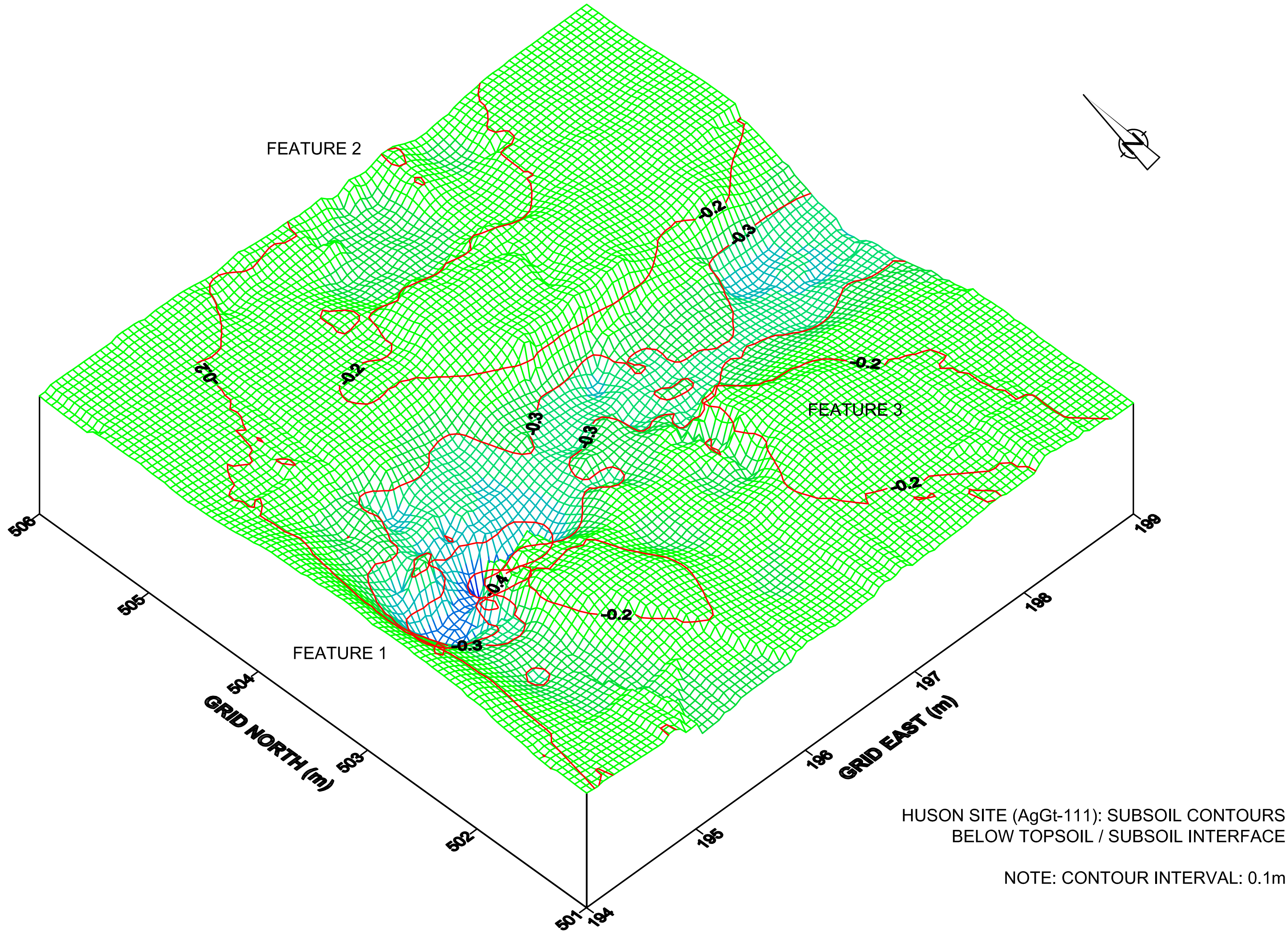
DATE:
JAN. 29, 2004

Figure 4.9: Isopleth map showing lowest occurences of artifacts below ground surface



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FILE: 01WB-03

DATE:
JAN. 29, 2004

Figure 4.9b: Wire mesh depiction of lowest occurences of artifacts below ground surface and role of natural versus culture processes in forming them, is explored further in this section using spatial and flake dimensional data.

Each of the features may be depicted in cross-sectional profiles of artifact distributions.

Feature 1 (Figure 4.10) is the best defined of the three artifact concentrations. A regular basin shape is well-defined by a high density of lithic artifacts. The disjunction between topsoil and subsoil is possibly a result of the methodology of excavation. This feature is the most regular, the deepest and the densest of the three features discussed here.

Feature 2 (Figure 4.11) is larger in area and shallow than Feature 1. The artifact spatial data suggest a relatively well-defined, flat-bottomed, shallow pit feature. The bottom of this feature is regular and even, reinforcing the argument for cultural origin. A key limitation in its interpretation, however, was the removal of topsoil from two of the units prior to its piece-plotting.

Feature 3 (Figure 4.12) is the least well-defined of the three features. There is poor definition to the sides of the concentration, especially in the upper part of the profile (the topsoil). Together, the profiles of this feature suggest a natural, irregular subsurface depression, with one particular deep spot, that became filled with debitage.

Feature formation processes, including any post-depositional disturbance, can be investigated partly with data on artifact size and depth distribution within and outside of features. Patterns in size-distribution can indicate natural formation processes, including bioturbation and fluvial action, operating on archaeological deposits (e.g., Gunn and Foss 1997). Figure 4.13 shows the distribution of flakes by depth below ground surface and flake size (maximum length) for each of the three features, as well as for non-feature flakes (flakes piece-plotted outside the boundaries of features as defined in Figures 4.10 to 4.12). These scatterplots suggest that flake size is not correlated with depth in non-feature units. Feature 1 exhibits the bi-modal distribution of depth seen in profile drawings but no correlation of depth with flake size. Feature 2 and 3 exhibit correlation, particularly for depths between -40 and -60 and for flake sizes less than 20 mm (Pearson's $r = 0.50$ and 0.43, for these data sub-sets within Features 2 and 3, respectively). Diminishing flake size with depth in these features suggests that some size-sorting occurred. This finding calls into question the integrity of Features 2 and 3. The relative lack of correlation in Feature 1 (Pearson's $r = -0.16$ for the same subset of data) supports the idea that post-depositional natural processes affected Features 2 and 3 more than Feature 1.

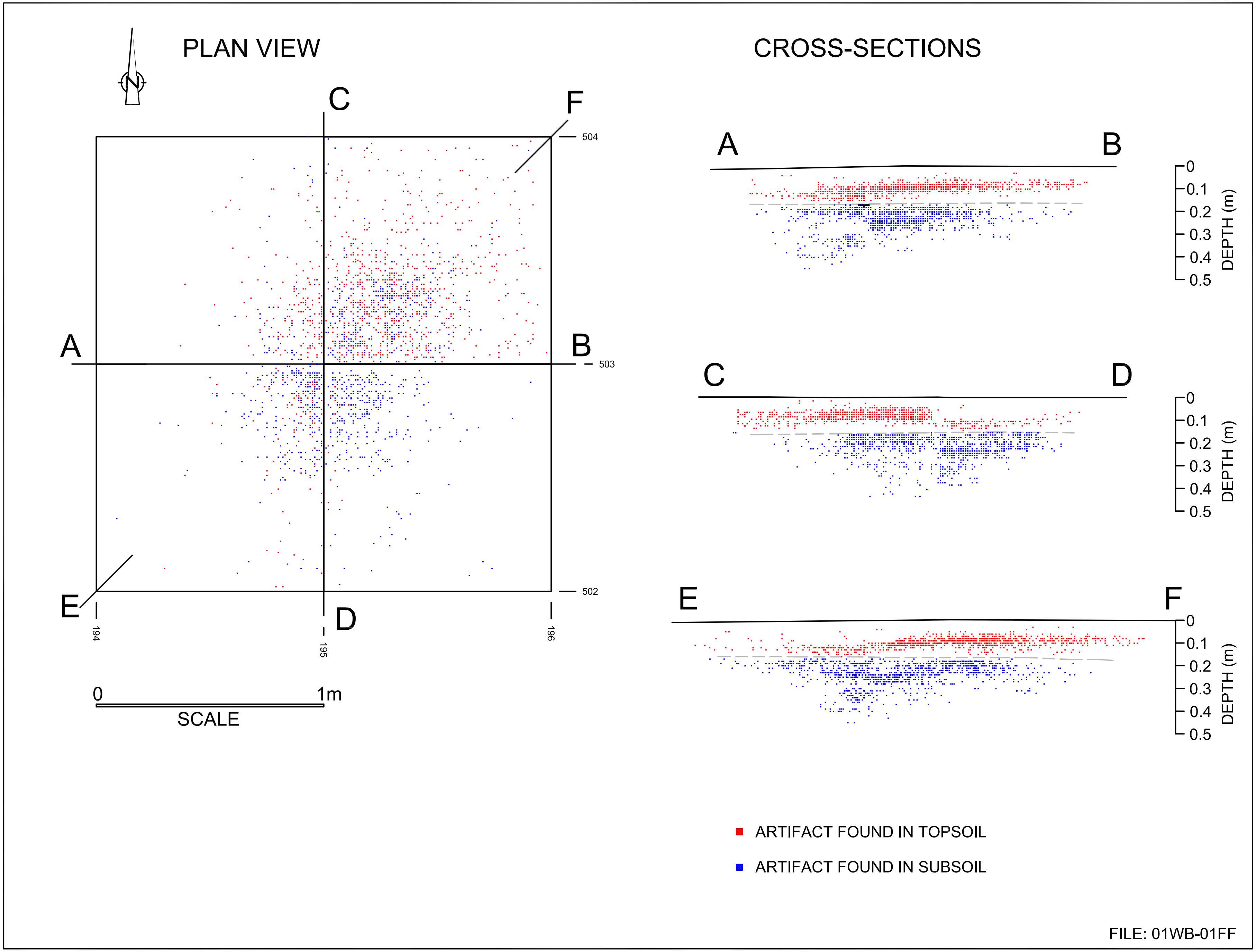

Figure 4.10 Feature 1 plan and profile plot of artifacts

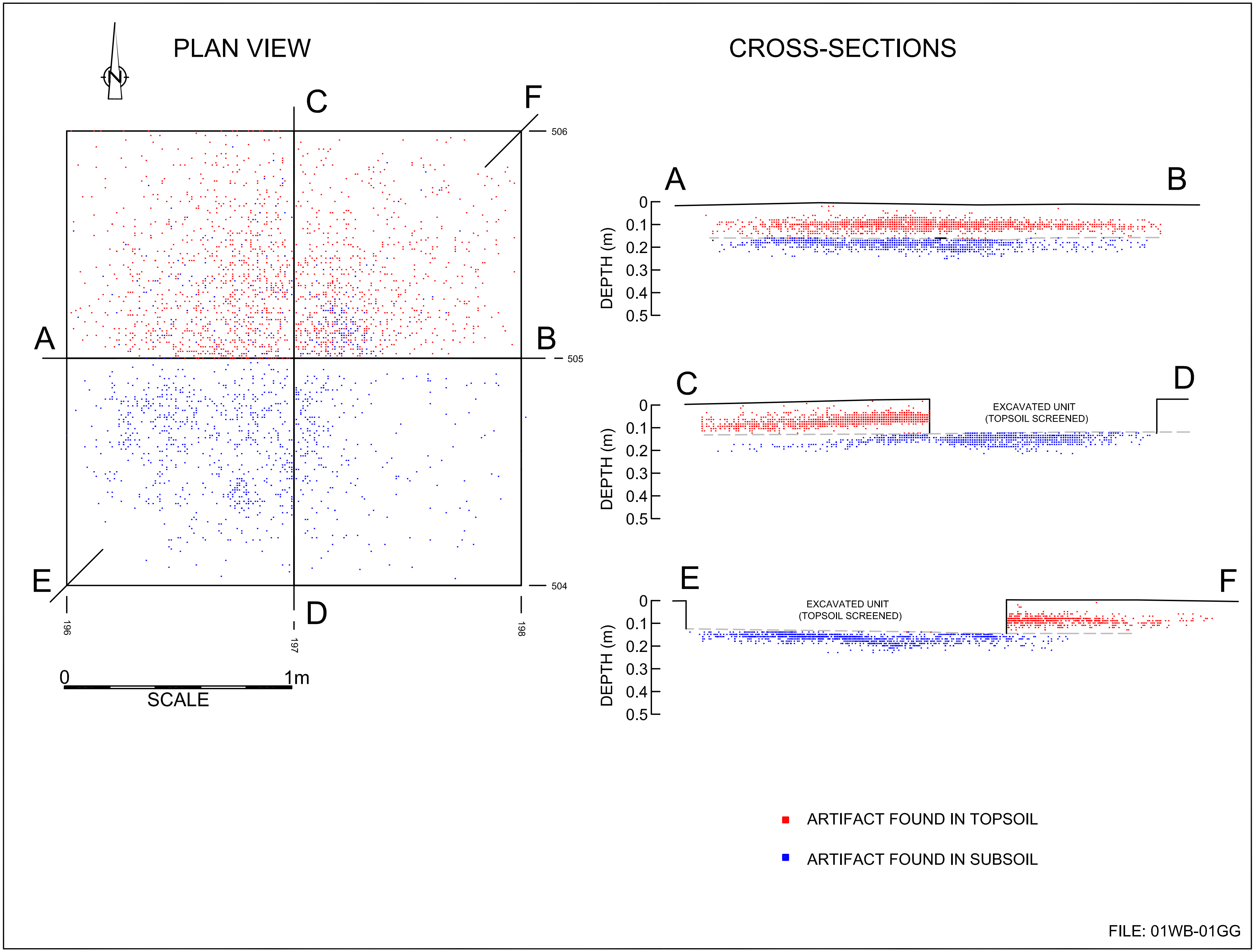

Figure 4.11 Feature 3 plan and profile plot of artifacts

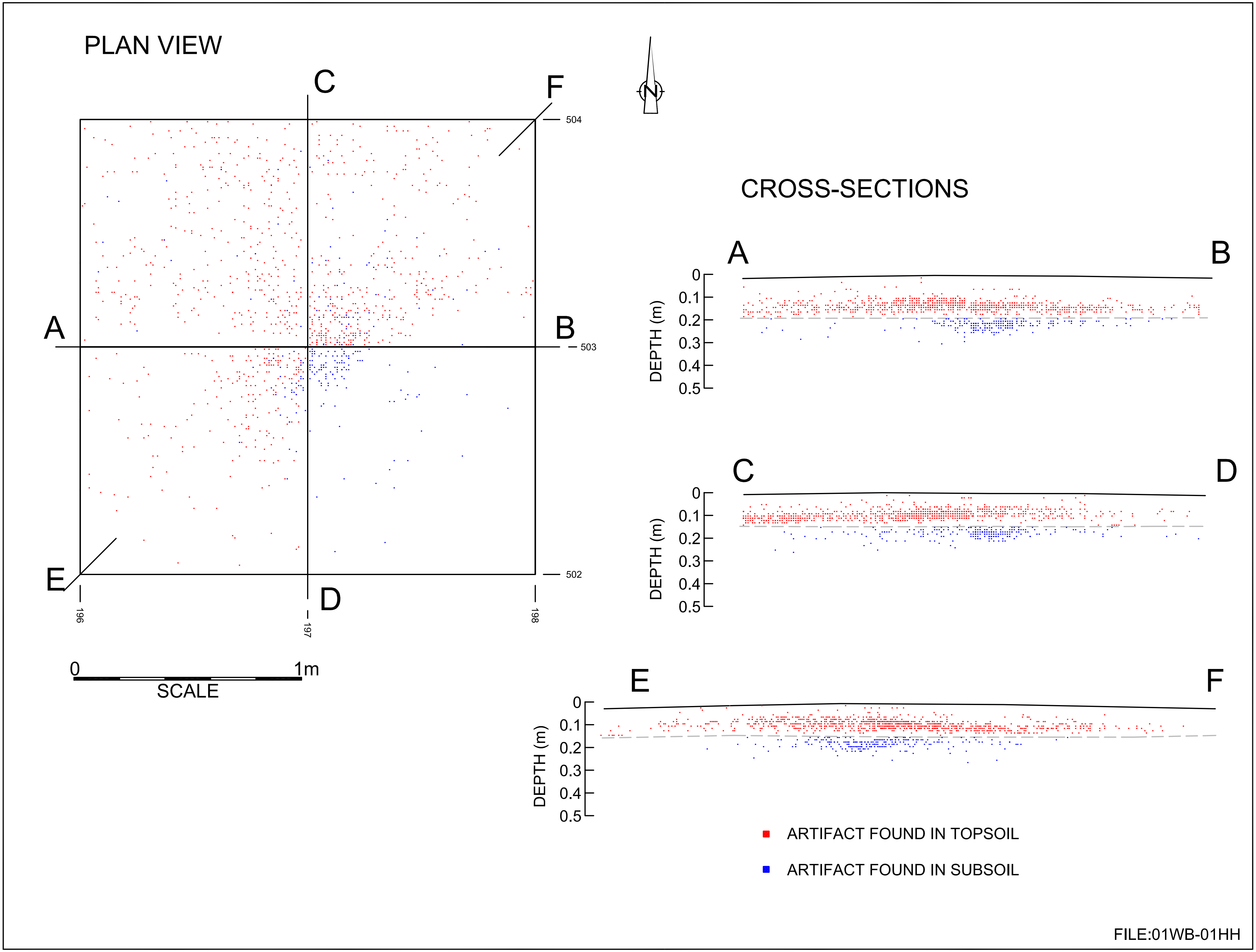

Figure 4.12 Feature 3 plan and profile plot of artifacts

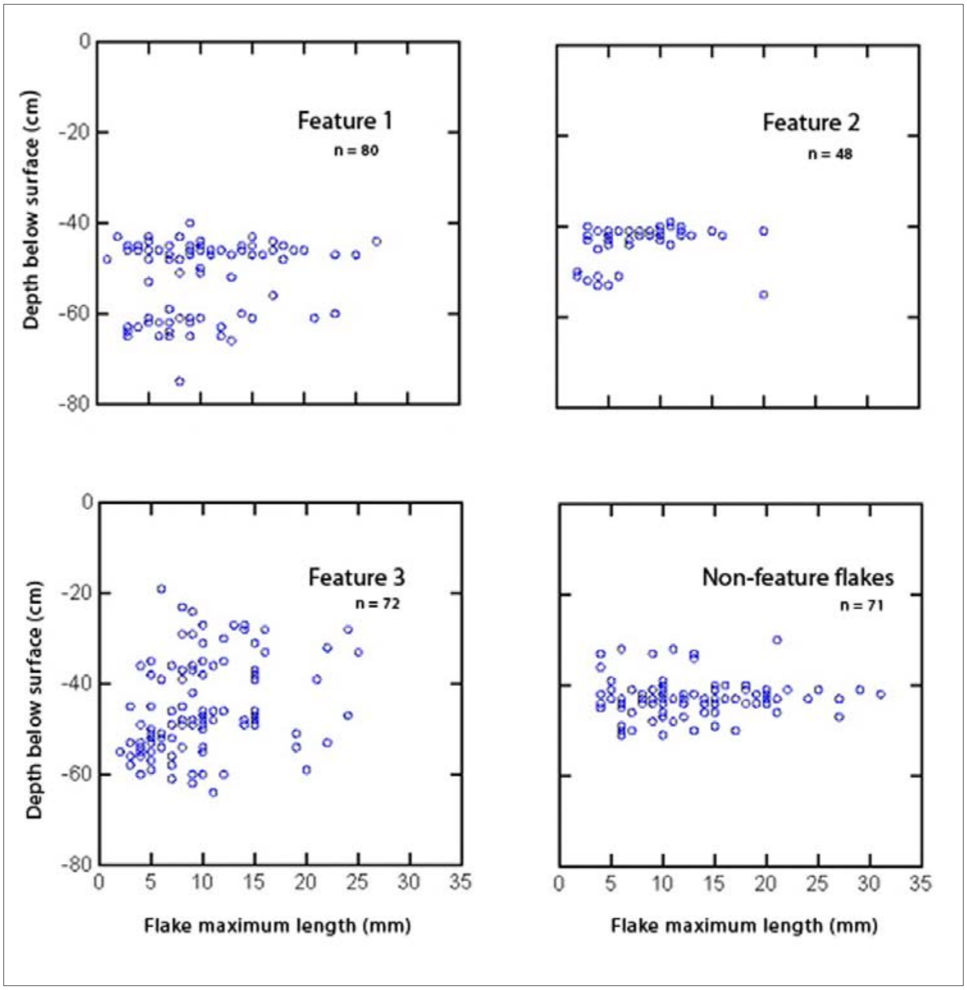

Figure 4.13: Relation between flake size and depth in features and non-feature areas.

4.1.3.2 Distribution of Tool Forms in Relation to Features

The relation of bifacial and unifacial tool types to features can be assessed visually from plan diagrams. Figures 4.14a-4.14c presents the distribution of these tool forms in three maps. Three of five bifacial forms (Figure 4.14a) are associated with Feature 1 – each of the other two features having one biface apiece. Both end scrapers occur south of Feature 1 and (unidentified) unifacial artifact fragments occur throughout the southern part of the site, in particular (Figure 4.14b). In contrast, unifacially worked flakes are in the central and northern part of the site, associated with Features 2 and 3 (Figure 4.14c).

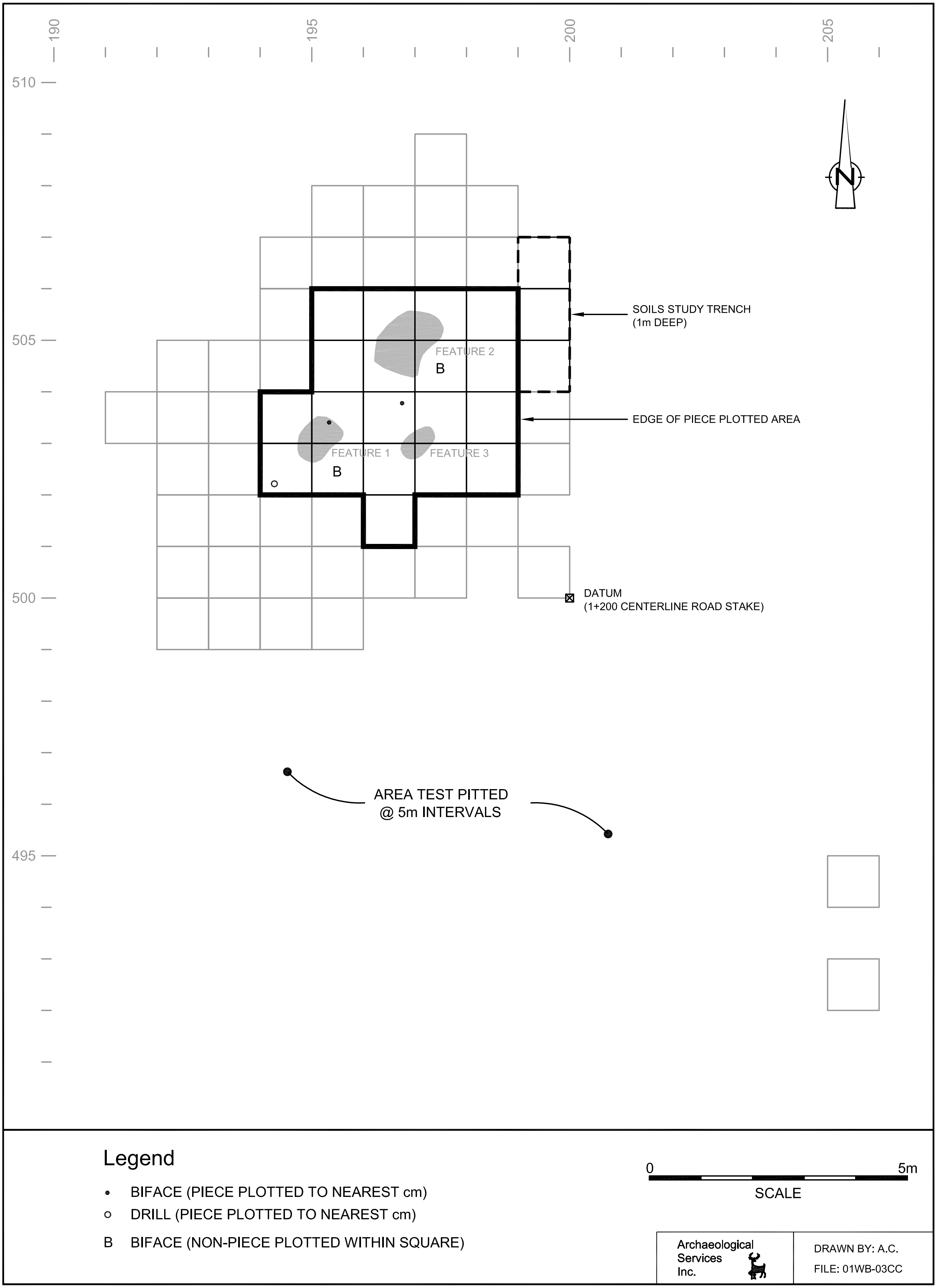

Figure 4.14a Distribution (map) of drill and bifaces

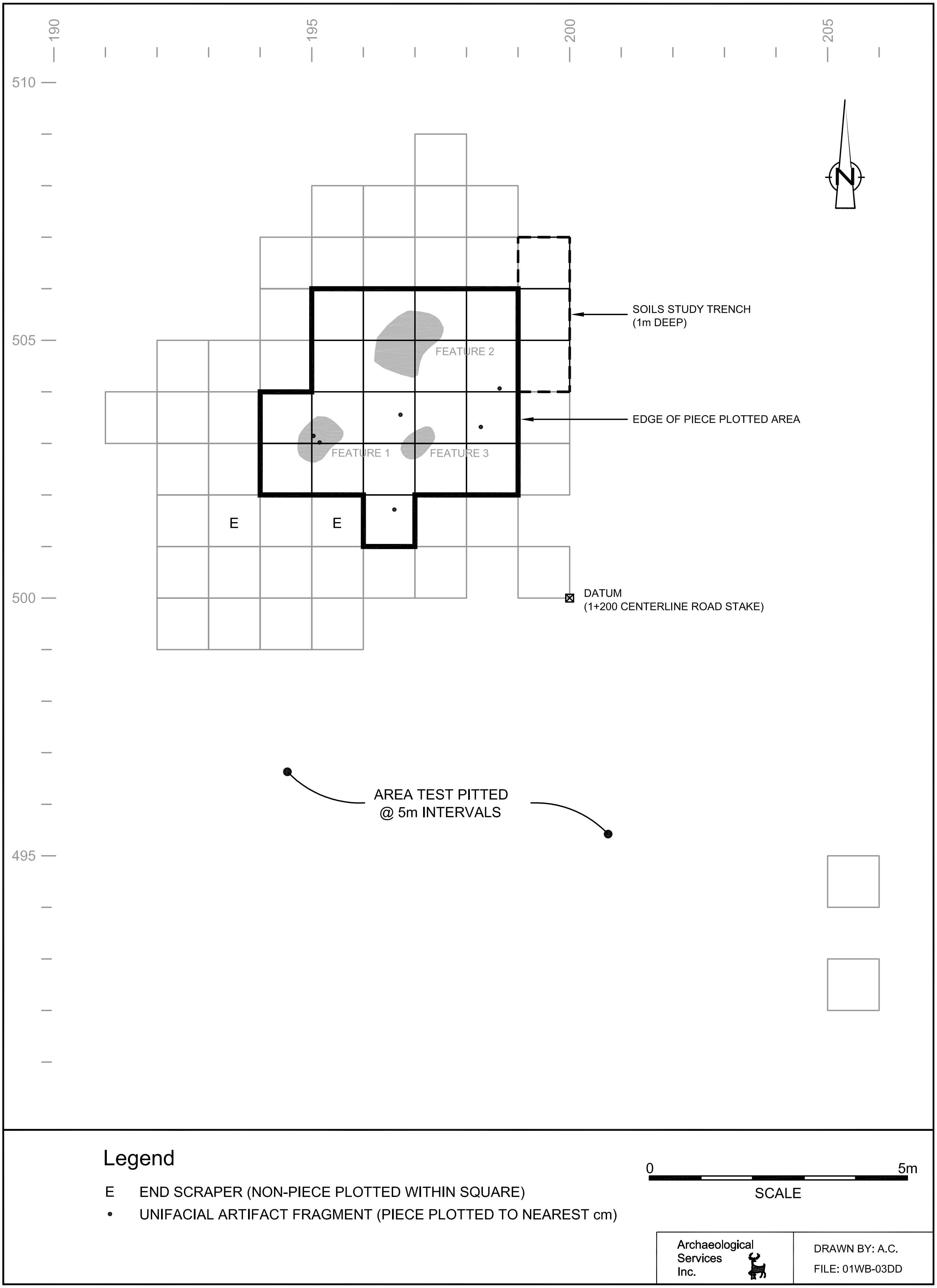

Figure 4.14b Distribution (map) of end scrapers and unifacial artifact fragments

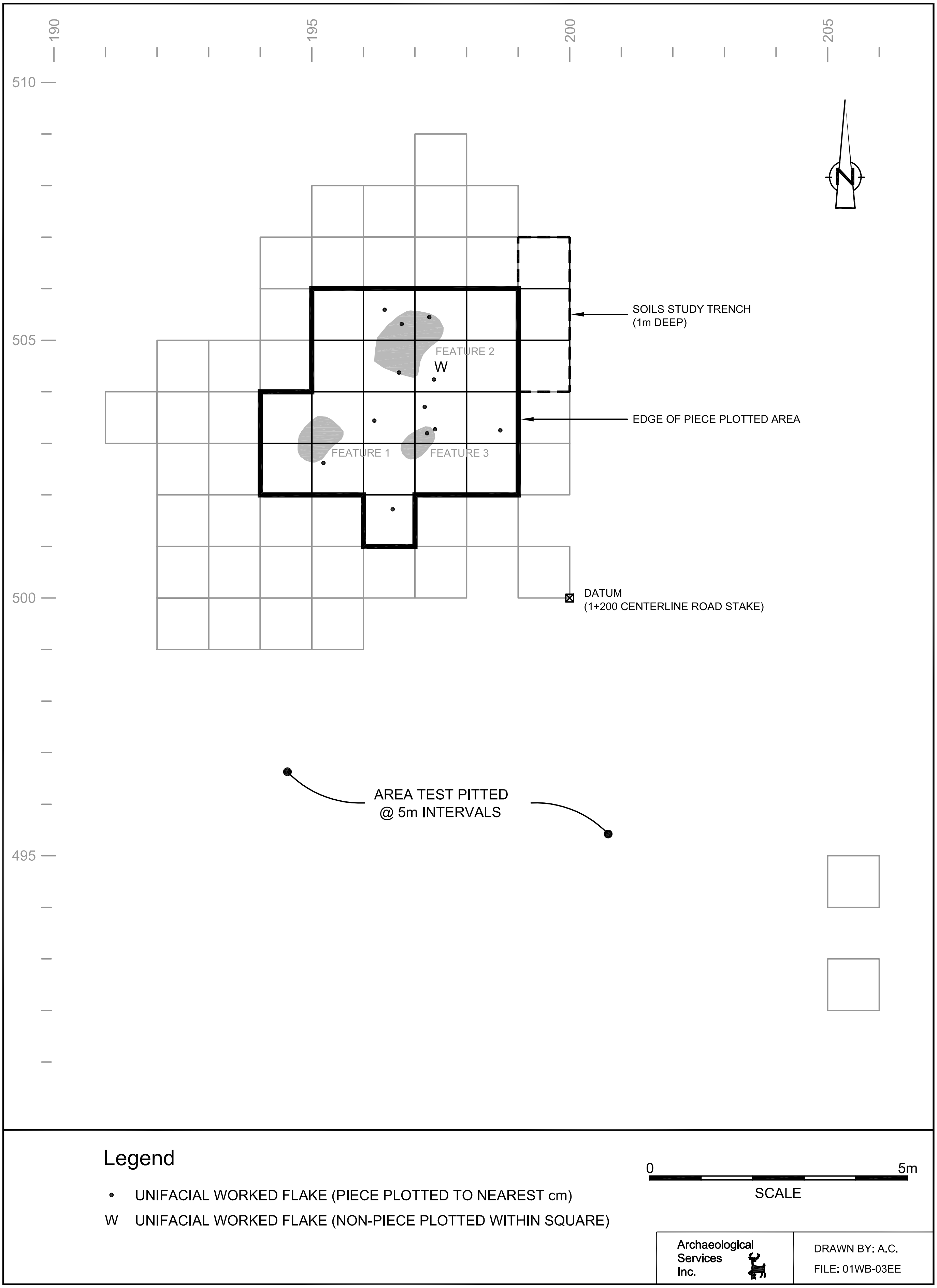

Figure 4.14c Distribution (map) of unifacially worked flakes

4.2 Palaeobotany

Initial flotation of bulk samples revealed only a few tiny fragments of wood charcoal in Feature 1, and nothing in Feature 3. Two of the three wood charcoal fragments from Feature 1 measured less than 1 mm in transverse section and could barely be broken in half for inspection. The fourth fragment was approximately 3 mm across. All were deciduous wood taxa. The larger fragment still did not provide enough surface for a confident identification, and could be either beech (*Fagus grandifolia*) or birch (*Betula* sp.).

In contrast to the poor macrofossil record, 14 pollen taxa were identified from Features 1 and 3 (Table 4.6). Several spore types of uncertain environmental significance were also recovered, including *Sphagnum* and a number of monolete and trilete spore types. Both features are clearly dominated by pine pollen, contributing around half to each population. Systematic measurement of pine pollen (60 grains) revealed that 80 percent were jack pine (*Pinus banksiana*), the dominant species during the early Holocene (early Zone 2, dating 8,000 to 10,000 BP (McAndrews 1994)). This is accompanied by lower percentages of spruce, oak, cedar, birch, and alder among others.

Table 4.6: Pollen counts and frequencies.

Counts	Spruce	Cedar	Larch	Pine	Fir	Birch	Alder	Dogwood	Maple	Beech	Ironwood	Oak	Basswood	Ash	Hemlock	Hickory	Ragweed	Grass	Chenopod	Artemisia	Total
Feature 1	3	1	1	54		2					1	10	5		11		3	6			97
Feature 3	12			47		5	2					3	7		6	3	12	2	3		102
O horizon (moss)	1			27	1	4	1	1	1		3	20	1	1	2		89	3	4		159
O horizon (litter)				10		1			1	2		35				5	41	1	3	1	100
A horizon	2			50		1			1			8			1	3	33	3	1		103
A horizon				34								2			1		9	1	2		49
Percentages																					
Feature 1	3.1	1.0	1.0	55.7	0.0	2.1	0.0	0.0	0.0	0.0	1.0	10.3	5.2	0.0	11.3	0.0	3.1	6.2	0.0	0.0	100.0
Feature 3	11.8	0.0	0.0	46.1	0.0	4.9	2.0	0.0	0.0	0.0	0.0	2.9	6.9	0.0	5.9	2.9	11.8	2.0	2.9	0.0	100.0
O horizon (moss)	0.6	0.0	0.0	17.0	0.6	2.5	0.6	0.6	0.6	0.0	1.9	12.6	0.6	0.6	1.3	0.0	56.0	1.9	2.5	0.0	100.0
O horizon (litter)	0.0	0.0	0.0	10.0	0.0	1.0	0.0	0.0	1.0	2.0	0.0	35.0	0.0	0.0	0.0	5.0	41.0	1.0	3.0	1.0	100.0
A horizon	1.9	0.0	0.0	48.5	0.0	1.0	0.0	0.0	1.0	0.0	0.0	7.8	0.0	0.0	1.0	2.9	32.0	2.9	1.0	0.0	100.0
A horizon	0.0	0.0	0.0	69.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.1	0.0	0.0	2.0	0.0	18.4	2.0	4.1	0.0	100.0

Comparison of subsurface with four surface pollen samples – two from leaf litter (O soil horizon); and two from the underlying mineral surface layer (A soil horizon) – reveals important patterns (Table 4.6 and Figure 4.14). Pollen percentages from the mineral surface layer (A horizon) are similar to the feature soil, supporting the idea that sediments close to the present surface are relatively undisturbed and old (early to mid Holocene). Pollen percentages from the overlying organic layer (O horizon) contrast strongly with both this underlying mineral layer and the feature soil. Pollen content from the organic layer reflect present forest composition,

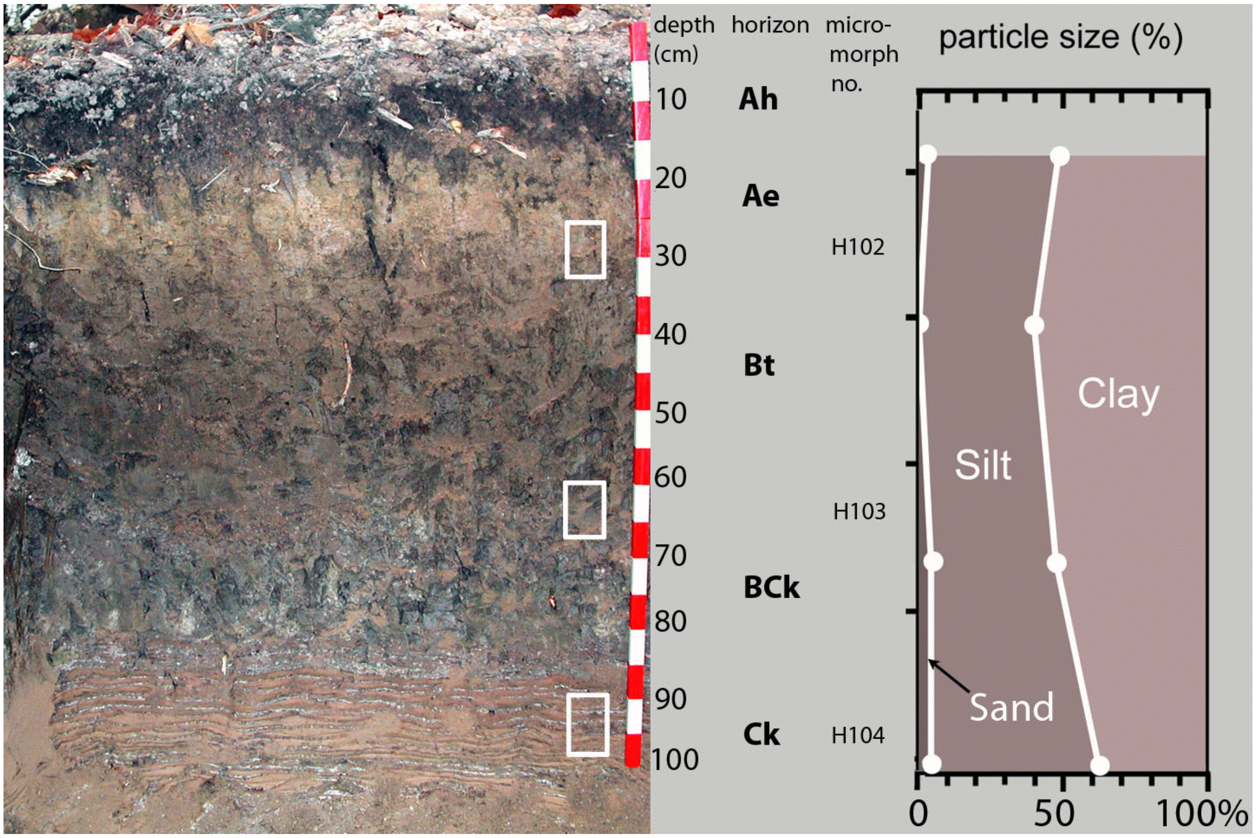

Figure 4.15: Soil profile, interpretation and granulometry.

dominated by oak and hickory, with beach and maple as lesser contributors. Pine is present in all surface samples but pine pollen in the organic layer samples reflects white pine (*Pinus strobus*), which is prevalent in the region today. Ragweed is the most abundant non-forest pollen type in all surface samples (and in Feature 3). Its strong presence reflects absence of forest cover – and either late Pleistocene or post-mid-19th century open environmental conditions.

In addition to bulk samples, individual finds of plant remains were recovered during excavation and piece-plotted. They are listed in Table 4.7 (and in the catalogue, Appendix A).

Table 4.7: Individual piece-plotted plant remains.

Unit	Piece-plot #	Other provenience	Material
502-195	6452	Subsoil, SE edge of Feature 1	Beech wood fragment, charred
503-195	2400	Topsoil	Beech wood fragment, charred
503-197	3007	Topsoil	Maple wood fragment, charred; unidentified fragment, charred
504-196	5276	Subsoil, Feature 2	unidentified botanical material, uncharred
504-196	5277	Subsoil, Feature 2	unidentified seed, uncharred, modern

Table 4.7: Individual piece-plotted plant remains.

Unit	Piece-plot #	Other provenience	Material
504-196	5995	Subsoil, Feature 2	unidentified botanical material, uncharred
505-195	19	Topsoil	Deciduous tree wood fragment, charred
505-197	4216	Subsoil, Feature 2	unidentified material (charred bone?)

All of the identified woods are deciduous and several samples are clearly modern, as they are not charred. Feature 3, in particular, appears to have material which has been introduced in recent times.

In general, pollen and macroplant evidence from bulk samples indicate a lack of disturbance of the archaeological feature soil. This finding is based on: (1) the pollen spectrum is in clear contrast with the modern vegetation, in which deciduous species dominate; (2) there are no European daisy-type (e.g., dandelion) pollen grains in the archaeological feature sample, or excessively high frequencies of ragweed (which is indigenous and has been recovered in low numbers from the earliest late Pleistocene deposits as well as from post-1850 deposits in Ontario); and, most importantly, (3) there is a complete absence of insect parts or modern seeds in the bulk samples – their presence normally indicates disturbance and the establishment of subsurface seed banks.

This evidence for assignment of feature fill to an early Holocene or Pleistocene-Holocene transition date is contradicted by independent recovery, during excavation, of deciduous wood in subsoil feature fill that is more likely to derive from more recent periods. Early assignment and lack of disturbance is still possible, however, if it is assumed that the coniferous pollen recovered in bulk samples is more resistant to decay than deciduous pollen. Deciduous species are known for pollen zone 2 (particularly oak) and are not incompatible with an early Holocene date.

4.3 Pedology and Sedimentology

A soil profile was exposed in the north face of the 1 m-deep trench which was excavated on the east margin of the site (Figure 3.1). Figure 4.15 shows this profile together with interpretations of soil horizons (Soil Classification Working Group 1998), locations of micromorphology samples, and results of particle size analysis. Soil horizons are described in detail in Appendix C.

The profile contains a downward sequence of soil horizons (Ah, Ae, Bt, BCk, Ck) that are assumed to have formed within a single lithological unit. This unit is silt and clay rhythmites, visible near the bottom of the sequence as alternating dark and light bands (horizon Ck), but invisible further up the profile where they have been overprinted by soil development (horizons Ah to BCk). This unit has been identified, regionally, as nearshore glaciolacustrine sediments (Feenstra 1984) and probably includes a veneer of sediments from shallowing post-glacial ponds. It is also possible, however, that a second, upper lithological unit is present but invisible due to soil overprinting – water- or wind-deposited silt that accumulated during the Holocene on top of the Pleistocene silts and clays. Resolution of these alternatives awaits further analysis of micromorphology samples H0102 and H0103 (see Section 4.4) which might, if the first alternative is correct, retain evidence of the original laminated structure.

Soil horizons are well developed and conform to the regional classification of a Gleyed Brunisolic Grey Brown Luvisol indicated for this locality (Kingston and Presant 1989). They include, from top to bottom, a forest mull Ah, an eluvial (leached) Ae, a clay-enriched Bt, a carbonate-enriched BCk transition in which blocky structure of soil is particularly well-developed, and a relatively unweathered Ck parent material which preserves the original lacustrine laminates. The development of the profile indicates considerable age and stability. It does not, however, rule out the possibility that cultivation and limited erosion occurred on this land surface in the past, as part of the Ae horizon usually remains intact under ploughed conditions as long as cultivation did not exceed 15 cm in depth and surface erosion was limited (Soil Classification Working Group 1998:91).

Silt and clay dominate the profile. Nowhere does sand account for more than 5 percent of sediments, and larger clasts are absent. Sands increase towards the base of the profile, suggesting the addition of wind-borne fines (mainly silts) during the Holocene, contributing to the burial of the archaeological site materials. The slight increase in sands at the top of the profile hint at recent land-surface disturbances.

The soil analysis indicates that the Ae horizon (a light-coloured layer identified throughout this report and in field notes as ‘subsoil’) lies close to (within 20 cm of) the present surface of the ground. This horizon is below any disturbance caused by ploughing or forest clearance in the past 200 years and archaeological materials contained within it should be intact. Typically, a Grey Brown Luvisol in Southern Ontario that is as well-developed as this one appears to be should be in the range of 5,000 to 10,000 years old (Dr Bert VandenBygaart, Dept of Land Resource Science, University of Guelph, pers. comm. to Andrew Stewart, 5 Feb. 2002). Assuming that archaeological materials were not translocated down into this horizon at a later time by bioturbation or tree wind-throw action, they should be in the same age range, i.e., approximately 5,000 to 10,000 years.

4.4 Soil Micromorphology

The four samples that were recovered were processed at Brock University’s Micromorphology Unit. A total of 12 thin-section slides were produced. Images from these slides – photographs and accompanying graphic interpretation – are presented in Appendix D.

Sample H0101 (Appendix D), taken from Feature 1, exhibits considerable disturbance, possibly the result of animal foraging, tree root disruption from wind throw, but most likely human disturbance. The evidence of disturbance can be seen in the presence of pollen grains, charcoal fragments and tree root hairs. There are also clasts (particles) of chert, visible in the original slides but not identified in photographs. This sample is completely disrupted and no evidence of sediment deposition patterns can be seen. Micromorphologically, the sample exhibits marbleization – typical of total disruption by non-geological processes. Since the disruption is so shallow it seems unlikely that tree-throw is the effect.

Sample H102, taken from near the top of the soil profile (E/B horizon), from a trench at the edge of the site, is similar to sample H101 but is less disrupted. Charcoal fragments, rootlets and twigs can be seen, suggesting that these elements are present in the upper soil horizons generally, and should not be attributed to the (pre-contact) cultural processes operating at this site.

Sample H103, taken from the Bt horizon, produced a poor set of thin sections and are not reproduced here.

Sample H104, is taken from the laminated sediments in the C horizon. These sediments exhibit an ichnofabric (disrupted lamination or bedding structure) in which at least 10 percent of the original bedding shows disturbance. This disruption may be caused partly by tree wind-throw but is more likely due to dessication effects, as lakes and ponds in this area gradually dried during the Holocene (see Section 2.1). Evidence of faulting in this sample may be the result of localized loading, such as tree felling, seismic shocks, or consolidation due to clay drying.

In summary, all samples from the Huson site exhibit disturbance of different types. A pattern of intense, shallow disturbance is noted in the upper part of the profile. This is particularly noticeable in the sample from the cultural feature. Such intense, shallow disturbance is possibly due to natural effects of tree wind-throws but such effects should also, then, be seen lower down. This disturbance is more likely due to the effects of human and animal activity. The disturbance in the lower part of the profile, in the lacustrine laminated sediments, is probably the result of dessication as lakes or ponds in this area shallowed and dried out during the postglacial period.

4.5 Faunal Remains and Radiocarbon Date

A single precaudal vertebra of a pike, mostly likely a northern pike (*Esox lucius*), was recovered in the topsoil (Ah horizon) of unit 506-196, encompassing Feature 2. It was subjected to detailed analysis by Stephen Thomas and found to have been chewed by a carnivore or possibly a person, and perhaps partly digested. The growth rings indicated it was a large, mature fish, about 65 cm long. Its only serious predator would have been human beings.

The vertebra was submitted to Beta Analytic for AMS dating on bone collagen. It returned an age of 111.5 +/-0.6 pMC ("percent modern carbon")(Beta - 166512). This indicates that the fish was living within the last 50 years.

5 SUMMARY AND CONCLUSIONS

The Huson site is a small, dense concentration of exclusively Onondaga chert artifacts. The worked tools are: one bifacial, square-ended drill; two end scrapers, one of which is spurred; four early-stage biface fragments; six unifacial artifact fragments, one of which may be a piercing tool; 14 unifacially worked flakes. Additionally, a total of 9380 unworked chert flakes and fragments was recovered.

The bifacial drill, comparable to specimens from the Nettling site, and other Kirk corner-notched assemblages, suggests that the Huson site can be attributed to the corner-notched horizon of the Early Archaic period (9700 - 8900 BP) (Ellis et al. 1990:73). End scrapers and the piercer are consistent with a Late Palaeo-Indian and Early Archaic assignment (Lennox 2000).

The setting of the site in a woodlot and preliminary Stage 2-3 work indicated that the archaeological deposits were minimally plough-disturbed, if at all, and had the potential for a higher level of preservation of behavioural and environmental information about the poorly-known and rarely-encountered early Holocene period of cultural occupation. For this reason, piece-plotting of artifacts was employed and organic and soil/sediment studies undertaken.

Analysis of chert debitage suggests that some kind of small core reduction took place. Later – but not earlier – stages of bifacial reduction are also well-represented (Table 4.4). Debitage analysis also indicates that unifacial tool retouch occurred at the site. The presence of end scrapers and unifacial artifact fragments, together with the uniface retouch flakes, suggests that unifaces were used and resharpened on-site.

5.1 External Comparisons

Comparisons of Huson with other Archaic assemblages in the area suggest that the Huson site is a small site with a narrow range of tool forms – possibly representing a small residential camp or task-specific camp. Four sites that have been comprehensively investigated and reported on in the region provide a basis for comparison: the Kassel and Blue Dart sites, both Early Archaic (Bifurcate Base tradition) sites, located 120 km northwest of the Huson site (Lennox 1993); the Little Shaver site, a Middle and Late Archaic site located about 70 km west of the Huson site, in an unploughed woodlot (Timmins 1996); and the Bell site, a large, Middle Archaic, plough-disturbed site located on the edge of the sandy Fonthill delta/kame (Tinkler 1994) in the middle of the Niagara peninsula, 10 km southwest of the Huson site (Williamson et al. 1994). The latter two sites date to considerably later in the Holocene (Middle and Late Archaic) than the presumed period of occupation for the Huson site (Early Archaic).

First, the assemblage at the Huson site has a greater proportion of early-stage bifacial flaking or core reduction, compared to the other sites (Table 5.1).

Table 5.1: Comparison of diagnostic stage debitage for Huson, Little Shaver and Bell sites (based on data from this report, Timmins 1996; Williamson et al. 1994; and Lennox 1993).

Stage	Huson % (n =444)	Little Shaver, Onondaga only (n = 1238)	Bell (n =1248)	Kassel and Blue Dart (n = 561)
Primary	43.2	12	6	12.3
Secondary	56.8	88	94	87.7
Total (diagnostic stage debitage)	100	100	100	100

Although methods of lithic analysis differ among the sites, the separation of primary from secondary flakes at the four sites may be robust enough to allow comparison. Primary detachment is clearly represented far more at Huson than at any of the other sites. This is probably due, in part, to its location close to primary chert sources on Lake Erie.

Second, the Huson site has a narrow range of tools, which includes bifaces and scrapers and excludes projectile points. No evaluation of diversity in relation to assemblage size has been attempted and so this conclusion is impressionistic. None the less, the total lithic assemblage at Huson is larger than either Little Shaver or Blue Dart and Kassel sites. The limited range and number of worked tools at Huson, and the absence of projectile points, suggest that Huson may be a task-specific camp – but not a kill station or point re-tooling station. Alternatively, it may represent a small residential camp.

Third, both Little Shaver and Huson provide opportunities to evaluate finer spatial patterning of material, due to relatively undisturbed contexts and piece-plotting of finds. There is some spatial patterning at the Huson site – bifacial tools generally occur in the eastern part of the site (particularly around Feature 1, in the southeast). Feature 1 also has more evidence of later bifacial reduction and less evidence for cortex removal. The drill and end scrapers occur near Feature 1. The southeast part of the site may be an area of task-performance employing formal tools, with some maintenance of those tools. The northwest part of the site (including Feature 2) may have been an area of tool-manufacture (earlier-stage bifacial reduction). Unlike the Little Shaver site, the total area of distribution of tools and debitage is too small to test whether displacement and toss zones for artifacts around hearths are distinguishable from a drop zone. There is, in fact, no evidence in the form of calcined bone, charcoal concentrations, associations with heat-altered flakes, or hardened soil, that features at the Huson site actually represent hearths, with the possibly exception of Feature 2, where one charred fragment was recovered that may represent bone (see Section 4.2).

Fourth, the setting of the Huson site in heavy, poorly-drained substrate near the headwaters of Ten Mile Creek contrasts with the settings of the other sites, which are located on sand. The other sites were, however, located next to wetlands. The location of Huson on silt, a potentially wetter substrate, is unique among the four sites.

5.2 Determination of Disturbance/Integrity

The Huson site is only minimally or not at all plough-disturbed. This conclusion is supported by current (at time of excavation) land cover (forest), known landscape history of the site during the period of European settlement, the well-developed Grey Brown Luvisol soil profile recorded beside the site, the characterization of the mineral A horizon pollen assemblage as early zone 2 (early Holocene), and density and concentration of lithic material in both topsoil (A horizon) and subsoil (Ae and B horizons). Its cultural deposits retain, therefore, a high level of integrity relative to plough-zone sites. This is rare for the Archaic period, and almost unknown for the Early Archaic period of the early Holocene. On these grounds alone, the Huson site is unusual.

In addition to this site-wide integrity, several features were identified, during excavation, based on areas of high artifact density in topsoil and subsoil. The extent of features was defined based on artifact distributions. The irregular topography defined by maximum depth of subsoil finds suggests that features are either natural phenomena (e.g., tree throws) or have been modified by natural phenomena. This possibility does not exclude subsequent cultural use of previously-formed natural features (e.g., Evans et al. 1999).

Post-excavation analysis suggests that, of the three features, Feature 1 is most likely to have a cultural origin and be least disturbed. This is based on: (1) regularity of feature shape (Figure 4.10); (2) an early, zone 2 pollen assemblage; (3) the absence of modern plant or insect macro-remains; (4) evidence for size-sorting of flakes in Feature 3 but not in Feature 1; and (5) the weak but unique association of Feature 1 with elements of the lithic assemblage: a positive association with later bifacial reduction (and possibly also with formal tools), and a negative association with cortex-bearing flakes. This interpretation of integrity must be qualified: archaeological deposits are shallow – all occur within 30 cm of the modern surface – and therefore subject to bioturbation.

Assessment of the nature of sediment accumulation in the upper soil horizons (Ah to BCk) is relevant to understanding the nature of integrity and preservation of archaeological materials at the Huson site. Cumulative soil development, in which sediment (here, water- or wind-borne silt) is added while soil develops, should enhance protection of archaeological materials (features, artifact emplacements) that are buried by sediments. The alternative is non- or shallow burial by non-cumulative soil development in sediments during the Holocene – sediments that have already been mostly emplaced by late glacial and early Holocene ponding – with consequent exposure to taphonomic forces associated with near-surface, active soil horizons (Ferring 1992:18). Further study of micromorphology samples may resolve this question, which may be stated as extreme alternatives: either, (1) sediments in the Ae and B horizons are not linked to lacustrine rhythmites (e.g., they do not retain properties of layering), making it more probable that Early Archaic archaeological deposits were buried by wind- or water-borne sediment during cumulative soil development throughout the Holocene, enhancing the probability of their being intact; or, (2) sediments in these upper horizons do, indeed, retain properties of rhythmites, which are most visible at the base of the profile, increasing the probability that early or mid Holocene archaeological deposits remained close to the surface and subject to bioturbation and other destructive agents.

6 CLEARANCE OF FURTHER ARCHAEOLOGICAL CONCERNS

Following the completion of the Stage 3-4 archaeological salvage excavation of the Huson site (AgGt-111), ASI submitted a letter report that summarized these activities to the Ministry of Culture and the Ministry subsequently issued a letter of clearance for the site. This final report, represents fulfilment of the terms and conditions imposed by licensing agreement 2001-025 with the Ontario Ministry of Culture, as well as the statements contained in CIF #2001-025-020.

The artifacts and documentation related to this project shall be curated by Archaeological services Inc. until such time that arrangements are made for their ultimate transfer to Her Majesty the Queen in right of Ontario, or other public institution, can be made to the satisfaction of the landowner, the Ministry of Culture, and any other legitimate interest groups.

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APPENDIX A: Artifact Catalogue

Excavation Unit	Description	No of Pieces of Debitage	No of Worked Artifacts	No of Other Material	Piece-plot number
499-192		0			
499-193		0			
499-194		0			
499-195		0			
500-192		0			
500-193		0			
500-194	debitage	3			
500-195	debitage	3			
500-196		0			
500-197		0			
500-199		0			
501-192	debitage	1			
501-193	end scraper		1		
501-193	debitage	6			
501-194	unifacially worked flake		1		
501-194	debitage	11			
501-195	end scraper		1		
501-195	debitage	12			
501-196	unifacial artifact fragment		1		3773
501-196	unifacially worked flake		1		3774
501-196	debitage	13			
501-197	debitage	5			
501-198		0			
502-192	debitage	1			
502-193	debitage	1			
502-194	bifacial drill		1		3791
502-194	debitage	401			
502-195	biface		1		
502-195	unifacially worked flake		1		6651
502-195	debitage	597			
502-195	beech wood fragment			1	6452
502-195	deciduous tree wood fragment			1	6453
502-196	debitage	252			
502-197	debitage	319			
502-198	debitage	17			
502-199	debitage	2			
503-191		0			
503-192	debitage	1			
503-193		0			
503-194	debitage	238			
503-195	biface		1		2277
503-195	unifacial artifact fragment		1		2546
503-195	unifacial artifact fragment		1		4711
503-195	debitage	1163			

Excavation Unit	Description	No of Pieces of Debitage	No of Worked Artifacts	No of Other Material	Piece-plot number
503-195	beech wood fragment			1	2400
503-196	biface		1		2648
503-196	unifacial artifact fragment		1		2647
503-196	unifacially worked flake		1		2639
503-196	debitage	373			
503-197	unifacially worked flake		1		3123
503-197	unifacially worked flake		1		3218
503-197	unifacially worked flake		1		3315
503-197	debitage	461			
503-197	maple wood fragment; unidentifiable organic fragment			2	3007
503-198	unifacial artifact fragment		1		2609
503-198	unifacially worked flake		1		2583
503-198	debitage	66			
503-199	debitage	6			
504-192		0			
504-193		0			
504-194	debitage	1			
504-195	debitage	84			
504-196	unifacially worked flake		1		6223
504-196	debitage	1832			
504-196	unidentified material - uncharred, probably modern			1	5276
504-196	unidentified material - uncharred, probably modern			1	5277
504-196	unidentified material - uncharred, probably modern			1	5995
504-197	biface		1		
504-197	unifacially worked flake		1		4749
504-197	unifacially worked flake		1		
504-197	debitage	1121			
504-198	unifacial artifact fragment		1		4491
504-198	debitage	26			
504-199		0			
505-194	debitage	1			
505-195	debitage	68			
505-195	deciduous tree wood fragment			1	19
505-196	unifacially worked flake		1		3979
505-196	unifacially worked flake		1		645
505-196	debitage	1141			
505-197	unifacially worked flake		1		1455
505-197	debitage	998			
505-197	unidentified material - charred bone?			1	4216
505-198	debitage	49			
505-199	debitage	3			
506-194	debitage	2			
506-195	debitage	3			
506-196	fish vertebra			1	
506-196	debitage	45			
506-197	debitage	24			

Excavation Unit	Description	No of Pieces of Debitage	No of Worked Artifacts	No of Other Material	Piece-plot number
506-198	debitage	14			
506-199	debitage	1			
507-195	debitage	1			
507-196	debitage	6			
507-197	debitage	1			
507-198	debitage	6			
508-197	debitage	1			
TOTAL		9380	27	11	

APPENDIX B: Worked Tool Descriptions (n = 26)

Feature 1: (n = 6)

#3791 (502-194): Bifacial drill. This piece is the base and most of the length of a bifacially-worked drill, measuring 14 mm wide (across the base), 35 mm long (from base to snapped tip) and 7 mm at point of maximum thickness, which is laterally centred and about 15 mm along its length from the base. Both surfaces of the biface are uniformly flaked from both lateral margins. One margin on the obverse side is more steeply and uniformly flaked, indicating retouch of this edge, the flake scars extending about 4 mm in to, and terminating at, a longitudinal ridge. This edge is gently concave in plan form as a result of this retouch. The base is also uniformly flaked on both faces. When viewed edge-on, the margins of the biface are centred and straight all the way around the artifact. Edges and flake arrises are worn smooth, suggesting heavy reuse or curation. There is no suggestion of notches or spurs on the margins near the base. This artifact most closely resembles an Early Archaic drill (Ellis et al. 1990:74-5).

#6651 (unit 502-195): Unifacially Worked (?) Flake. Flake with thin edges, one of which appears to be shallowly (< 1 mm) retouched. Retouch may be fortuitous result of edge crushing. Retouched edge measures 15 mm along one edge and includes a protruding termination of a prominent dorsal ridge, giving the retouched edge a slight, rounded spur. The flake itself appears to be early bifacial reduction but the platform is missing: it has a longitudinal curve, with prominent mass removed near missing platform, and dorsal scars oriented from many directions.

Non-piece-plotted, Topsoil (502-195): Biface Fragment. Base (or tip) of a mid-stage biface (more advanced than #2277). Both faces have been fully flaked, resulting in a semi-regular biconvex cross-section. Two large flake scars dominate the obverse face; six or eight smaller scars are present on reverse face. Edges are sinuous. Tip is pointed. Artifact has been snapped through the midsection. The break suggests end-shock from a blow directed to one end of the biface, possibly placed too high on the margin of the biface (Callahan 1979:85, 109). Maximum length, tip to midsection break, 45 mm. Maximum width across midsection, 40 mm. Maximum thickness through midsection, 15 mm.

#2277 (503-195) Biface Fragment. Base of an early stage biface. Irregular cross-section and surface treatment. Obverse face retains part of weathered surface of tabular core. Part of this surface has been removed by one long (32 mm) flake from end of biface. The reverse face has one large invasive flake scar plus several short, step-terminating scars around edge of biface. The biface is broken through the middle where there is a large mass of material. The broken edge has also been flaked, indicating the use of this biface as a core.

#2546, (unit 503-195): Unifacial Artifact Fragment or unifacially worked core fragment. A blocky single-facet platform flake (interior core flake, code 120), broken distally. One of the broken edges is unifacially worked – invasive retouch (up to 8 mm) and continuous for entire length of broken edge (15 mm). Probably a platform fragment from a core that retains evidence of platform preparation.

#4711 (unit 503-195): Unifacial Artifact Fragment. Longitudinally curving, unifacial tool rejuvenation flake (coded 190). Rejuvenated edge retains heavily step-fractured, steeply-worked edge of original unifacial tool. The distal end of the flake comes to a point along a flake arris. The edge to the right of the arris is retouched (possibly as a result of crushing or damage to flake) along 5 mm of length.

Feature 2: (n = 5)

6223 (504-196): Unifacially Worked (?) Flake. A long (27 mm) flake fragment, probably from late bifacial reduction, with narrow (6 mm) termination that has been blunted with non-invasive (< 1mm) retouch, possibly fortuitous as a result of flake breakage.

Non-piece-plotted, Topsoil (504-197): Biface Fragment. Basal fragment of early stage biface. Two large flake scars are visible on each face. Edge is sinuous. Maximum dimension of fragment (width), 35 mm.

#4749 (504-197): Unifacially Worked Flake. Possible interior flake struck from a core with platform edge bearing non-invasive (1 mm) retouch B possible fortuitous result of damage to flake during removal or platform preparation.

Non-piece-plotted, Topsoil (504-197): Unifacially Worked (?) Flake – possible graver-like unifacial tool. This tool is made on a longitudinally-curved single-facet platform flake that retains a step-fractured edge, dorsally. The platform is ‘off-centre’ suggesting that it is a product of alternate flaking in the early bifacial sequence but it is single-facetted and may, rather, be a corner-removal flake from a block core. An unflaked surface of the core is preserved, distally. The distal end has possibly been retouched on one side to enhance the flake termination, which is pointed, giving the tool a graver-like functioning tip. Flaking is irregular and non-invasive (up to 1 mm). The worked edge is 5 mm long.

#3979 (505-196): Unifacially Worked (?) Flake. Distal end of flake that appears to have been shallowly worked but may result from fortuitous retouch (edge crushing or breakage during flake removal). Retouched edge is rounded, forming narrow (5 mm) end to long (20 mm) flake.

645 (505-196): Unifacially Worked (?) Flake. Long (28 mm) flake fragment with narrow (5 mm) termination that has been blunted with shallow (1 mm) retouch, possibly fortuitous as a result of flake breakage.

#1455 (505-197): Unifacially Worked (?) Flake. This flake appears to be shallowly (< 1 mm) worked along a distal broken edge (edge appears to be deliberately blunted or crushed, but worked aspect may be fortuitous result of flake removal or breakage). Flake is 24 mm long, from platform to broken distal (worked) edge, and 28 mm wide along its worked edge. Distal edge is thick (9 mm) and steep; worked aspect is less than 1 mm deep and is continuous along entire edge.

Feature 3: (n = 6)

#2639 (503-196): Unifacially Worked (?) Flake. This flake has continuous, shallow (< 1 mm) unifacial retouch, possibly fortuitous as a result of crushing or breakage, along distal broken edge of a flake fragment (platform is missing). Worked edge is approximately 10 mm long.

#2647 (503-196): Unifacial Artifact Fragment (?): blocky fragment, preserves part of an edge that had possibly been unifacially, shallowly (up to 1 mm) worked, though retouch may be fortuitous result of flake breakage. Length of preserved worked edge is less than 5 mm.

#2648 (503-196): Biface and possible Bipolar or Multi-directional Core. This biface measures about 5 cm (length) by 3.5 cm (width) by 1.3 cm (maximum thickness through broken midsection). Cross-section shape is irregular plano-convex. It represents the base of a biface that has been broken through its midsection and then probably reworked − flakes have been struck on both faces, the longest and widest one on the reverse (plano) face − using this broken edge as a platform. A series of flakes has also been struck from the lateral edges of the biface, primarily on the obverse (convex) face only. The obverse face also shows evidence of having been thinned from the end which remains intact.
#3315 (503-197): Unifacially Worked (?) Flake. Distal flake fragment, one edge with non-invasive (< 1 mm) retouch along 5 mm, possibly a fortuitous result of crushing.

#3218 (503-197): Unifacially Worked (?) Flake. Distal flake fragment (platform missing) with pointed termination, longitudinally curved. One edge has been possibly shallowly worked (may also be result of fortuitous crushing) for 9 mm from point of distal termination on the ventral face.

#3123 (503-197): Unifacially Worked (?) Flake. Distal flake fragment (platform missing), thick (about 5 mm), short (about 19 mm), and longitudinally curved, with straight (transverse to flake axis) termination that has been unifacially continuously worked (9 mm length). Unifacial flaking is non-invasive (1-2 mm) and may be fortuitous result of flake breakage.

Non-feature Units: (n = 10)

Non-piece-plotted, Topsoil (501-193): End Scraper. This is a complete end scraper measuring 34 mm long, 27 mm wide (across the base of the convex bit) and 13 m thick at the thickest point, coinciding with the base of the bit. In plan view, the convex curve of the bit is the dominant feature. There is a spur on the right lateral edge (coinciding with the base of the bit). Both sides converge from the base of the bit towards the base of the artifact. The base measures 10 mm across and is concave, giving it a spurred appearance. In longitudinal section, the flake on which the scraper is made is curved – concave downwards. The underside is an unworked ventral flake surface. The upper surface of the scraper is extensively flaked. The convex bit edge is extensively and steeply retouched. The left lateral edge is step-fractured. The right side retains a large flake scar. The right lateral spur is formed on one ridge of this large flake scar. Both surfaces of the artifact are bumpy, with the appearance of having been damaged by heat through crazing and pot-lidding.

Non-piece-plotted, Topsoil (501-194): Worked (?) Flake (platform preparation flake from core). This flake may have been worked (prepared prior to flake removal) along its platform edge. The platform is an unfacetted, large surface (15 mm across) that retains cortex. The dorsal surface of the flake is one, large previous flake removal from the same platform (at least from the same direction). This piece probably, therefore, represents debitage that retains evidence of platform preparation on a tabular or block core.

Non-piece-plotted, Topsoil (501-195): End Scraper. This scraper is made on a core-struck flake (code 120) measuring 36 mm long and 17 mm wide at the bit end. The original flake blank retains a large (9 mm wide) single-facet platform, which is positioned at the haft end of the end scraper. The ventral surface of the flake retains a shallow bulb of percussion. This (bulb) end of the flake is thinner (3-5 mm) than the distal end (5-7 mm), where the bit end of the scraper is formed on the dorsal surface of the flake. The sides of the flake, on either side of the platform, are dorsally retouched (5-10 mm long), probably to assist hafting. Dorsal scar patterning includes two, deep, prominent flake removals from the platform end and step-fracturing and steep retouch around the bit end of the scraper.

#3773 (501-196): Unifacial Artifact Fragment (with shallow retouch and rounded bit edge. The bit end of unifacially worked tool made on a thin (4 mm) flake. Bit end has been uniformly rounded (radius 6 mm) by shallow, invasive (2-4 mm) unifacial retouch. Tool has been snapped proximally. Remaining length, 20 mm. Width of bit end (across base) 15 mm. Flake ridges are highly worn.

#3774 (501-196): Unifacially Worked (?) Flake. Long (4 cm), narrow (1.9 cm) flake which has been irregularly retouched along one of the long edges, extending from next to (broken) flake platform 2.5 cm to middle of flake. Retouch may be a fortuitous result of use or manufacture as it exhibits evidence of crushing and minor step-fracturing along curved edge.

#2609 (503-198): Unifacial Artifact Fragment (end scraper bit?). This is an edge fragment of a unifacial tool, possibly an end scraper, with a convex shape (plan). A spur in the middle of this rounded edge fragment has been emphasized by retouch on one side. Maximum dimension (across the >base' or along the broken edge of this fragment), 20 mm.

#2583 (503-198): Unifacially Worked Flake. Wide, short, edge-preparation flake, or possibly an interior flake from a core platform (retaining large, flat, unfacetted platform), that has been steeply worked at one end. Length of worked edge, 5 mm. Length of flake, 29 mm.

#4491 (unit 504-198): Unifacial Artifact Fragment – possibly end scraper bit fragment. Flake fragment that retains 7 mm of steeply worked unifacial edge, invasive (up to 5 mm). Unworked face of flake appears to be unaltered (non-conchoidally fractured) surface of tabular rock.

APPENDIX C: Soil Horizon Descriptions

Ah horizon (0-13 cm): colour is 10YR3/2 (moist); massive structure with very fine grains; no gravel; consistence is slightly sticky and slightly plastic when wet, friable when moist; abrupt, irregular lower boundary; no reaction to 10 percent HCl. Roots are extensive through this horizon and below.

Ae horizon (13-23 cm): colour is 10YR5/4 - 10YR6/3 (moist). Massive structure; no gravel; consistence is slightly sticky when wet; firm when moist; clear, wavy lower boundary; no reaction to HCl; roots extend through this horizon; texture determined by granulometry is silty clay (percent sand 3.2; silt 46.2; clay 50.6)

Bt horizon (23-60): colour is 10YR3/2 becoming 10YR4/3 towards base. Massive structure; no gravel; consistence is friable when moist; lower boundary is abrupt, wavy; roots extend through this horizon; no reaction to HCl; texture determined by granulometry is clay (percent sand 0; silt 40; clay 60).

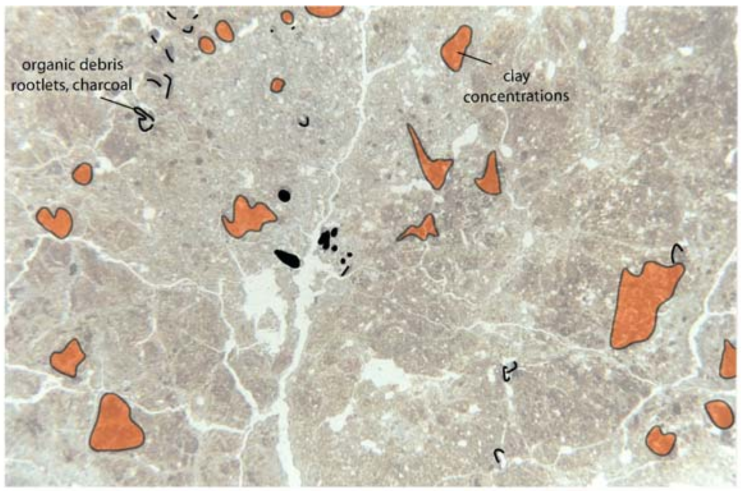
BCk horizon (60-80 cm): colour is 7.5YR4/4 with mottling (10-20 percent). Weak angular blocky structure, with medium-sized blocks; no gravel; friable moist consistence; abrupt, straight lower boundary; reaction to HCl . Texture determined by granulometry is silty clay (percent sand 4.3; silt 43.4; clay 52.4)

Ck horizon (80 to base): relatively unweathered rhythmites of silt or clay – alternate dark and light laminations. Colour of light laminations is 7.5YR6/4; laminations are 1-2 cm thick. Colour of dark laminations is 7.5YR5/2; laminations are <1 cm thick. Laminations are continuous, horizontal. Strong effervescence to HCl; Texture determined by granulometry is silty clay loam (percent sand 4.1; silt 56.5; clay 39.3)

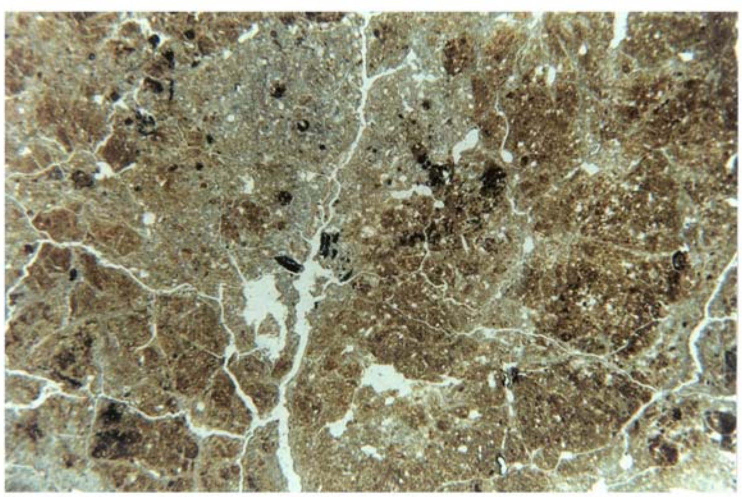
APPENDIX D: Micromorph Photography

Selected images of soil micromorphology thin-sections: photographs and interpretations

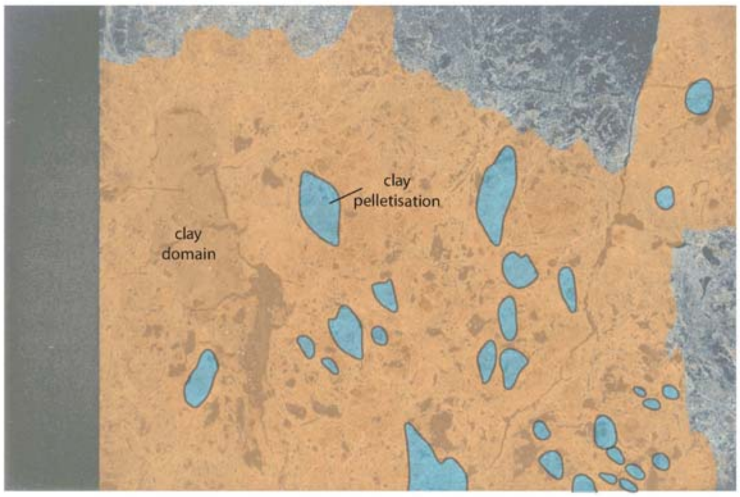
D1: Feature 1 fill (sample taken from west face of NW quadrant of Feature 1, subsoil)



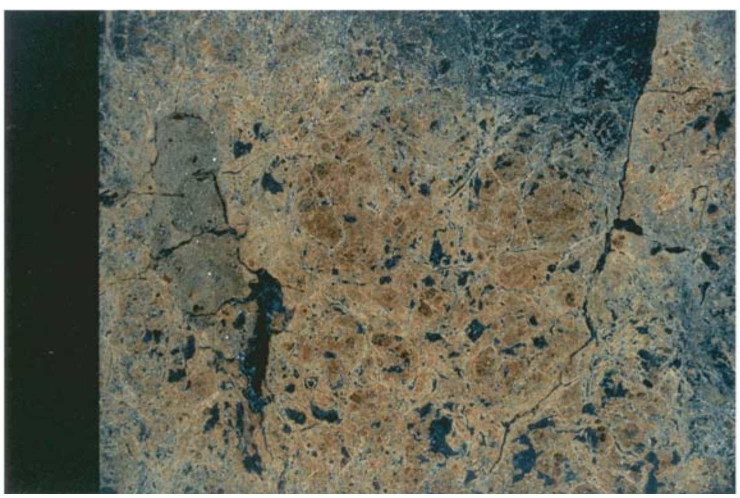
H101B
Feature 1



D2: sample taken from Ae/Bt transition near top of soil trench (north wall of trench)



H102B
soil profile
Ae/Bt transition



D2: sample taken from Ck horizon near bottom of soil trench (north wall of trench); shows lacustrine rhythmites