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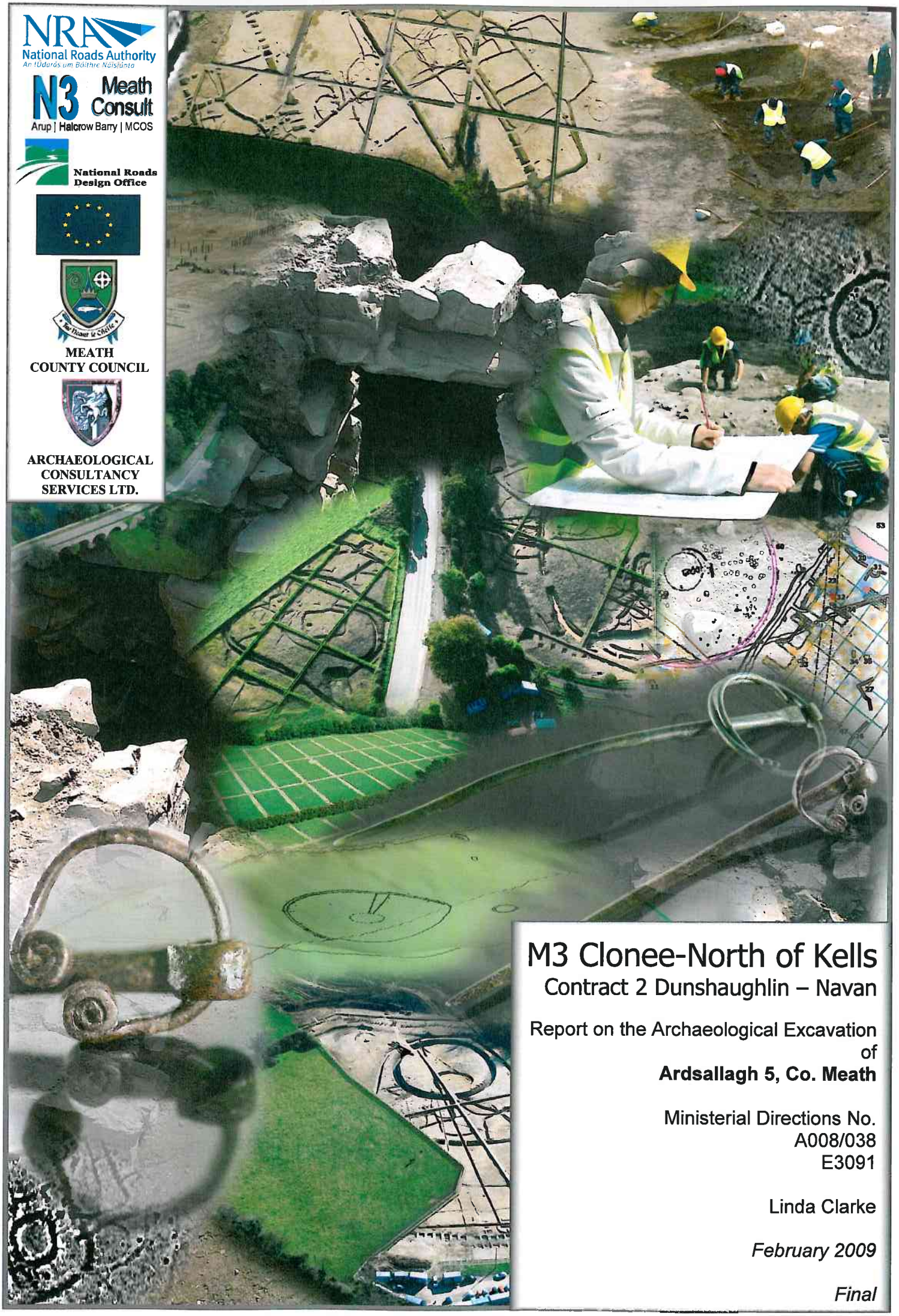

M3 Clonee-North of Kells

Contract 2 Dunshaughlin – Navan

Report on the Archaeological Excavation of

Ardsallagh 5, Co. Meath

Ministerial Directions No.
A008/038
E3091

Linda Clarke

February 2009

Final

PROJECT DETAILS

Project	M3 Clonee–Kells Motorway
Site Name	Ardsallagh 5
Ministerial Direction Number	A008/038
Registration Number	E3091
Senior Archaeological Consultant	Donald Murphy
Site Director	Linda Clarke
Excavated	08 December 2005 – 19 January 2006
Client	Meath County Council, National Roads Design Office, Navan Enterprise Centre, Navan, County Meath
Townland	Ardsallagh
Parish	Ardsallagh
County	Meath
National Grid Reference	288157, 263884
Chainage	35350–35425
Height	59.87m OD
Report Type	Final
Report Status	Submitted
Date of Report	February 2009
Report by	Linda Clarke

ACKNOWLEDGEMENTS

This report has been prepared by Archaeological Consultancy Services Ltd on behalf of Meath County Council National Roads Design Office (NRDO) and the National Roads Authority (NRA). The excavation was carried out under Ministerial Directions issued by the Department of the Environment, Heritage and Local Government (DOEHLG) in consultation with the National Museum of Ireland (NMI).

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NON-TECHNICAL SUMMARY

This site at Ardsallagh 5 was excavated by Archaeological Consultancy Services Ltd (ACS) as part of the M3 Clonee–North of Kells Motorway Scheme on behalf of Meath County Council NRDO and the NRA. The excavation was carried out between 08 December 2005 and 19 January 2006 under Ministerial Direction Number A008/038 issued by DOEHLG in consultation with the NMI. The site at Ardsallagh 5 incorporated a series of linear features/ditches, pits, a kiln, and a series of postholes which could possibly represent the remains of a structure. These features were located in proximity to Cannistown church and some of the features may have been associated with its early foundations. Finds from the site included slag, a complete bone cylinder, a blue glass bead, and a piece of flint. The features on this site were dated from the late Iron Age to the Early Medieval/Medieval period.

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FIGURE LIST

PLATE LIST

1 INTRODUCTION

The site at Ardsallagh 5 (Figures 1–7; Plates 4–6) was identified during advance testing carried out by Stephen Linnane during March 2004 under licence number 04E0421 (Linnane 2004). Advance testing revealed a possible cremation pit (0.75m diameter), a north–south ditch (0.60m width x 0.10 depth) and a northwest–southeast ditch (Linnane 2004). A Topsoil Assessment (Appendix 4), including metal detection, field walking and test pits, produced 17 artefacts of modern date. Upon full archaeological resolution of the site in 2005–2006 a key-hole-shaped kiln, the remains of a possible circular structure and associated postholes, several pits, a metalled stone surface, and linear ditch features were exposed.

1.1 Development

Meath County Council and the National Roads Authority are constructing 49km of two-lane, dual-carriageway motorway between Clonee and Kells and 10km of single carriageway from Kells to Carnaross, north of Kells, along with additional road upgrades, realignments and associated ancillary works. For the purposes of the Environmental Impact Assessment and the subsequent archaeological investigations the scheme was subdivided into five separate sections as follows: Clonee to Dunshaughlin (Contract 1), Dunshaughlin–Navan (Contract 2), the Navan Bypass (Contract 3), Navan to Kells (Contract 4) and Kells to North of Kells (Contract 5). This section of the scheme (Contract 2) commences at Dunshaughlin and progresses to Navan. The immediate area is dominated by the River Boyne and the Hill of Tara, which has been the focus of extensive research projects in recent years by The Discovery Programme, and the number of previously known monuments in this hinterland is high.

The archaeological components of the Environmental Impact Statement published in 2002 were carried out by Valerie J. Keeley Ltd (VJK) and Margaret Gowen and Co. Ltd (MGL) in 2000–2001. This included desk based studies and field surveys of each section (VJK – Sections 1 & 3 and MGL – Sections 2, 4 & 5). Additionally on behalf of Margaret Gowen and Co. Ltd geophysical survey was undertaken on the Dunshaughlin–Navan section and at Nugentstown on the Navan–Kells section by GSB Prospection (2000 & 2001). These studies carried out as part of the Environmental Impact Assessment were augmented by further geophysical survey conducted by Bartlett-Clark Consultancy on the remainder of the scheme (2002). Archaeological testing was completed by ACS and Irish Archaeological Consultancy Ltd (IAC) in 2004 (ACS – Sections 1–3 and IAC Sections 4–5). Excavation of the sites identified during testing was conducted by ACS and IAC between 2005 and 2008 (ACS Sections 1–3 & 5 and IAC Section 4).

2 EXCAVATION

Excavation occurred between 08 December 2005 and 19 January 2006 under Ministerial Direction Number A008/038 issued to Meath County Council NRDO. The work was carried out by Linda Clarke on behalf of ACS. The topsoil, F4 (c. 0.35m depth), was stripped by a machine equipped with a grading bucket under archaeological supervision. The subsoil, F5, consisted of pale orange/brown silty clay with areas of gravel.

All archaeological features exposed were recorded and excavated by hand using the single context method. Each feature was assigned a context number. Where appropriate, samples were retrieved in an attempt to obtain evidence for the date and function of these features (Appendix 3). Unless otherwise stated, the features have been measured length-width-depth. All measurements are in metres. All finds were numbered according to the requirements of the National Museum of Ireland from 1 onwards consistent with licence and feature number. The artefacts recovered from the site underwent an initial archaeological assessment and where deemed appropriate further specialist analysis was carried out on each artefact type.

2.1 Results

Sixty three contexts of archaeological interest were identified. Only the principal archaeological features of Ardsallagh 5 will be discussed within this report; full details of all these, and further, contexts are located in Appendix 1.

2.1.1 Possible structure

The remains of a possible oval-shaped structure (Figure 11) enclosing an area c. 4.00m north–south and almost 2.00m east–west were identified in the southern extent of the site, situated to the north of the kiln F59 and the cobbled area F68. The full extent of this structure was not defined as it extended beyond the eastern limits of excavation. This possible structure was represented by the postholes F65–F67, F36, F70, F48, F49 combined with slot-trench/conjoined postholes F45 (0.75m x 0.34m x 0.28m) and F74 (0.56m x 0.27m x 0.25m). The postholes F65–F67 (Figure 11) and F70 and the conjoined postholes/slot-trench F45/F74 (Figure 11) appeared to define the outer extent of the structure while the postholes F48 and F49 may have held internal posts (Figure 11). The postholes varied in size from F70 (0.23m diameter x 0.18m depth) to F49 (0.67m x 0.46m x 0.30m) while the fills varied little, generally consisting of a dark-brown material with occasional charcoal flecks. Animal bone was recovered from fills F34 (of F36), F62 (of F65), F63 (of F66), F47 (of F49), and F41 (of F45) and cremated bone was recovered from F46 (of F48). Oat (1), barley undifferentiated (9), wheat (3), and Cerealia indeterminate (5) (ASDU, Appendix 8) were also recovered from

the fill (F46) of posthole F48. Barley undifferentiated (1) and Cerealia indeterminate (1) (ASDU, Appendix 8) were recovered from the fill (F47) of posthole F49.

An additional feature, F31 (1.00m x 0.39m x 0.24m), which was similar in shape to F45, was located outside the possible structure to the southwest. This feature may represent the remains of a large posthole or pit and may have been associated with the possible structure. Charred remains were recovered from the fill (F17) of F31 and consisted of wheat (1) and undetermined grains (4) (ASDU, Appendix 8).

2.1.2 Kiln

F59 (the bowl: 1.10m x 0.86m x 0.35m, the flue: 0.60m x 0.34m x 0.10m; Figure 10) represented the remains of a keyhole-shaped drying kiln. Situated in the southwest corner of the site, southwest of the possible structure described above, it was cut into the natural subsoil and was not stone-lined. The upper fill (F55) consisted of a grey/brown clay with oxidised clay and the primary fill (F58) consisted of a layer of ash and charcoal. The charcoal from F58 was identified as hazel, pomaceous fruitwood and cherry (O'Donnell, Appendix 7). A sample of hazel was dated to AD 240–420 (Beta 227863; Appendix 5). Charred remains were recovered from F55 and barley occurred the most frequently (79 in total)-three were hulled and seventy-six were undifferentiated. A small quantity of oat (3 grains) and undetermined grains (25 grains) were also recovered. Wheat seeds and weed seeds were absent (ASDU, Appendix 8).

2.1.3 Pits

Four pits (F26, F29, F30, and F37) were exposed. The full extent of the pit F30 (2.20m x 1.16m x 0.43m; Figures 8 and 9; Plate 2) was not revealed as it extended beyond the eastern boundary of the excavation area. Five fills were identified within this feature (F15, F42, F43, F50, and F51) and they contained slag, charcoal, oxidised clay and charred remains. The slag was recovered from F15 and consisted of one medium and three small irregular pieces of slag (Wallace; Appendix 12) Charcoal from F15 and F43 were identified as hazel (ASDU, Appendix 8; O' Carroll, Appendix 6). The charred remains were also recovered from F43 and consisted of hulled barley (6), barley undifferentiated (2) and unidentified grains (1) (ASDU, Appendix 8). A charcoal sample (from F43) yielded a radiocarbon date of AD 1022-1167 (UB-7051; Appendix 5). The large, oblong-shaped pit F26 (2.60m x 0.85m x 0.25m; Figures 10–11) was filled with a sandy soil that contained fragments of animal bone, slag and semi-vitrified fuel waste (F13) and was located in close proximity to the possible structure described above. The slag consisted of four small-medium sized irregular nodules of iron slag (Wallace; Appendix 12). The oval-shaped pit F29 (0.75m x 0.90m x 0.14m; Figures 8 and 9)

was located southwest of the pit F30 and was sealed by the spread F38. This feature was filled with a brown/black clay that contained inclusions of charcoal flecks, burnt stone, animal bone, and charred remains (F10). Seeds identified included oats (12), hulled barley (28), barley undifferentiated (12), wheat (3), bread wheat (1), unidentified grains (27) and weed seeds included sheep's sorrel (1), goosefoot (5), grass (3), dock (3) and vetch (1) and sedges (3) (ASDU, Appendix 8). The charcoal from F10 was identified as hazel and ash (ASDU, Appendix 8). The possible pit F37 (0.31m x 0.35m x 0.15m; Figure 10) was located southwest of the possible structure. No finds were recovered from this feature.

2.1.4 Spreads/stone surfaces

Two spreads (F38 and F56) and two stone surfaces (F39 and F60) were identified at this site. The first spread, F38 (5.00m x 1.30m x 0.10m) was located in northeast corner of the site and was quite similar to the overlying topsoil. It sealed the pits F30 and F29 and the stone surface F39. This probably represented interface material (F38) and was located below the topsoil. Finds recovered from F38 included an opaque blue glass annular bead (A008/038:38:1; Cropper; Appendix 10), a flint flake (A008/038:38:2; Nelis: Appendix 11), a metal fragment (A008/038:38:3) and five small nodules of iron smithing slag (Wallace; Appendix 12). The thin spread F56 (4.40m x 2m x 0.10m) was located in the southeast corner of the site above the stone surface F60 and was also quite similar to the overlying topsoil.

The stone surface F39 (5m x 1.60m x 0.30m; Figure 9; Plate 1) was contained within the irregular cut F52 (4.70m x 2.60m x 0.20m; Figure 9). Slag, including eleven irregular pieces of smithing slag, a fragment of a rounded smithing hearth cake and ten small irregular shaped pieces of smithing slag (Wallace; Appendix 12), charred remains (3 unidentified grains) (ASDU, Appendix 8) and a single goose bone (Hamilton-Dyer; Appendix 14) were recovered from F39. This, combined with its proximity to the pit F30, suggests that they were associated. The second stone surface, F60 (3.30m x 2m x 0.20m; Figure 12), was contained within the irregular cut F68 (3.10m x 2.20m x 0.20m; Figures 10 and 12) and was located south of the possible structure described above and was likely to represent a cobbled area/walkway. The full extent of this feature was not defined as it extended beyond the excavation area.

2.1.5 Linear features

Eight linear features were identified at this site. Five of these were identified as linear ditches (F20, F32, F21, F28, and F23), two were identified as possible cultivation furrows (F19, F27) and one was an irregular shaped feature the function of which was unknown (F24). The exact function of all of these features is not known as the majority of these features extended

beyond the excavation area and only a portion of them was therefore excavated. The ditch F20 (10.10m x 0.95m x 0.65m; Figures 8 and 10) was aligned northwest–southeast and was located in the northwest corner of the site. It extended beyond the excavation area, where it appeared to turn slightly. A significant quantity of charcoal and animal bone was recovered from the fill (F6). A single seed was also recovered from the fill F6 and was identified as barley undifferentiated (ASDU, Appendix 8). This ditch F20 cut through a smaller east–west linear feature (F32; 4.40m x 1.10m x 0.28m; Figure 8). Animal bone was also recovered from the fill (F9) of F32. The third ditch (F21; 3.88m x 1.60m x 0.46m; Figure 10) was located towards the centre of the site and cut through a smaller linear ditch F28 (2.90m x 0.40m x 0.25m; Figure 10). Slag, which consisted of one small round smithing hearth cake, two small pieces that probably belonged to smithing hearth cakes and approximately twenty small irregular fragments of slag (Wallace; Appendix 12), animal bone (including a single fish vertebra (ASDU, Appendix 8)) and charred remains including oats (4), wheat (2) and undetermined grains (6) (ASDU, Appendix 8) were recovered from the fill (F11) of F21. A cattle bone from F11 was dated to AD 716-744 / 768-971 (Beta 228251; Appendix 5). Small fragments of animal bone were recovered from the fill (F12) of F28. The final linear ditch exposed was F23 (1.60m x 0.98m x 0.39m; Figures 10 and 11; Plate 3). This was located in the southwestern corner of the site. Only a small portion of this feature was exposed as it extended beyond the landtake to the west. It may be possible that this feature was related to the oblong shaped pit F26 as they were of similar size and shape. A complete bone cylinder (A008/038:14:1; Appendix 13) was recovered from the upper fill (F14) of F23. Animal bone was recovered from the upper (F14) and lower (F22) fill. Charcoal and charred remains were recovered from F14. The charcoal was identified as oak (O'Donnell, Appendix 7; ASDU, Appendix 8), hazel and ash (ASDU, Appendix 8) and the charred remains consisted of oats (1), hulled barley (1), barley undifferentiated (11), wheat (4) and unidentified grains (10) (ASDU, Appendix 8).

The two possible cultivation furrows (F19; 2.2m x 0.4m x 0.17m and F27; 2.80m x 0.40m x 0.03m) and the irregular-shaped linear feature (F24; 1.3m x 0.45m x 0.24m) were located in the northeast corner of the site. All three features were located in proximity to each other and were almost on the same alignment so were probably all associated.

2.2 Finds

Only four finds, mentioned above, and a small quantity of slag were recovered from this site. Three of the finds, including the blue glass bead (A008/038:38:1), the flint flake (A008/038:38:2) and a fragment of metal (A008/038:38:3), were recovered from the spread F38. This spread consisted of interface material located below the topsoil and above the pits

F29 and F30 and the stone surface F39. The fourth find, a complete bone cylinder (A008/038:14:1) was recovered from the fill (F14) of F23.

The glass bead (A008/038:38:1) was identified as a cable bead and consisted of an opaque annular bead with an opaque yellow/translucent light green cable and was composed of two separate twisted rods forming a herring bone pattern (L=4.5-6.5mm, D=9mm, PD=4mm; Cropper; Appendix 10). A similar example (no. 239) was recovered from Lough Gur (O Riordain, 1949, 90, Fig. 19) and was dated to approximately the 8th-11th centuries. It is possible the bead from Ardsallagh 5 is of similar date. The flint flake was identified as a complete platform flake which was partially corticated (28mm in length; Nelis; Appendix 11).

The complete bone cylinder was "cut from the lower midshaft of a cattle metatarsus. Separated from the remainder of the bone at both ends with the aid of a knife. Cortile tissue on the medial side of the bone towards the distal end has been perforated, so that the bone is hollowed throughout….Polished throughout on the upper surface" (Trzaska-Nartowski & Riddler; Appendix 13). Objects such as this appear to come from sites of 10th-12th century date, but mainly from contexts dating to the 11th and 12th century (ibid). The function of these objects is not clear but many have been suggested (Hurley 1997, 685) and it is possible that they functioned as large beads, net spaces, devices for twisting/rolling of cordage (Trzaska-Nartowski & Riddler; Appendix 13).

The slag (Wallace; Appendix 12) represented iron smithing slag and was recovered from a variety of contexts including the pits F30 and F26, the linear ditches F23 and F21, the spread F38, and the stone surface F39 in the irregular cut F52 (total of 2.17kg). All of the finds recovered from the site are typical of those associated with an early medieval site.

3 DISCUSSION

3.1 Form and function

As the area excavated at Ardsallagh 5 was long and narrow (c. 40m long by c. 5m wide) and only parts of the majority of features were revealed, discerning the overall form and function of the site is difficult. However, there are a few clusters of activity where an assessment is possible.

3.1.1 Possible structure

The remains of a possible structure were identified within the southeastern portion of this site and were located along the eastern boundary. It would appear that a significant portion of this

structure extended beyond the excavation area and the portion which was inside the landtake was defined by five postholes and a possible slot-trench/conjoined postholes. A further two postholes which may have contained central posts were located within the area defined by the aforementioned five postholes/slot-trench. If these features represent the remains of a structure, then, if contemporary, it is not unlikely that this structure was related to either the cereal-drying activities carried out in the kiln (see below) or to the area potentially related to nearby metalworking (see below). No evidence of a fire was identified. The exposed remains of this feature measured approximately 4m by 2m. The projected measurements for this feature measured approximately 4m by 4m. A small, oval-shaped and rather narrow feature, it would seem unlikely that this possible structure could have functioned as a dwelling place. Perhaps it functioned as a temporary hut or had a specific function related to the kiln; however, its precise purpose remains undetermined. It is not possible without further excavation to determine the exact function of this possible structure. Further evidence may have been destroyed by post-medieval agricultural activities.

3.1.2 Kiln

The remains of a single kiln (F59) were identified. It was a relatively simple drying kiln, cut into the subsoil and it was not stone lined. The full extent of this feature was not defined but it did appear to be keyhole in shape. The remainder of the kiln was located outside the excavation area. The sub-circular bowl had an eastern flue. The burnt clay primary fill would indicate that high temperatures were reached. The fact that it only contained two layers suggests F59 was only used on a few occasions, perhaps even only once. It was aligned east-west and was visible for a length of 1.70m. In their study of kilns (2005), Monk and Kelleher have discovered that keyhole shaped kilns ranged in length from 1.3m-8m with the majority measuring 1.2-4m in length. It was also noted, by Monk and Kelleher, that kilns in general were aligned northsouth or eastwest. The kiln at Ardsallagh 5, therefore proved to be typical in size and alignment.

Drying kilns were commonly used to dry cereals, such as corn, which was an important part of cereal processing (O Keefe 2000, 66), especially in the relatively wet climate of Ireland (Monk 1981, 216). Kilns were also essential to harden the grains to allow for effective milling (Monk 1991, 217). It was suggested in the *Crith Gabhlach* that a prosperous farmer (*boaire*) was expected to own a drying kiln while lower down the scale (*ocaire*) was only expected to have a share in a kiln. The author of *Triad 140* also states that the ability to dry grain was taught to the male offspring of farmers of *boaire* and *ocaire* rank (Kelly 1998). Textual evidence suggests that a typical early historic farm would have consisted of a farmhouse, a

barn and a drying kiln and various enclosures which would have been used for occupation, grazing and cultivation (Johnston 2001).

A significant quantity of charred remains (ASDU; Appendix 8), were recovered from the upper fill (F55) of this feature. The volume of grains from this feature was by far, the greatest amount recovered from any one feature within the site. The grains recovered consisted of barley (79 in total), which occurred the most frequently - three were hulled and seventy-six were undifferentiated, a small quantity of oat grains (3) and unidentified grains (25). Wheat and weed seeds were absent which would support the theory that this feature was used for grain drying/storage (ASDU, Appendix 8). A sample of charcoal (from F58-primary fill) was also analysed and three species were identified-pomaceous fruitwood, hazel and cherry (O'Donnell; Appendix 7). O' Donnell has noted that it is not unusual to identify a variety of species within a kiln as fuel selection is not as specific as it is for other activities such as smelting or cremating (Appendix 7). This charcoal was dated to Cal 246-420 (Beta 227863) which places this kiln in the late Iron Age.

The date recovered from this kiln is not one that is typically associated with keyhole shaped kilns. Monk and Kelleher have attempted to form a preliminary chronological framework with regard to kilns based on typology and form. They have suggested that figure-of-eight shaped kilns and dumbbell shaped kilns date to the early medieval period followed by keyhole shaped kilns with are associated with the high middle ages (2005). Based on recent excavations and the increased volume of radiocarbon determinations available Kinsella (2007; Appendix 14) has tried to refine their study and has suggested that figure-of eight shaped kilns are dated from AD 400-700, oval and sub-oval shaped kilns are dated from the mid-late Iron Age to the 7th century and keyhole shaped kilns are dated form AD 800-900 to the late medieval period. The kiln at Ardsallagh 5 is significantly earlier than any of the previously identified keyhole shaped kilns, as analysed by both Monk and Kelleher and Kinsella. As mentioned previously, the date recovered from this kiln at Ardsallagh 5 places it in the late Iron Age, a date which has been associated with the oval / sub-oval shaped kilns. This would suggest that some keyhole shape kilns predated the introduction of the figure-of-eight shaped/dumbbell kilns. A second, simple earth cut kiln which also appeared to be keyhole in shape was excavated by the author at Colp West (Murphy & Clarke 2001a). A radiocarbon date obtained from this feature also placed it within the Iron Age-AD 256-492. The analysis of kilns is still in its infancy and it is likely that the above preliminary chronological framework will be altered once the entire assemblage of kilns (at least ninety) along this proposed motorway scheme have been analysed and dated

Keyhole-shaped kilns are a common feature found within the Irish landscape and are predominantly located on early medieval sites. These simple, earth-cut features are similar in form and function to figure-of-eight shaped kilns and have more recently become a common feature identified on major road projects and large developments. The majority of kilns identified along the proposed M3 were figure-of-eight in shape. Keyhole kilns were however identified at Dunboyne 4 (A017/002), Johnstown 2 (A017/020), Castlekeeran 1 (A030/016), Berrilstown 1 (A008/009) and Roestown 2 (A008/002). Keyhole-shaped kilns have also been identified at, among others, Colp West (Murphy & Clarke 2001a), Solsborough Co. Tipperary (Murphy & Clarke 2001b), Derrinsallagh 2 and 3 Co. Laois (Kenny 2007), and Corbally Co. Kildare (Tobin 2001; 2002; 2003).

In general kilns would appear to be constructed some distance away from settlement activity and are usually located outside enclosures. This has been evident on large sites and in particular at Colp West (Murphy & Clarke 2001a), at Johnstown (Clarke & Carlin 2008) and at Corbally, Co. Kildare where geophysics revealed a large sub-rectangular enclosure which was located northwest of a kiln complex (Tobin 2001; 2002; 2003). This may have been a precautionary measure taken in order to combat the spread of fire. It is possible therefore that the kiln at Ardsallagh 5 was an outlying feature associated with a settlement site nearby.

3.1.3 Spreads

Two of the spreads identified represented inter-phase material. The most significant spread revealed at Ardsallagh 5 was F68 which consisted of a cobbled area that was irregular in shape and may possibly have represented a walkway/surface. However, it extended outside the proposed landtake and its association with any nearby, definite structure remains unknown.

3.1.4 Linear features

The exact function of the linear features within this site remains unknown. Only a portion of each linear feature was exposed during the course of this excavation and interpretation was therefore not possible. It is likely that the narrow, shallow linear features in the northeast corner of the cutting represent the remains of cultivation furrows.

3.1.5 Metalworking activity

Some of the features at Ardsallagh 5 would indicate that metalworking was being carried out in the vicinity. Slag (Wallace; Appendix 12) was recovered from the ditch F21 (fill F11-one small round smithing hearth cake and two small pieces that were probably part of a small smithing hearth/cakes), the pit F26 (fill F13-four small irregular nodules of iron slag), the stone surface F39 (eleven irregular pieces of smithing slag, a fragment of a rounded smithing

hearth cake and ten small irregular shaped pieces of smithing slag), the spread F38 (five small nodules of iron smithing slag), the large pit F30 (fill F15-one medium sized and three small irregular piece of slag), and from the nearby irregular cut F52 (fill F73-one small roughly oval shaped smithing hearth cake) which may have overlain, or been associated with the aforementioned large pit F30. It is likely that the identified pit features that contained slag represented refuse pits containing waste products produced during/as a result of the metalworking process than to form any part of the actual metalworking process. A total of 2.17kg of iron smithing slag was recovered and the volume recovered would suggest that it was related to repair as opposed to manufacture.

3.1.6 Environmental analysis

The metallic waste, charcoal, semi-vitrified material, fragments of animal bone, cremated bone, and the charred seeds recovered from a variety of contexts within this site would indicate fuel waste from domestic or small scale industrial activity (ASDU, Appendix 8).

Detailed analysis of a selection of the charcoal recovered also allows us to formulate a picture of the surrounding landscape. Species identified included hazel, pomaceous fruitwood type (crab apple, wild pear, rowan/whitebeam and hawthorn), wild/bird cherry and oak (O' Carroll; Appendix 6; O' Donnell; Appendix 7). Hazel was recovered from the pit F30, hazel, pomaceous fruitwood and cherry were recovered from the kiln F59 and oak was recovered from the ditch F23.

The environmental conditions favoured by each of the above species, (O' Donnell; Appendix 7) is particularly important with regard to providing us with an insight into the surrounding landscape. Hazel will grow as a tree or shrub and is indicative of a dry terrain (but will tolerate flooding) and it is possible that it was grown in a coppiced wood or in association with an oak forest. Wild cherry needs light to grow and is found on or near woodland margins and bird cherry occurs in marginal forests. Oak favours acid soils, often in hilly regions (*Quercus petraea*) or heavy lowland soils (*Quercus robur*). All of these species would suggest a mixed environment which would have consisted of large canopy trees (oak) and smaller shrub trees (cherry) which preferred to grow in a more open environment (ibid). No wetland species (e.g. willow and alder) were identified in any of the charcoal samples analysed.

Analysis of the charred remains is also important with regard to the surrounding environment (ASDU; Appendix 8). Barley, oat, wheat and a significant quantity of unidentified grains were recovered from a variety of contexts and would suggest that all three cereals grew and

were probably harvested in the vicinity of Ardsallagh 5. Barley was by far, the most predominant, followed by oat and wheat which occurred in much smaller quantities. The majority of barley grains present were undifferentiated, although a small proportion of hulled varieties were identified. It was not possible to identify the particular variety of wheat due to the absence of chaff, although grains from one pit (F29) would suggest bread wheat. The cereal pattern noted on this site is typical of the general pattern noted in early medieval Ireland (ASDU; Appendix 8)-barley following by oats (Monk 1991). A high occurrence of weed seeds (docks, grass, vetch, goosefoot, sheep's sorrel) and sedges were also identified (ASDU: Appendix 8). This may suggest the presence of some crop processing debris on Ardsallagh 5 and may suggest that cultivation and crop processing occurred locally (ibid).

3.1.7 Faunal remains

All of the faunal remains from this site were analysed in order to identify each fragment to species and to identify evidence for butchery and pathology (Sloane; Appendix 9). The main species identified at this site were cattle, sheep/goat and pig. It is not always possible to distinguish between goat/sheep when examining the faunal remains but three positive examples of sheep were identified amongst the Ardsallagh 5 assemblage. Two specimens of dog and a single specimen of cat and horse were also identified. Evidence of butchery was noted on two samples-a small chopmark was noted on a cattle scapula and a chopmark was noted on a bovid/equid/cervid vertebral fragment (non-countable specimen - low grade material). A single pathology was also identified. Traces of eburnation was identified on a cattle bone fragment and was indicative of degenerative joint disease (Roberts and Manchester 1995, 105). Finally a developmental defect was noted on a bone mandibular cattle incisor. A single bird bone fragment was also recovered (from the fill F39 of irregular cut feature F52) and consisted of a right humerus from a white fronted goose, a winter visitor (Hamilton-Dyer; Appendix 14).

3.2 Date and sequence

The small size of this site and the fact that only a portion of each feature was exposed made it difficult to determine the date and sequence of activity but initial interpretations suggested contemporaneity with the early foundations of the nearby Cannistown church. The features exposed were indicative of nearby early medieval settlement activity and it was presumed that all of these features were more or less contemporary. Three radiocarbon dates were recovered from three separate features which showed that this site, even given its small scale, was in use over a considerable period and was in use prior to the earliest foundations of Cannistown church. Activity at Ardsallagh 5 commenced towards the end of the Iron Age, continued through the early medieval period and possibly extended into the medieval period.

It is difficult to establish an overall sequence of events at this site as the majority of features were not stratigraphically related but existed as independent, simple, earth-cut features. As shown by the radiocarbon dates recovered, the features located in proximity to each other were not necessarily contemporary. It seems that the earliest phase of activity on site was represented by the keyhole-shaped, drying kiln which was constructed towards the end of the Iron Age. This feature was located in the southwest corner of the cutting and was dated to AD 246-420 (Beta 227863; Appendix 5). It is generally perceived that keyhole-shaped kilns are late medieval in date (Monk & Kelleher 2005). Based on the examination of recent radiocarbon dates this perception has been revised and it would seem that keyhole-shaped kilns date from the eighth century to the late medieval period (Jonathan Kinsella, pers. comm.). The kiln at Ardsallagh 5 would appear to be one of these exceptions as the radiocarbon date places it significantly earlier than the generally accepted timeframe.

The construction of the kiln (AD 246–420) and its subsequent use may have occurred during the same period in which a ringditch was in use at the nearby site of Ardsallagh 1 (A008/034, 590m southeast of Ardsallgh 5). The earliest evidence for this ringditch dates it to AD 28–230 and it was re-used by AD 382–560 (Clarke 2008). Burials were also inserted at Ardsallagh 1 during this period. Burial 4 which was located outside the ringditch was dated to AD 343–542 (ibid). The proximity of the two sites and the close dating associations may indicate that they were related or that they were used by the same peoples.

The next phase of activity at Ardsallagh 5 was represented by the ditch F21 which was dated to the early medieval period. This feature was radiocarbon dated to AD 716-744 / 768-971 (Beta 228251; Appendix 5). The function of this feature is unknown as it extended beyond the limits of excavation and its relationship with the other features exposed on site could not be ascertained. It may have formed some sort of enclosing element as it curves slightly to the northwest. It post-dated some of the smaller linear features (F32 and F27 – possible cultivation furrows) as it cut through them. The glass bead (A008/038:38:1) was similar to one recovered (no. 239) from Lough Gur (O Riordain, 1949, 90, Fig. 19) which was dated to approximately the 8th-11th centuries. This glass bead was broadly contemporary with the date recovered from the ditch mentioned above.

The final known phase of activity was represented by a large pit (F30) which may have been associated with metalworking activities. Various layers of charcoal and burning and a quantity of slag were recovered from this feature which was dated to the early medieval period/medieval period (AD 1022-1167; UB-7051; Appendix 5). The spread F38 sealed this

pit and therefore could only have been created when pit F30 was decommissioned. The irregular-shaped cut (F52) was also sealed by F38 and was located immediately adjacent to/partially cut F30 and may also be contemporary with F30. A single artefact was recovered from this site which was broadly contemporary with this date-the complete bone cylinder recovered from fill (F14) of the ditch F23. It has been suggested by Trzaska-Nartowski and Riddler (Appendix 13) that bone cylinders come from sites dated from the 10th-13th century but mainly from contexts dated from the 11th-12th century (Appendix 13).

The remains of a small structure were located in the southeast corner of the site. The full extent of this feature was not exposed but it had projected dimensions of 4m by 4m. No dateable finds were recovered from this feature and no radiocarbon date was obtained.

4 CONCLUSIONS

Ardsallagh 5, (A008/038), was excavated from 08 December 2005 to 19 January 2006 by Linda Clarke (ACS) as part of the M3 Clonee–North of Kells Motorway Scheme on behalf of Meath County Council NRDO and the NRA. This site was defined to the west by a ditch and hedge-line and to the east by the edge of the roadtake. Consequently, expansion of the narrow trench was impossible, thus hindering further assessment or expansion of the site as the majority of features identified continued beyond the landtake. Artefacts from the site were few and consisted of slag, a blue glass bead, a bone cylinder and a piece of flint. Radiocarbon dates recovered from this site confirmed that this site, despite its relatively small size, was in use for a considerable period, although it is unlikely that this use was continuous. The earliest date recovered was from the kiln (AD 240–420), followed by the linear ditch (AD 720–740 / 770–790) and the final phase of activity was represented by a pit (AD 994–1155).

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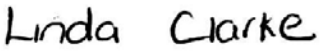

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Linda Clarke

February 2009

APPENDIX 1 Context Data

Ardsallagh 5: A008/038											
No	**Type**	**Fill of/ Filled with**	**Strat above**	**Strat below**	**Description**	**Interpretation**	**Group**	**Artefacts**	**Animal bone**	**Cremated bone**	**Samples**
1-3					used previously during Topsoil Assessment						
4	topsoil	N/A	5	N/A	Topsoil – dark brown loam 0.30-0.45m in depth	topsoil			yes		
5	subsoil	N/A	N/A	4	pale, orange-brown, silty clay with gravel patches	subsoil					
6	fill	20	20	4	tightly compact, light-dark-grey soil with occasional root activity and moderate stones. 10m x 1.01m x 0.16m	fill of ditch 20			yes		#7- #10 soil
7	fill	19	19	4	moderately loose, mottled-brownish-dark-grey, silty soil with 2% angular to sub-angular stones. 2.13m x 0.52m x 0.17	fill of cultivation furrow 19					
8	fill	27	27	32	moderately loose, light-brownish-grey, silty soil with occasional angular to sub-angular stones. 3.80m x 0.57m x 0.03m	fill of possible plough furrow 27					
9	fill	32	32, 27	4, 20	very loose, light-grey, silty soil with 2% medium angular stones. 0.51m width x 0.28m depth. Cut by 20 and cut 27	fill of linear ditch 32			yes		#32 soil
10	fill	29	29	38	loose, light-brownish-black soil with occasional charcoal flecks and 5% of small, burned stones. 0.60m x 0.49m x 0.16m depth	fill of pit 29			yes		#23, #24, #26, #27 soil

11	fill	21	21, 28	4	loose, mottled-brownish-black-dark-grey clay with occasional charcoal flecks and frequent sub-rounded stones. 3.75m x 1.40m x 0.45m. Cuts 28	fill of ditch 21			yes		#1 charcoal, #13- #16 soil, #69 slag
12	fill	28	28	21	moderately loose, dark-greyish-black clay with occasional charcoal flecks and 3% of medium angular to sub-angular stones. 2.24m x 0.14m x 0.17m	fill of ditch 28			yes		
13	fill	26	26	4	moderately loose, light-brown-dark-grey, sandy soil with occasional charcoal flecks. 2.48m x 0.83m x 0.20m	fill of oblong shaped pit 26			yes		#17- #21 soil, #70 slag
14	fill	23	22	4	loose, light-brown-dark-grey, sandy clay with occasional charcoal flecks and 8% of medium angular to sub-angular stones. 1.61m x 0.98m x 0.20m	upper fill of ditch 23		bone	yes		#2- #6 soil
15	fill	30	42	52	brown soil with occasional charcoal flecks and frequent medium angular stones. 2.14m x 1.10m x 0.43m	fill of pit 30					#25, #28, #29, #34, #35 soil, #71 slag
16	fill	N/A	5	4	same as topsoil						
17	fill	31	31	4	moderately loose, dark-brownish-grey, silty soil with occasional charcoal flecks, 2% burnt stone and 20% medium stones. 0.70m x 0.43m x 0.15m	fill of conjoined posthole 31			yes		#30, #31 soil
18	fill	24	24	4	moderately loose, dark-grey soil with occasional charcoal flecks. 1.22m x 0.40m x 0.20m	fill of irregular shaped linear feature 24					

19	cut	7	5	7	oval, north-south cut (2.20m x 0.40m x 0.17m) with a sharp-imperceptible break of slope, gentle-moderately sloping sides and an imperceptible break of slope leading to an uneven base	cultivation furrow					
20	cut	06	32	6	linear, north-south cut (10.10m x 0.95m x 0.65m) with steeply sloping sides leading to a concave base	ditch					
21	cut	11	28	11	linear, east-west cut (3.88m x 1.60m x 0.46m) with a sharp break of slope, steep sides and a gradual break of slope leading to a flat base. Cuts 28	early medieval ditch					
22	fill	23	23	14	moderately compact, mid-brown, silty clay with occasional charcoal flecks and small stones. 1.60m x 0.70m x 0.14m	fill of possible ditch 23			yes		#11, #12 soil
23	cut	14, 22	5	22	linear, east-west cut (1.60m x 0.98m x 0.39m) with a sharp break of slope, steep sides and a gradual break of slope leading to a flat and slightly sloping base	possible ditch					
24	cut	18	5	18	oval, north-south cut (1.30m x 0.45m x 0.24m) with a sharp-gentle break of slope, gentle-sharp sides leading to an irregular base	Irregular-shaped linear feature, function unclear					
25	NOT ASSIGNED										
26	cut	13	5	13	linear, north-south cut (2.60m x 0.85m x 0.25m) with a sharp-gradual break of slope, steep-gently sloping sides and a gradual break of slope leading to a flat base	Oblong-shaped pit					

27	cut	8	5	8, 32	linear, northeast-southwest cut (2.80m x 0.40m x 0.03m) with a flat base. Cut by ditch 32	possible plough furrow					
28	cut	12	5	12, 21	linear, north-south cut (2.90m x 0.40m x 0.25m) with a sharp-gradual break of slope, steep sides and a gradual-sharp break of slope leading to a flat base. Cut by ditch 21	linear ditch					
29	cut	10	5	10, 38	oval cut (0.75m x 0.90m x 0.14m) with a gradual break of slope, gently sloping sides and an uneven base. Sealed by 38	pit					
30	cut	15, 42, 43, 50, 51	5	51	sub-oval, north-south cut (2.20m x 1.16m x 0.43m) with a sharp break of slope, steep-vertical sides and a sharp break of slope leading to a flat base. Partially cut by feature 52 and sealed by 38 and 39	pit, possibly associated with metalworking, Early Medieval					
31	cut	17	5	17	oval, NNE-SSW cut (1.01m x 0.39m x 0.24m) with a gradual break of slope, steep sides and a sharp-gradual break of slope leading to a concave base	conjoined posthole, possibly part of a structure	S1				
32	cut	9	27	9, 20	linear, northwest-southeast cut (4.10m x 1.10m x 0.28m) with a sharp break of slope, steep sides and a gradual break of slope leading to a flat base. Cut by 20 and cuts 27	linear ditch					
33	NON-ARCHEOLOGICAL										
34	fill	36	36	4	moderately loose, dark-brown, silty clay with occasional charcoal flecks and small stones. 0.40m x 0.30m x 0.33m	fill of posthole	S1		yes		
35	fill	37	37	4	moderately loose, dark-brownish-black soil with 3% charcoal flecks. 0.40m x 0.30m x 0.15m	fill of pit 37					#36 soil

36	cut	34	5	34	sub-circular cut (0.40m x 0.30m x 0.33m) with a sharp break of slope, vertical-steep sides and a flat base	posthole, part of a possible structure	S1				
37	cut	35	5	35	oval cut (0.35m diameter x 0.15m depth) with a sharp break of slope, vertical-steep sides and a flat base	pit					
38	spread	15, 39, 42, 43, 50, 51	39, 10	4	brown soil with stones, inter-phase material below the topsoil. Sealed pit 30 and irregular cut 52. 5.00m x 1.30m x 0.10m	spread		glass, flint, metal, slag	yes		#72 slag
39	fill	52	52, 30	38	greyish-brown clay with frequent stones. 5.00m x 1.60m x 0.85m. Partially overlay pit 30	mettled/stone surface, fill of irregular cut 52			yes		#54- #59 soil, #73 slag
40	NON-ARCHEOLOGICAL										
41	fill	45	45	4	loose, dark-greyish-brown soil with 15% of stones and occasional charcoal flecks. 0.83m x 0.37m x 0.20m	fill of conjoined posthole 45			yes		#37, #42 soil
42	fill	30	43	15	loose, dark-greyish-brown clay with 60% medium rocks and angular stones and occasional charcoal flecks. 0.80m width x 0.29m depth. Stone layer	fill of pit 30			yes		
43	fill	30	50	42	charcoal fill with oxidised clay. 2.20m x 1.16m x 0.08m	fill of pit 30			yes	yes	#38, #39, #43 soil, #44 charcoal
44	NON-ARCHEOLOGICAL										
45	cut	41	5	41	oval/kidney-shaped, northwest-southeast cut (0.75m x 0.34m x 0.28m) with a sharp-gradual break of slope, steep sides and a flat base	conjoined posthole/ possible slot-trench -with 74, forms part of possible structure	S1				

46	fill	48	48, 53	4	loose, dark-brown soil with 10% angular to sub-angular stones and occasional charcoal flecks. 1.12m x 0.68 x 0.43m	fill of posthole 48				yes	#40, #41, #47 soil
47	fill	49	49	4	loose, dark-brownish-black soil with occasional angular to sub-angular stones and charcoal flecks. 0.57m x 0.35m x 0.33m	fill of posthole 49, associated with cut 48			yes		#45, #46, #48 soil
48	cut	46, 53	5	46, 53	irregular cut (1.12m x 0.69m x 0.43m) with a sharp break of slope, steep sides and a flat base	conjoined posthole, part of a possible house structure	S1				
49	cut	47	5	47	sub-rectangular, west-east cut (0.67m x 0.46m x 0.30m) with a sharp break of slope, vertical sides and a sharp break of slope leading to a flat base	posthole, part of possible house structure	S1				
50	fill	30	51	43	oxidised clay 0.60m x 0.64m x 0.05m	oxidised fill of pit 30					#49 soil
51	fill	30	30	50	soft, mid-brown clay with frequent charcoal flecks. 2.00m x 1.00m x 0.07m. Cut by fill 39	lower fill of pit 30			yes		#50, #51 soil
52	cut	39, 61, 73	30	73	irregular cut (4.70 x 2.60m x 0.20m) with a gradual break of slope and gradual sides leading to a flat base. Cuts pit 30	stone surface, possibly associated with pit 30					
53	fill	48	48	46	compact, grey stones with clay inclusions. 0.35m length x 0.31m width	fill of posthole 48, possibly natural					
54	NON-ARCHEOLOGICAL										
55	fill	59	58	4	light-greyish-brown, silty clay with charcoal flecks and frequent stones (0.06m x 0.05m x 0.03m - 0.14m x 0.10m x 0.05m) and oxidised clay. 1.05m length x 0.20m depth	upper fill of cereal-drying kiln 59			yes		#52, #53, #63, #64 soil

56	fill	60	60	4	mid-dark-brown clay. 4.40m x 2.00m x 0.10m. Extended beneath western baulk and full extent not defined. Similar to topsoil 4	spread over mettled surface 60, fill of cut 68			yes		#60, #61 soil
57	fill	71	71	4	loose, greyish-brown soil with occasional charcoal flecks. 0.20m x 0.23m x 0.20m	fill of posthole 71					#68 soil
58	fill	59	59	55	burnt clay with ash and charcoal flecks. 0.80m x 0.71m x 0.11m. Located in the base of the bowl part of the kiln	primary fill of kiln 59					#62, #65, #67 soil
59	cut	55, 58	5	58	east-west cut (the bowl: 1.10m x 0.86m x 0.35m; the flue: 0.60m x 0.34m x 0.10m) with a sharp break of slope, concave sides and a concave base	Iron Age cereal-drying kiln					
60	fill	56	68	56	stony fill with angular stones (0.02m- 0.12m). 3.30m length x 2.00 width. Full extent not defined	stone surface/metalled surface, possible pathway, fill of cut 68					
61	fill	52	73	39	layer of sub-angular stones (0.05m-0.10m). 1.40m x 0.75m x 0.24m	fill of cut 52, possible dump of stones					
62	fill	65	65	4	loose, dark-greyish-brown clay with 5% small stones. 0.23m width x 0.14m depth	fill of posthole 65			yes		
63	fill	66	66	4	loose, dark-brown clay with 1% charcoal flecks. 0.25m x 0.16m x 0.25m	fill of posthole 66			yes		
64	fill	67	67	4	loose, dark-brown clay with occasional charcoal flecks. 0.28m x 0.24m x 0.24m	fill of posthole 67					
65	cut	62	5	62	circular cut (0.24m diameter x 0.21m depth) with a sharp break of slope, steep sides and flat base	posthole, possible part of house structure	S1				

66	cut	63	5	63	oval cut (0.24m x 0.17m x 0.23m) with a sharp break of slope, steep sides and relatively flat base	posthole, possible part of house structure	S1				
67	cut	64	5	64	oval cut (0.28m x 0.24m x 0.24m) with a sharp break of slope, steep sides and a flat base	posthole, possible part of house structure	S1				
68	cut	56, 60	5	60	irregular cut (3.10m x 2.20m x 0.20m) with a gentle break of slope, gently sloping sides and an uneven base	irregular shaped cut that contained rough stone walkway/metalled surface					
69	fill	70	70	4	loose, grey-brown clay with 3% small stones and occasional charcoal flecks. 0.23m x 0.18m	fill of posthole 70					#66 soil
70	cut	69	5	69	circular cut (0.23m diameter x 0.18m depth) with a sharp break of slope, gradual-steep sides and a concave base	posthole, possible part of house structure	S1				
71	cut	57	5	57	circular cut (0.24m diameter x 0.25m depth) with a sharp break of slope and steep-vertical sides leading to a flat base	isolated posthole					
72	fill	74	74	4	mid-brown clay with very occasional flecks of charcoal, moderate large stones and small, angular stones. 0.59m x 0.30m	fill of posthole 74					
73	fill	52	52	61	orangey-yellow soil. 4.70 length x 0.05m depth. Similar to subsoil	fill of cut 52			yes		#74 slag
74	cut	72	5	72	oval cut (0.59 x 0.27m x 0.25m) with a sharp break of slope and steeply sloping sides.	posthole-may form part of slot trench with 45, possible part of house structure	S1				

APPENDIX 2 Finds List

Find Number	Description
A008/038:14:1	bone cylinder (See Appendix 13)
A008/038:38:1	blue glass bead with decoration
A008/038:38:2	flint debitage
A008/038:38:3	metal fragment

APPENDIX 3 Sample List

Sample No	Context No	Description
1	11	5g charcoal
2-6	14	2g charcoal and some seeds
7	06	Seeds, cremated bone fragments
8	06	Nothing visible in residue
9	06	I tiny fragment of bone
10	06	467g charcoal
11	22	491g charcoal
12	22	Small amount of charcoal/bone in residue
13	11	Organic remains and charcoal flecks in flot
14	11	Nothing visible in residue
15	11	Organic remains and charcoal flecks in flot
16	11	Organic remains, charcoal flecks, tiny fragments of cremated bone and some seeds in flot
17	13	Organic remains in flot
18	13	Organic remains in flot
19	13	Organic remains, tiny fragments of cremated bone and seeds in flot
20	13	Nothing visible in residue
21	13	Nothing visible in residue
22	08	Nothing visible in residue
23	10	Nothing visible in residue
24	10	Seeds, charcoal, cremated bone and organic remains in flot
25	15	18g charcoal
26	10	Seeds, charcoal, tiny cremated bone fragments and organic remains in flot
27	10	< 1g charcoal, organic remains and seeds in flot
28	15	Nothing visible in residue
29	15	Some tiny bone fragments in residue
30	17	Some organic remains
31	17	Organic remains in flot
32	09	Nothing visible in residue
33	15	3g charcoal
34	15	Charcoal flecks, seeds in flot, cremated bone in residue
35	15	Seeds, charcoal, tiny fragments of cremated bone and organic remains in flot
36	35	Some organic remains
37	41	Nothing visible in residue
38	43	11g charcoal, residue contains cremated bone, seeds and tooth fragments
39	43	11g charcoal
40	46	Cremated bone fragments in residue, seeds and charcoal in flot
41	46	Organic remains in flot
42	41	Organic remains in flot
43	43	3g charcoal
44	43	15g charcoal

45	47	Organic remains in flot
46	47	Nothing visible in residue
47	46	Seeds, tiny fragments of cremated bone
48	47	Some organic remains, cremated bone and seeds in flot
49	50	Some organic remains and flecks of charcoal
50	51	3g charcoal
51	51	2g charcoal
52	55	Organic remains, seeds and charcoal flecks in flot
53	55	Organic remains, cremated bone and seeds in flot
54	39	<1g charcoal
55	39	Organic remains, tiny fragments of cremated bone and some seeds in flot
56	39	Organic remains and some charcoal in flot
57-59	39	Nothing visible in residue, organic remains and seeds in flot
60	56	Some cremated bone fragments in residue
61	56	Nothing visible in residue/organic remains in flot
62, 65, 67	58	Organic remains, seeds and some charcoal in flot
63	55	cremated bone and some seeds in flot
64	55	Organic remains and seeds in flot
66	69	Some organic remains in flot
68	57	Organic remains in flot
69	11	Slag
70	13	Slag
71	15	Slag
72	38	Slag
73	39	Slag
74	73	Slag
75	43	Cremated bone
76	46	Cremated bone

APPENDIX 4 Topsoil Assessment

PROJECT DETAILS

Project	Metal Detection: M3 Clonee to North of Kells, Contract 2
Archaeologists	Maria Lear & Stuart Rathbone
Project Start	13 June 2005
Report Date	June 2005

List of Figures

1. INTRODUCTION

The proposals for archaeological resolution included an assessment of the potential for finds retrieval from topsoil at archaeological sites. This assessment was achieved by a program of metal detecting at ploughed and pasture fields. As per the *Method Statement for Topsoil Assessment Including Metal Detection*, metal detection of the topsoil began within Contract 2 on June 13, 2005. This report details the results of the two phases of metal detection, the field walking survey and the test pit phase of Ardsallagh 5.

2. ARCHAEOLOGICAL ASSESSMENT

2.1 Metal Detection Methodology

1. A grid was established as follows – a baseline was marked on one side of each site along the long axis. Perpendicular offset lines were marked at 10m intervals along the baseline to form stints and these were subdivided along the offset line to form parallel transects 2m wide.
2. The metal detection commenced at one end of the baseline and provided for a 2m 'sweep' along each transect, thus providing for 100% coverage of topsoil deposits at each site.
3. The location of all metal 'hits' were marked on the ground with tags.
4. All metal 'hits' in the sod or topsoil were tested by careful hand excavation of the sod/topsoil. Stratified artifacts were left *in situ*.
5. All artifacts were bagged and numbered citing DOE record number, context and individual number. Their location was also be recorded.

2.2 Field Walking Survey Methodology

1. A grid was established as follows – a baseline was marked on one side of each site along the long axis. Perpendicular offset lines were marked at 10m intervals along the baseline to form stints and these were subdivided along the offset line to form parallel transects 4m wide.
2. Each transect was assigned a letter and each stint a number so that each stint would have a unique reference.
3. The field walking took place along each transect and provided for 2m coverage (i.e.: 1m either side of the walker's path), thus providing 50% coverage of the site.
4. The location of all artefacts were marked on the ground with tags.
5. All artifacts were bagged and numbered citing DOE record number, context and individual number. Their location was also be recorded.

2.3 Test Pit Methodology

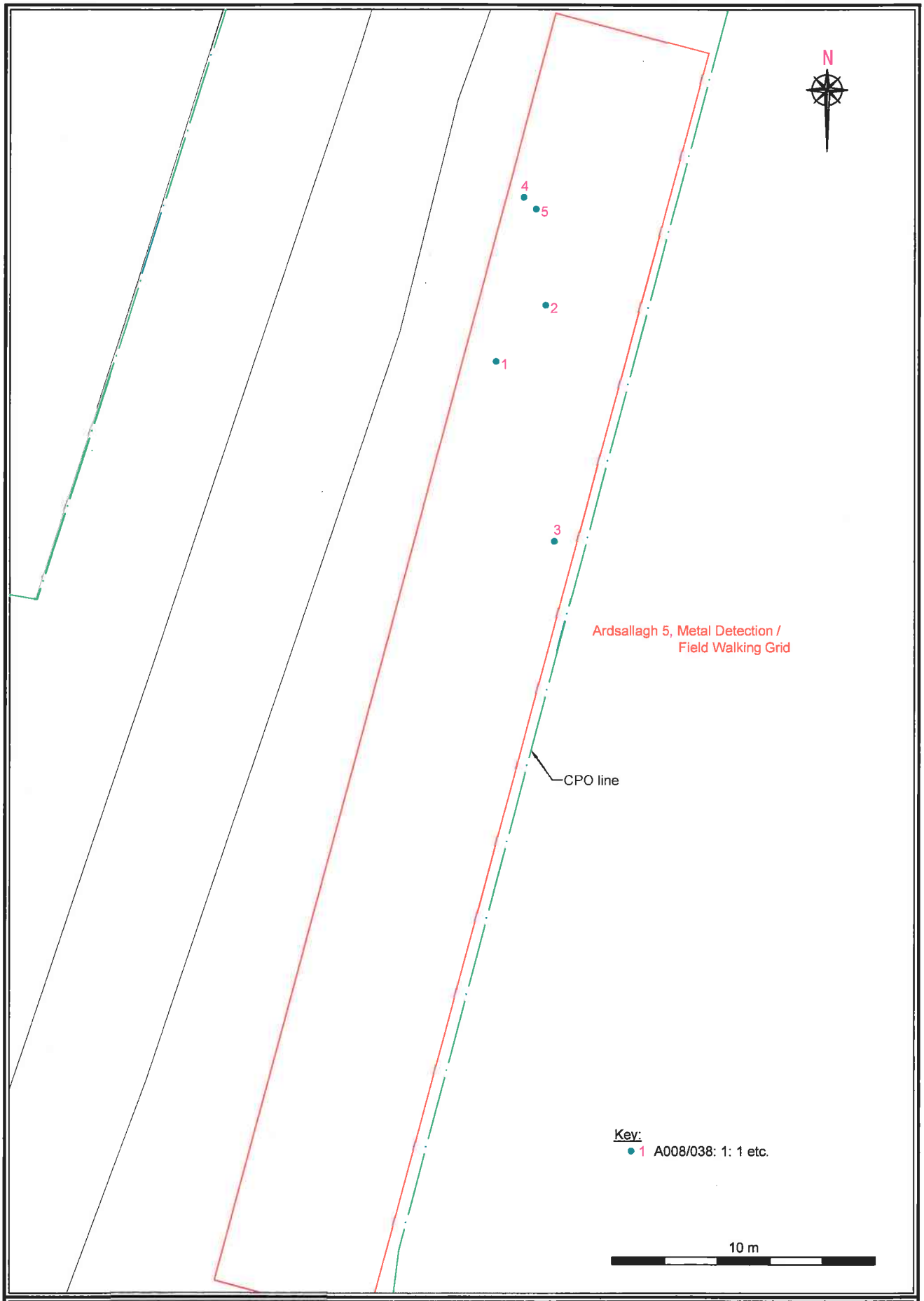
When deemed necessary, a number of pre-designated test pits were dug at various locations within the site. The test pits measured $1m^2$ and their precise position was surveyed. Each test pit was dug by hand to the depth of subsoil with the resulting loose topsoil sifted on site for the recovery of finds. All finds were bagged and numbered citing DOE record number, context and individual number. There location was recorded with reference to the specific test pit from where it was collected.

2.4 Results

The first phase of metal detection dealt with the sod layer only and finds recovered were labelled as being from context 1. Initial metal detection of the Ardsallagh 5 site produced a small number of 'hits' with a total of 5 'hits' recorded with 5 finds recovered. The second phase of metal detection was completed after the sod was removed and dealt with the topsoil layer only. These topsoil finds were recorded under context number 2. This second phase also produced a small number of 'hits' with a total of 7 'hits' recorded and 7 finds recovered. Field walking of Ardsallagh 5 produced the collection of an additional 5 modern finds. All of the finds recovered were of modern date and consisted of items associated with a modern timeframe (nails, nuts/bolts, a hinge and modern pottery, etc…). A total of 5 test pits were completed within the site with no additional finds collected.

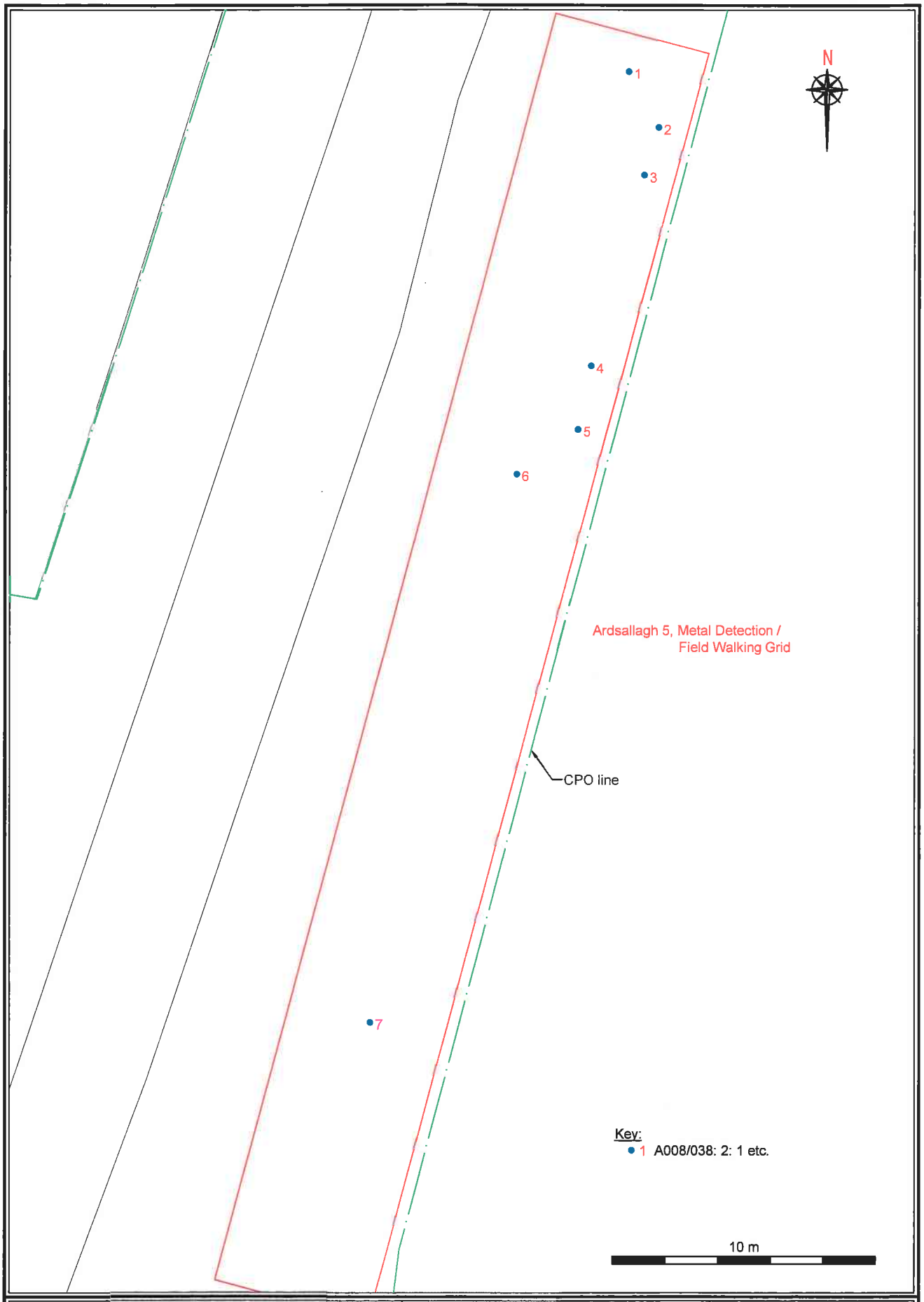
2.5 List of Finds

Find Number	Description
A008/038:1:1-2	Chain links
A008/038:1:3-4	Machine parts
A008/038:1:5	Modern iron object
A008/038:2:1	Metal bar
A008/038:2:2	Nail
A008/038:2:3	Iron bar
A008/038:2:4	Modern iron pin
A008/038:2:5	Wire
A008/038:2:6-7	2 Modern iron objects
A008/038:2:8	Modern pottery
A008/038:2:9	Glass
A008/038:2:10-12	3 sherds of modern pottery



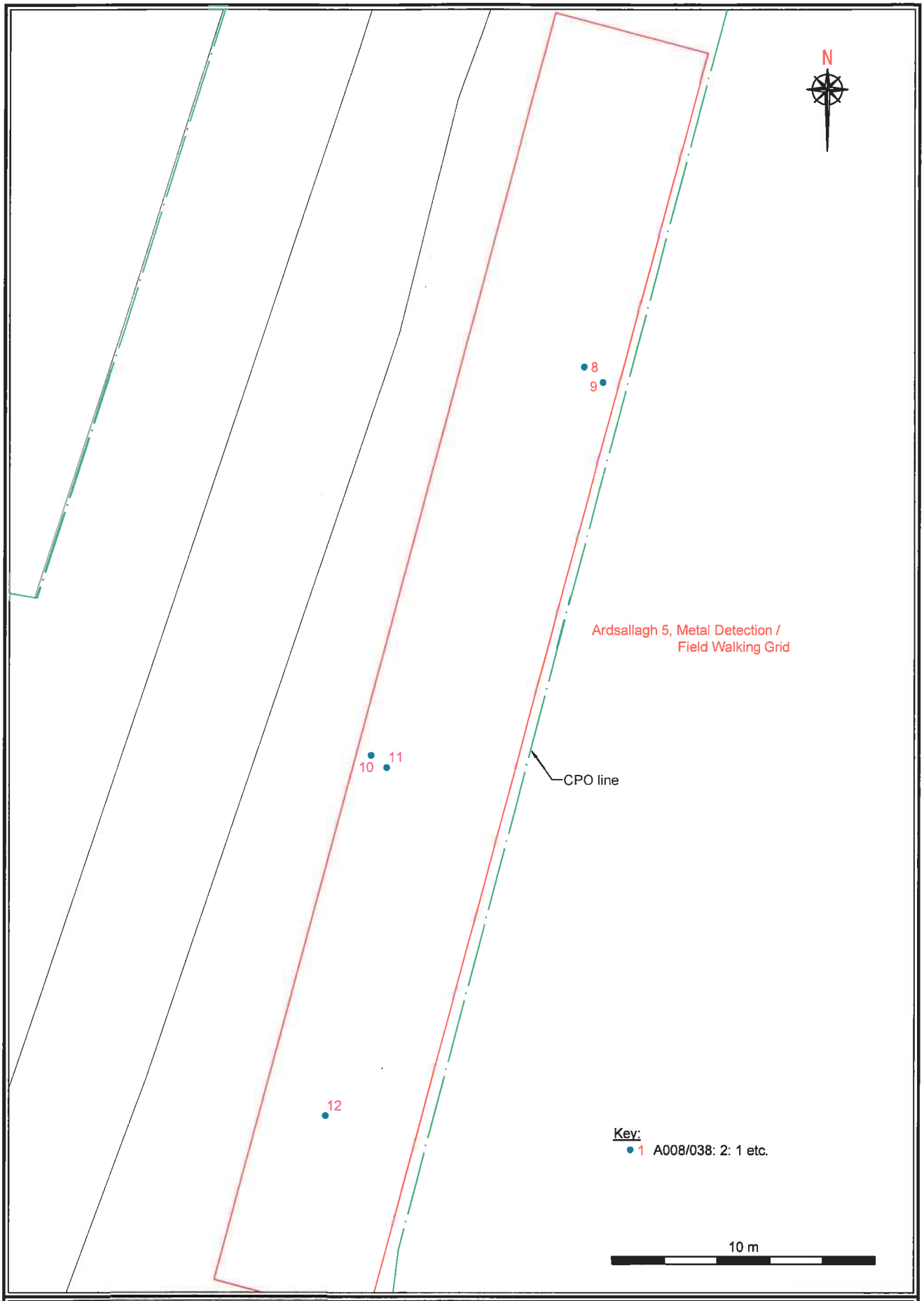
Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M3 Clonee - North of Kells PPP Scheme Contract 2, Ardsallagh 5	Scale: 1: 200 A4
		Date: Jul '08
	Issued for: Excavation Report	Origin: Courtesy of client / ACS
	Client: Meath County Council	Drawing no.: 04_01_C79031

Appendix 4, Topsoil Assessment, Figure 1: Metal Detection (Phase 1) Distribution Map



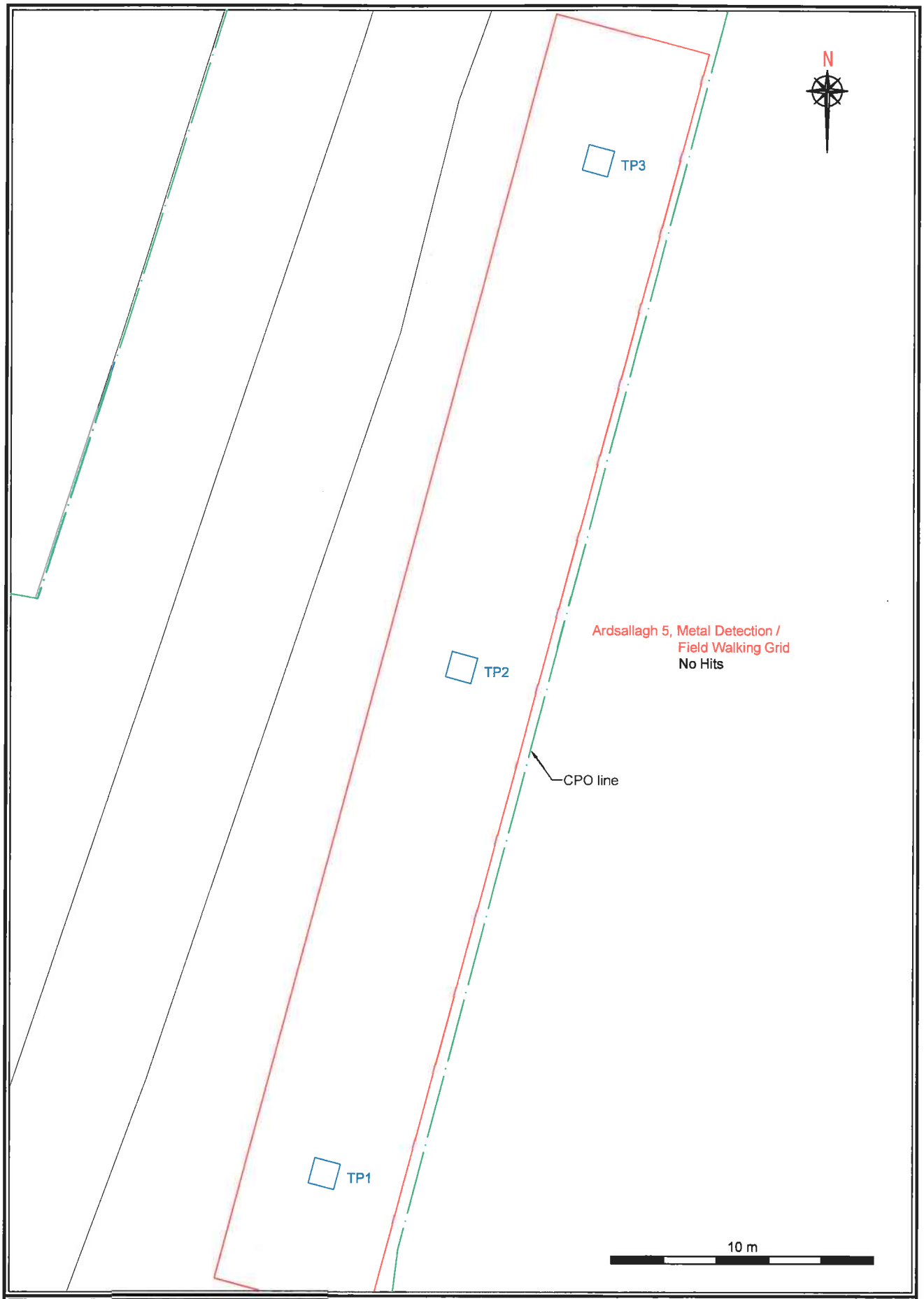
Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M3 Clonee - North of Kells PPP Scheme Contract 2, Ardsallagh 5	Scale: 1: 200 A4
		Date: Jul '08
	Issued for: Excavation Report	Origin: Courtesy of client / ACS
	Client: Meath County Council	Drawing no.: 04_01_C79032

Appendix 4, Topsoil Assessment, Figure 2: Metal Detection (Phase 2) Distribution Map



Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M3 Clonee - North of Kells PPP Scheme Contract 2, Ardsallagh 5	Scale: 1: 200 A4
		Date: Jul '08
	Issued for: Excavation Report	Origin: Courtesy of client / ACS
	Client: Meath County Council	Drawing no.: 04_01_C79033

Appendix 4, Topsoil Assessment, Figure 3: Field Walking Distribution Map



Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M3 Clonee - North of Kells PPP Scheme Contract 2, Ardsallagh 5	Scale: 1: 200 A4
		Date: Jul '08
	Issued for: Excavation Report	Origin: Courtesy of client / ACS
	Client: Meath County Council	Drawing no.: 04_01_C79034

Appendix 4, Topsoil Assessment, Figure 4: Test Pit Distribution Map

APPENDIX 5 Radiocarbon dates

Context	Sample No	Material	Species id/Weight	Lab	Lab Code	Date Type	Calibrated Date
11: fill of linear ditch	1	A/bone	Cattle phalanx 2 (12g)	Beta	228251	AMS (Std)	AD 720–740 AD 770–970
43: fill u/stone linear C30	39	Charcoal	Hazel (5g)	QUB	7051	AMS (Std)	AD 994–1155
58: fill of kiln	1	Charcoal	Hazel, cherry & fruitwood (0.48g)	Beta	227863	AMS (Std)	AD 240–420

APPENDIX 6 Wood Identification

SPECIES IDENTIFICATION

OF A CHARCOAL SAMPLE

FROM ARDSALLAGH 5 (A008/038),

CO. MEATH

ELLEN OCARROLL
June 2006

TABLE OF CONTENTS **PG NOS**

1. INTRODUCTION

One charcoal sample from excavations associated with the early ecclesiastical Cannistown foundations at Ardsallagh 5 was sent for identification and analysis. Two linear ditches, pits, a drying kiln, 2 metalled stone surfaces and the remains of a circular house structure were excavated at the site. The charcoal identified was extracted from a layer below stones in a linear feature **C43**.

The charcoal was sent for species identification prior to ^{14}C dating, and also to obtain an indication of the range of tree species which grew in the area, as well as the utilization of these species for various functions. Wood used for fuel at pre-historic sites would generally have been sourced at locations close to the site. Therefore charcoal identifications may, but do not necessarily, reflect the composition of the local woodlands. Larger pieces of charcoal, when identified, can provide information regarding the use of a species.

2. METHODS

The process for identifying wood, whether it is charred, dried or waterlogged is carried out by comparing the anatomical structure of wood samples with known comparative material or keys (Schweingruber 1990). The identification of charcoal material involves breaking the charcoal piece so as a clean section of the wood can be obtained. This charcoal is then identified to species under an Olympus SZ3060 x 80-zoom stereomicroscope. By close examination of the microanatomical features of the samples the species were determined. The diagnostic features used for the identification of charcoal are micro-structural characteristics such as the vessels and their arrangement, the size and arrangement of rays, vessel pit arrangement and also the type of perforation plates. A representative amount of charcoal pieces were identified and separated into bags by species type.

3. RESULTS

Table 1: Results from charcoal identifications

Context no. and type	Sample no.	Species	Weight and comment
C43, Layer below stones	3	*Corylus avellana*	25 grammes

Table 2: Species represented in the identified samples

Botanical name	Species
Corylus avellana	Hazel

4. DISCUSSION

Hazel (*Corylus avellana*) was the only species identified from the sample. Hazel was very common up to the end of the 17th century and would have been used for the manufacture of many wooden structures such as wattle walls, posts, trackways and baskets. McCracken (1971, 19) points out that "it was once widespread to a degree that is hard to imagine today". With the introduction of brick, steel and slate the crafts associated with hazel became obsolete, and today the woods that supplied hazel have diminished rapidly. Hazel is normally only about 3-5m in height and is often found as an understory tree in deciduous woods dominated by oak. It also occurs as pure copses on shallow soils over limestone as in The Burren in Co. Clare and survives for 30 to 50 years. Its main advantage is seen in the production of long flexible straight rods through the process known as coppicing and the coppiced wood can be used in the manufacture of wattle structures such as walls, baskets, trackways and troughs.

5. CONCLUSIONS

Hazel is indicative of a dryland terrain and may have grown in a coppiced wooded area or in association with an oak forest. The hazel may have functioned as a wattle fence structure which may have lain in the linear feature excavated at Ardsallagh 5.

6. Advice for Radiocarbon dating:

The desired amount of charcoal for a conventional **^{14}C** date is 5 grammes. The best material to send for dating is short lived species such as willow, alder and hazel. The sample identified above is perfect for ^{14}C dating**.**

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APPENDIX 7 Charcoal identification

Analysis of the Charcoal

Ardsallagh 5
Co. Meath

Licence No: A008/038.

By
Lorna O'Donnell
Margaret Gowen & Co. Ltd.

For
ACS Ltd

30th August 2006

Figures

Tables

1 Introduction

1.1 This report discusses the analysis of charcoal from Ardsallagh 5, Co. Meath. The site included hearth type features of post Medieval date, ditches, pits a kiln and the remains of a house structure. Two charcoal samples were analysed, one from a possible ditch, and one from a probable kiln.

2 Methodology

2.1 *Sampling and processing*

The samples were taken on site as bulk soil and were processed by a flotation machine by the client.

2.2 Identification of the charcoal

Each piece of charcoal was examined and orientated first under low magnification (10x-40x). They are then broken to reveal their transverse, tangential and longitudinal surfaces. Pieces are mounted in plasticine, and examined under a binocular microscope with dark ground light and magnifications generally of 200x and 400x. Each taxa or species will have anatomical characteristics that are particular to them and these are identified by comparing their relevant characteristics to keys (Schweingruber 1978; Hather 2000 and Wheeler *et al* 1989) and reference material.

3 Results

3.1 Four taxa were identified from Ardsallagh 1, these were hazel (*Corylus avellana*), pomaceous fruitwood (Pomoideae), wild/bird cherry (*Prunus avium/padus*), oak (*Quercus* spp.) (Figs 1 and 2).

S2, 3, 4, 5 and 6 F14 Oak only was identified from this upper fill of a possible ditch.

S62, 65 and 67 F58- From this kiln fill, pomaceous fruitwood, hazel and cherry were identified.

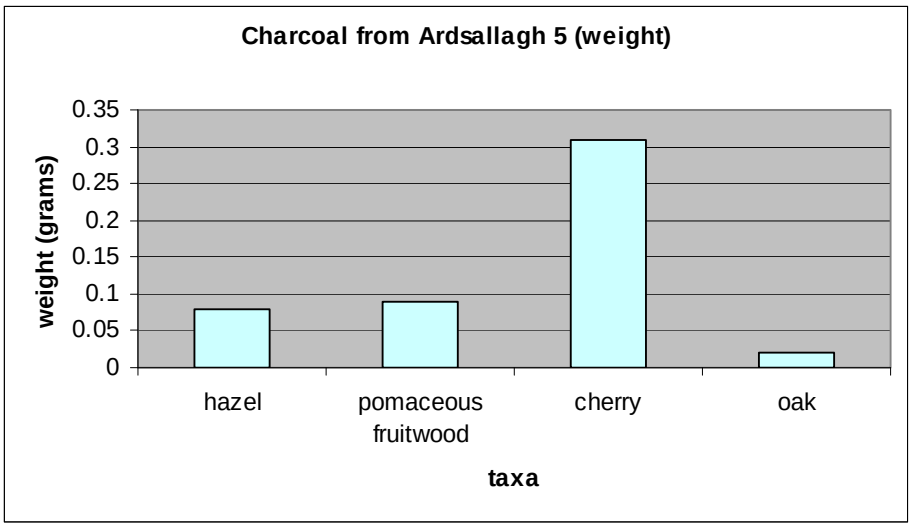

Figure 1

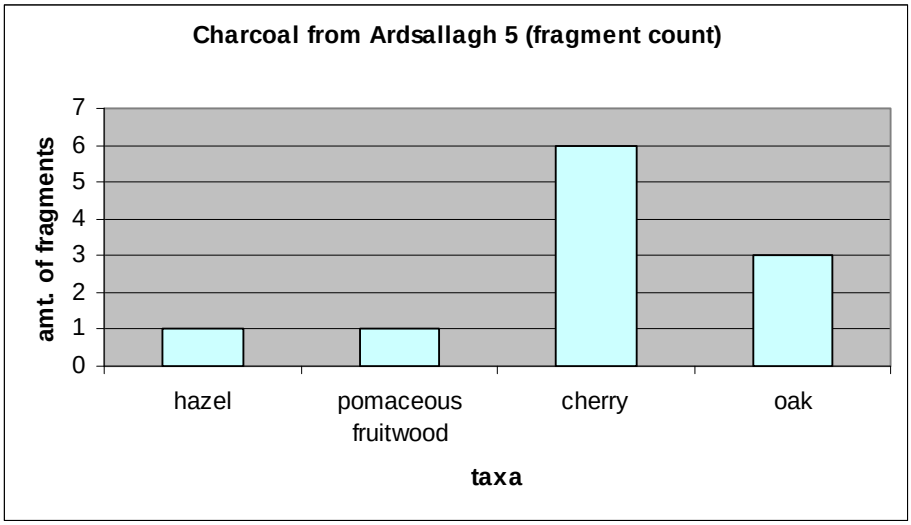

Figure 2

4 Discussion

4.1 While the level of material from these features was again low, they do provide an insight into the type of environment that surrounded the Ardsallagh 5 area when the site was in use. The sessile oak (*Quercus petraea*) is Irelands traditional oak. It is generally associated with poor acid soils, often in hilly regions. The pedunculate oak (*Quercus robur*) is generally associated with heavy lowland soils. Hazel will grow as a tree or as a shrub, and is often found growing in association with oak, as a coppice. In general, it prefers dry ground, but will tolerate flooding (Orme and Coles 1985).

4.2 The Pomoideae group, a sub family of the Rosaceae includes crab apple, wild pear, rowan/whitebeam and hawthorn. It is extremely difficult to separate these through wood anatomy. Crab apple (*Malus sylvestris*) tends to be found on woodland edges (Hickie 2002, 55). Wild pear (*Pyrus pyraster*) is mostly found as an isolated tree (Stuijts 2005). Rowan (*Sorbus aucuparia*) is a tough colonizer which can tolerate peaty soils and exposed conditions. It needs plenty of light to thrive (Hickie 2002, 65). Whitebeam (*Sorbus aria*) grows up to 20m high and has a preference for limestone soils (Orme and Coles 1985, 11). Hawthorn (*Crataegus monogyna)* can thrive in all but the most acid of soils (Gale and Cutler 2000). As wild pear is not a native Irish species, it is likely that the charcoal represents other types encompassed in the Pomoideae group.

4.3 Wild cherry (*Prunus avium*) needs light to grow, on or near woodland margins and on light well drained soils (Orme and Coles 1985, 11). Bird cherry (*Prunus padus*) occurs particularly in marginal forests, and is generally solitary (Stuijts 2005, 142).

4.4 The material from Ardsallagh 5 indicates material from mixed environments, for example large canopy trees are present such as oak, while smaller shrub and scrub trees were also identified, which prefer to grow in a more open environment like cherry. No typically wetland species such as alder or willow were identified from the samples.

4.5 Feature 58 was a kiln fill, with a high level of seeds. Three taxa were identified from this fill. In the authors experience, when dealing with fuel from cereal drying kilns one tends to identify a variety of taxa, and the fuel selection is not as specific as it is for other activities, such as smelting or cremating. This is probably because, when cereal is being dried (a necessity due to the Irish climate), the person operating the kiln must make sure the fire dries but does not burn the grain (Kelly 1997, 241), therefore most taxa would be suitable for this purpose, and a specific selection would not have to be made. From the early Medieval kiln deposits in Charlesland, Co. Wicklow (Site D, 03E0146), a variety of woods were identified, the most commonly used was oak (O'Donnell, 2004). From the Early Historic site of Kiltenan South, Co. Limerick (02E0666), six taxa were identified from the fill, while from Flemingtown, Co. Dublin (02E0296) four taxa were identified (O'Donnell forthcoming). From Killeen Castle, Co. Meath (various), from a possible Early Medieval kiln four taxa were identified (O'Donnell 2006a), which compares well to the results from Ardsallagh 5. In comparison to Ardsallagh 1, oak and hazel were also identified. However, cherry and the pomaceous fruitwood type were not identified from Ardsallagh 1 (O'Donnell 2006b). The charcoal from the ditch fill could have been deposited in variety of ways such as a dump from a hearth or as a result of general on site burning.

5 Conclusions

5.1 Charcoal was analysed from two samples from Ardsallagh 5, Co. Meath. The charcoal level was quite low in both samples, however four taxa were identified, which indicates that a relatively mixed environment surrounded the site, with larger canopy trees and smaller shrubs and scrub. The various wood types identified from the kiln fill compares well with other samples from kilns the author has analysed.

Lorna O'Donnell

August 2006

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Table 1 Charcoal identification details from Ardsallagh 5

Sample	**2-6**	**2-6**	**62, 69 & 67**	**62, 69 & 67**
Feature	**14**	**14**	**58**	**58**
	w	**f**	**w**	**f**
Corylus avellana L. Hazel			0.08	1
Pomoideae L. / Miller Pomaceous fruitwood type			0.09	1
Prunus avium/padus L. Wild/bird cherry			0.31	6
Prunus spinosa L. Blackthorn	0.02	3		

Archaeological Services
University of Durham

Ardsallagh 5, M3 Motorway Project, Ireland

environmental analysis

on behalf of
Archaeological Consultancy Services Ltd

Report 1639
August 2008

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environmental analysis

Report 1639

August 2008

Archaeological Services Durham University

on behalf of

Archaeological Consultancy Services Ltd

Unit 21 Boyne Business Park, Greenhills, Drogheda, Co. Louth, Ireland

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Contents

1. Summary

The project

1.1 An excavation was undertaken by Archaeological Consultancy Services Ltd at Ardsallagh 5, Co Meath, Ireland. Two linear ditches, pits, a drying kiln, 2 metalled stone surfaces, and the remains of a circular house structure were identified and excavated. This report presents the results of environmental analysis of bulk samples and cremated bone from the site.

Results

1.2 The flots were small and contained low volumes of charcoal and modern roots. The small cereal assemblage was dominated by barley, with lesser amounts of oats and wheat. There is evidence to suggest the kiln may have been used for grain drying. Material suitable for radiocarbon dating was present in most of the contexts.

1.3 The amount of cremated bone in each context was extremely small. Most cremated bone was white, implying burning took place at a high temperature (*c.* 600ºC or more), but some fragments were darker grey to black in colour, and occasionally the outer layer of bone was white surrounding a layer of black, implying partial oxidation at temperatures of *c*. 300-600ºC, and/or a lack of available oxygen. All fragments were examined with a view to identification, but the general small size of the fragments meant that none could be identified.

2. Project background

Location and background

2.1 An excavation was undertaken by Archaeological Consultancy Services Ltd at Ardsallagh 5, Co Meath, Ireland. The site is located in close proximity to Cannistown Church. Two linear ditches, pits, a drying kiln, 2 metalled stone surfaces, and the remains of a circular house structure were identified and excavated. Animal bone, cremated bone (very small amounts) and a blue glass bead were recovered from the site. Charcoal (hazel) obtained from a layer under stones located in one of the linear ditches has been radiocarbon dated to AD 994-1155. It is likely that all features are associated with the early ecclesiastical Cannistown foundation. This report presents the results of environmental analysis of bulk samples and cremated bone from the site.

Objective

2.2 The objective was to analyse the plant macrofossils, charcoal and cremated bone from the site and to identify material suitable for radiocarbon dating.

Dates

2.3 Samples were received by Archaeological Services Durham University on 23rd February 2007. Analysis and report preparation was conducted between 9th March - 11th April 2007. A few additional flots and charcoal samples were analysed in 2008.

Personnel

2.4 Sample processing was undertaken by Archaeological Consultancy Services Ltd. Environmental analysis and report preparation were by Dr Charlotte O'Brien. Cremated bone analysis was by Dr Anwen Caffell. Faunal remains identification was by Louisa Gidney. Lorne Elliott assisted with the sorting of residues.

Archive

2.5 The licence number is A008/038. The flots, residues and bones are currently retained in the Environmental Laboratory at Archaeological Services Durham University for collection or return.

3. Environmental analysis

Methods

3.1 The residues were examined for plant remains, shells, bones, pottery sherds and metalworking debris. The dry flots were scanned at up to ×60 magnification using a Leica MZ6 stereomicroscope for charred and waterlogged plant remains. Identification of these was undertaken by comparison with modern reference material held in the Environmental Laboratory at Archaeological Services Durham University. Plant taxonomic nomenclature follows Stace (1997).

Results

3.2 The results of the environmental analysis are presented in Appendix 1. The residues included large, angular and sub-angular stones, in addition to a few fragments of calcined bone, unburnt bone and tooth. Identifiable fragments included a cow mandible, a small bird bone, a fish vertebra and a sheep and pig tooth. Small amounts of charcoal, metallic waste and semi-vitrified fuel waste also occurred in a few contexts. All of the flots were small, and most contained charcoal and modern roots. Small metal spheres resembling hammerscale were recorded in the flot of context (13). The few charred plant macrofossils included barley, oats and wheat grains, and weed seeds of sheep's sorrel, sedges, goosefoot, grass, dock and vetch. Chaff was absent. An uncharred bramble fruitstone was present in context (11) and a buttercup achene occurred in context (55). The non-waterlogged nature of the site and the presence of modern roots, suggests these uncharred seeds may be of later origin.

Discussion

3.3 A few charred cereal grains occurred in most of the samples, but the largest numbers were in the samples from the upper fill of a possible pit or kiln context (55), and the upper fill of an oval-shaped feature context (10). Of the grains that could be identified, barley occurred the most frequently, with lesser amounts of oats present (Figure 1). Low numbers of wheat grains were recorded in five contexts. The majority of the barley grains could only be recorded as undifferentiated, although some in contexts (10), (14), (15) and (55) were identifiable as hulled. This is unsurprising considering the features appear to date to the Early Christian period, as hulled barley is believed to have replaced the naked variety in the early 1st millennium BC (Huntley 2000). It was not possible to establish the variety of wheat that was used, due to the absence of chaff, although one of the wheat grains in context (10) sample <27> had the characteristic squat shape which often occurs in bread wheat.

3.4 The small cereal assemblage from Ardsallagh 5 reflects the general pattern of cereal consumption in Early Christian Ireland, as shown from other studies of this period. These have shown a preponderance of barley, (particularly 6-row, hulled), with oats forming the second most important cereal (Monk 1991). Wheat and rye have been found at several sites, but rarely in higher numbers than either barley or oats.

3.5 Although chaff is absent from Ardsallagh 5, the relatively frequent occurrence of weed seeds may suggest the presence of some crop-processing debris, at least from the fine-sieving stages. This would point to cultivation and crop-processing having occurred locally. The occurrence of sedges among the weed seeds suggests some cultivation on heavy, damp soils or the presence of areas of damp ground near the site. Docks, grass, vetch and goosefoot may also have grown as arable weeds with the crops, or on areas of waste and disturbed ground. Sheep's sorrel may have grown on nearby areas of acidic grassland.

3.6 As mentioned above, the upper fill of the possible pit or kiln context (55) contained the largest numbers of grains, particularly in samples <52> and <53>. The identifiable grains are made up almost entirely of barley, with wheat grains and weed seeds absent (Figure 1). This may indicate that the feature was used for grain drying or storage. Although, the grains were in a poor condition, none appeared to have sprouted. Therefore, it is unlikely the feature was used as a malting oven.

3.7 The occurrence of the charred cereals and animal bone, suggests that most of the contexts represent domestic waste. The metallic waste, charcoal and semi-vitrified material, indicate fuel waste from domestic or small-scale industrial activity. Identification of the small amounts of charcoal in contexts (10), (14) and (15) suggest that hazel, ash and oak were used for fuel.

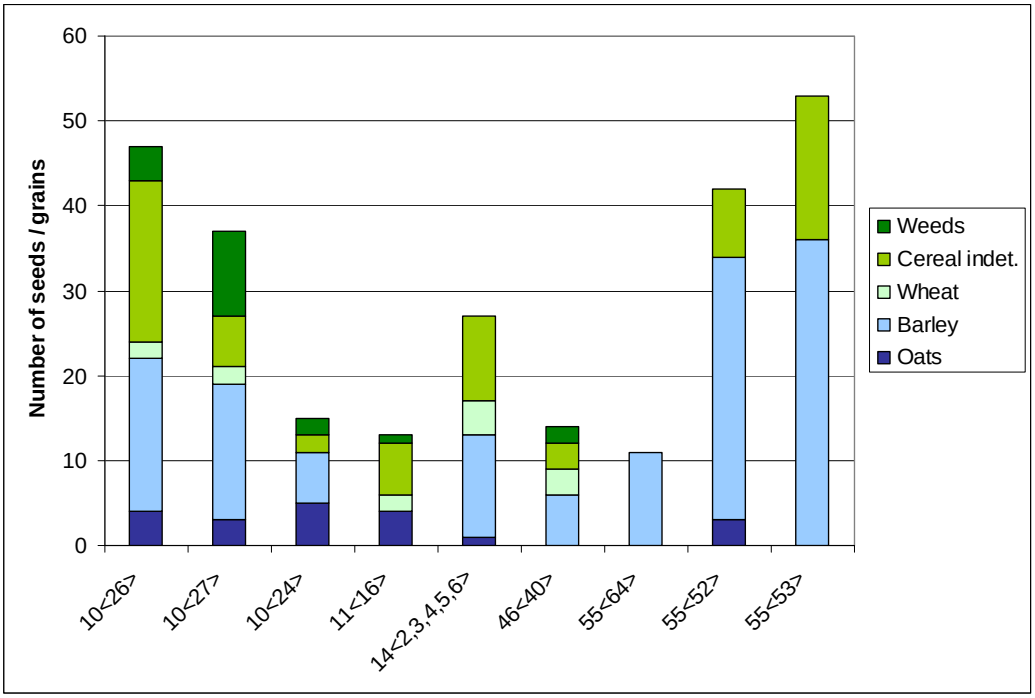

Figure 1: Charred plant remains from Ardsallagh 5 samples with >10 entities

3.8 Material suitable for radiocarbon dating was present in all of the samples except <19>, <34> and <55>. This included either charred grain or charcoal. The recommended material was cleaned of adhering roots and other organic material, and labelled in preparation for radiocarbon dating. Where possible, a single entity should be dated. However, when the charred grain weighed less than the recommended 10mg required for AMS radiocarbon dating according SUERC (Scottish Universities Environmental Research Centre), additional back-up material was attached to the samples (when available). Table 1 lists the material recommended.

Table 1: Material for radiocarbon dating from Ardsallagh 5

Sample	7	26	27	24	16	19	35	34
Context	6	10	10	10	11	13	15	15
Suitable material present	✓	✓	✓	✓	✓	✗	✓	✗
Type of material recommended	Grain	Grain	Grain	Grain	Grain	-	Charcoal	-
Species	Barley	Barley	Barley	Barley	Wheat	-	Hazel	-
Weight of entity chosen (g)	0.005	0.006	0.011	0.008	0.007	-	0.363	-

Table 1: continued

Sample	55	38	40	47	48	64	63	52	53
Context	39	43	46	46	47	55	55	55	55
Suitable material present	✗	✓	✓	✓	✓	✓	✓	✓	✓
Type of material recommended	-	Grain	Grain	Grain	Grain	Grain	Grain	Grain	Grain
Species	-	Barley	Wheat	Barley	Barley	Barley	Barley	Barley	Barley
Weight of entity chosen (g)	-	0.009	0.009	0.008	0.010	0.005	0.008	0.010	0.013

4. Cremated bone analysis

Methods

4.1 Eighteen samples from eleven contexts were presented for analysis. However, no cremated bone was present in samples <26> context (10), <16> context (11), <34> context (15), <47> context (46), and <53> context (55), meaning cremated bone was only present in thirteen samples from ten contexts. The total weight of cremated bone from all contexts was only 4.9g. Each sample of cremated remains was divided into fractions >10mm, 5-10mm, and 2-5mm (McKinley 2004). Each fraction was weighed and the largest fragment of bone was measured; the data for each individual sample is presented in Table 2, with the combined weights per context given in Table 3.

Results and discussion

4.2 The amount of cremated bone in each context was extremely small. The heaviest context (43), the fill of a pit, weighed 3.4g; the remainder all weighed <1g. The maximum size of the fragments in all samples was also small, with a mean of 12.9 x 6.7mm, and the largest measuring 19.6 x 5.5mm (from context 43). In no context were there any bone fragments in the >10mm fraction, and in eight contexts all the cremated bone fell into the >2mm fraction. Most cremated bone was white, implying burning at a high temperature (*c.* 600ºC or more), but some fragments were darker grey to black in colour, and occasionally the outer layer of bone was white surrounding a layer of black, implying partial oxidation at temperatures of *c.* 300-600ºC, and/or a lack of

available oxygen (McKinley 2004). All fragments were examined with a view to identification, but the general small size of the fragments meant that none could be identified. It is not even possible to be certain that these bone fragments represent human remains. None of the fragments is suitable for radiocarbon dating.

Table 2: Cremated bone - Weight and maximum fragment size per sample

Context	Sample	Total Weight	Fraction Weights						Max. Frag Size		
			>10mm		5-10mm		2-5mm				
		g	g	%	g	%	g	%	mm		
6	7	0.1	0.0	0.0	0.0	0.0	0.1	100.0	4.5	x	3.7
10	24	0.2	0.0	0.0	0.0	0.0	0.2	100.0	7.9	x	4.9
10	26	0.0	0.0	-	0.0	-	0.0	-	-	x	-
11	16	0.0	0.0	-	0.0	-	0.0	-	-	x	-
13	19	<0.1	0.0	0.0	0.0	0.0	<0.1	100.0	4.5	x	2.7
15	34	0.0	0.0	-	0.0	-	0.0	-	-	x	-
15	35	0.1	0.0	0.0	0.0	0.0	0.1	100.0	6.0	x	2.8
39	55	0.1	0.0	0.0	0.0	0.0	0.1	100.0	7.2	x	5.2
43	1	3.2	0.0	0.0	1.3	40.6	1.9	59.4	17.0	x	7.5
43	38	0.2	0.0	0.0	0.0	0.0	0.2	100.0	19.6	x	5.5
46	1	0.3	0.0	0.0	0.1	33.3	0.2	66.7	9.6	x	6.3
46	40	0.1	0.0	0.0	0.0	0.0	0.1	100.0	6.2	x	5.0
46	47	0.0	0.0	-	0.0	-	0.0	-	-	x	-
47	48	0.1	0.0	0.0	0.0	0.0	0.1	100.0	10.2	x	7.2
55	53	0.0	0.0	-	0.0	-	0.0	-	-	x	-
55	63	<0.1	0.0	0.0	0.0	0.0	<0.1	100.0	8.8	x	3.9
55	64	0.1	0.0	0.0	0.0	0.0	0.1	100.0	6.7	x	2.6
56	60	0.4	0.0	0.0	0.0	0.0	0.4	100.0	8.1	x	6.0

Table 3: Combined weight per context

Context	Sample	Total Weight	Fraction Weights						Max. Frag Size		
			>10mm		5-10mm		2-5mm				
		g	g	%	g	%	g	%	mm		
6	7	0.1	0.0	0.0	0.0	0.0	0.1	100.0	4.5	x	3.7
10	Total	0.2	0.0	0.0	0.0	0.0	0.2	100.0	7.9	x	4.9
11	16	0.0	0.0	-	0.0	-	0.0	-	-	x	-
13	19	<0.1	0.0	0.0	0.0	0.0	<0.1	100.0	4.5	x	2.7
15	Total	0.1	0.0	0.0	0.0	0.0	0.1	100.0	6.0	x	2.8
39	55	0.1	0.0	0.0	0.0	0.0	0.1	100.0	7.2	x	5.2
43	Total	3.4	0.0	0.0	1.3	38.2	2.1	61.8	19.6	x	5.5
46	Total	0.4	0.0	0.0	0.1	25.0	0.3	75.0	9.6	x	6.3
47	48	0.1	0.0	0.0	0.0	0.0	0.1	100.0	10.2	x	7.2
55	Total	0.1	0.0	0.0	0.0	0.0	0.1	100.0	8.8	x	3.9
56	60	0.4	0.0	0.0	0.0	0.0	0.4	100.0	8.1	x	6.0

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Appendix 1: Plant macrofossils from Ardsallagh 5

Sample	7	26	27	24	16	19	2,3,4,5,6	35	34	30	55	57	38	39	40	47	48	64	63	52	53
Context	6	10	10	10	11	13	14	15	15	17	39	39	43	43	46	46	47	55	55	55	55
Residue weight (g)	386	202	145	387	283	611	N/A	217	242	N/A	411	N/A	217	N/A	303	310	223	393	175	203	200
Flot weight (g)	<1	8	6	2	3	3	1	2	<1	2	3	<1	-	<1	3	<1	<1	2	-	7	6
Flot volume (ml)	1	9	7	1	3	2	1	3	1	4	2	<1	-	<1	2	1	2	2	-	10	10
Residue contents (relative abundance)																					
Angular large stones	1	-	-	1	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Bone (calcined)	-	1	1	1	-	-	-	-	1	-	-	-	-	-	-	-	-	1	1	-	-
Bone (unburnt)	1	1	-	2	1	1	-	2	1	-	1	-	1	-	1	1	1	1	1	-	2
Bird bone (small)	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Charcoal (undifferentiated)	-	1	1	1	-	-	-	-	-	-	-	-	1	-	-	1	-	1	-	1	-
Cow mandible fragment	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Fish vertebra	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metallic waste	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Semi-vitrified fuel waste	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-
Sub-angular large stones	-	1	-	-	1	-	-	-	1	-	1	-	-	-	-	1	-	1	1	1	-
Tooth (pig)	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Tooth (sheep)	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Charcoal (g)																					
Corylus avellana (Hazel)	-	-	0.021	-	-	-	0.021	0.363	-	-	-	-	-	-	-	-	-	-	-	-	-
Fraxinus excelsior (Ash)	-	-	0.020	-	-	-	0.062	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Quercus spp (Oak)	-	-	-	-	-	-	0.245	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indeterminate <4mm	-	-	-	-	-	-	0.950	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Flot matrix (relative abundance)																					
Charcoal (undifferentiated)	1	1	1	1	1	1	-	1	1	1	1	-	-	-	1	-	1	1	-	1	1
Charred culm node	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hammerscale	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Modern roots	1	1	1	1	1	1	-	-	-	1	-	-	-	-	-	-	-	1	-	1	1
Charred remains (total counts)																					
(c) *Avena* sp (Oats)	-	4	3	5	4	-	1	-	-	-	-	-	-	-	-	1	-	-	-	3	-
(c) *Hordeum* sp (Hulled barley)	-	13	11	4	-	-	1	2	-	-	-	-	-	6	-	-	-	-	-	-	3
(c) *Hordeum* sp (Barley undifferentiated)	1	5	5	2	-	-	11	-	-	-	-	-	2	-	6	3	1	11	1	31	33
(c) *Triticum* sp (Wheat)	-	2	1	-	2	-	4	-	-	1	-	-	-	-	3	-	-	-	-	-	-
(c) *Triticum* cf. *aestivum* (cf. Bread wheat)	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(c) Cerealia indeterminate	-	19	6	2	6	-	10	1	1	4	1	2	1	-	3	2	1	-	-	8	17
(h) *Rumex acetosella* (Sheep's sorrel)	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(w) *Carex* sp biconvex nutlet (Sedges)	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(w) *Carex* sp trigonous nutlet (Sedges)	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(x) *Chenopodium* sp (Goosefoot)	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(x) Poaceae indeterminate >2mm (Grass)	-	2	1	-	-	3	-	-	-	-	1	-	-	-	1	2	1	-	-	-	-
(x) *Rumex* sp (Dock)	-	1	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
(x) *Vicia* sp (vetch)	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waterlogged remains (relative abundance)																					
(t) *Rubus fruticosus* agg. (Bramble)	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(x) *Ranunculus* subgenus *Ranunculus* (Buttercup)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-

(c: cultivated plant; h: heathland; t: trees/shrubs; w: wetland; x: wide niche). Relative abundance is based on a scale from 1 (lowest) to 5 (highest)

APPENDIX 9 Faunal remains: Rachel Sloane

1. Introduction

This report details the analysis of mammalian bone remains recovered during archaeological excavations at Ardsallagh 5, Co. Meath, excavated as part of the M3 Clonee to North of Kells Road Scheme. Resolution phase works took place from 8th December 2005 to 19th January 2006 during which an Early Medieval corn-drying kiln, a series of linear ditch features, several pits and postholes and two stone surfaces were identified (Clarke *et al* 2007, 1-2). Much of the activity represented at this site is likely to be of the Medieval period (*Ibid*). Both Iron Age and Early Medieval radiocarbon dates were obtained however many of the Ardsallagh 5 features were not stratigraphically related (Clarke pers. comm.). It was possible to sub-divide the archaeological features that yielded animal bone into three groups although Group 3 consists of all features without any stratigraphical relationship to each other.

Group Number	Features in Group	Feature Description
Group 1	F38	Stony spread sealing pit F30
Group 1	F39	Early Medieval mettled/stone surface, fill of F52
Group 1	F73	Fill of F52
**********	**********	**********
Group 2	F42	Fill of pit F30
Group 2	F51	Lower fill of pit F30
**********	**********	**********
Group 3	F6	Fill of possible ditch F20
Group 3	F9	Fill of possible furrow F32
Group 3	F10	Fill of pit F29
Group 3	F11	Fill of possible ditch F21 (dated to Cal AD 720-740/770-970, Beta 228251)
Group 3	F12	Fill of ditch F28
Group 3	F13	Fill of pit F26
Group 3	F14	Upper fill of ditch F23
Group 3	F15	Fill of pit F30
Group 3	F55	Upper fill of corn drying kiln F59 (F58, the lower fill of kiln, dated to Cal AD 240-420, Beta 227863)
Group 3	F56	Spread over mettled surface F60, fill of cut F68
Group 3	F62	Fill of Early Medieval posthole F65

Table 1 Ardsallagh 5: Grouping of archaeological features that produced animal bone.

2. Methodology

The methodology adopted for analysis of this collection is based on that used for Knowth by McCormick and Murray (2007). A detailed description of the applied methodology has been outlined by the current author in the analysis report for mammalian bone remains recovered from resolution phase archaeological excavations at Roestown 2, also carried out as part of the M3 Clonee-North of Kells Road Scheme. The quantification system applied as part of this methodology is a modified version of that used by Albarella and Davis (1996). It entails a selective approach which, rather than counting every fragment of bone, results in the production of NISP values i.e. number of identifiable specimens. All faunal bone remains are examined but specimens found to be of low-grade information value are not recorded. Consequently the recording of a narrower range of clearly defined bone elements is ensured. Selected elements are recorded provided at least 50% of the diagnostic zone survives. This procedure avoids multiple counting of very fragmented elements (*Ibid*). The MNI i.e. minimum number of individuals was calculated for all species. This estimates the minimum number of animals that the recorded faunal remains could have come from (Chaplin 1971, 70). It is calculated through dividing the recorded value of each element for a species by its frequency in the skeleton. The resulting highest value is the MNI for that particular species. While both sides and proximal or distal were taken into account for MNI calculations, ageing data was not.

3. Results of Analysis

3.1 Summary of Findings

Ardsallagh 5 produced a total of 65 recordable elements with Group 1 accounting for 12.3%, Group 2 accounting for 9.2% and Group 3 consisting of 78.5% of the collection. The species represented include cattle (*Bos taurus*), sheep/goat (*Ovis/Capra*) and pig (*Sus sp.*) as well as dog (*Canis familiaris*) which was represented by two specimens and horse (*Equus caballus*) and cat (*Felis catus*) both represented by a single specimen (Tables 2-4). In analysis of mammalian bone remains, positive distinction between the two very similar species of sheep and goat is often not possible and such elements are classified as sheep/goat. However for some specimens it may be possible to distinguish them as either sheep or goat based on recognised morphological and metrical factors. Amongst the Ardsallagh 5 sheep/goat

material, three specimens were definitively identified as sheep (*Ovis aries*) based on morphological characteristics. They included a mandibular dP4 (deciduous fourth premolar), a distal humerus and a distal tibia. Some ageing data was recorded by applying the two ageing methods of tooth eruption and wear and epiphyseal fusion. Given the small size of the assemblage this data is of limited interpretive value and no age/slaughter patterns could be constructed. A very small range of metrical data was recorded and sex determination was possible in two cases. Evidence for butchery and pathology was also observed.

Table 2 indicates that cattle, sheep/goat and pig were present in the Group 1 assemblage with one distal tibia being positively identified as sheep following the morphological characteristics outlined by Prummel & Frisch (1986, 572-574). The MNI values show that a minimum of one animal of each species is represented by the recorded bone remains.

Element	Cattle	Sheep/Goat	Pig	Total
Loose teeth	2			2
Loose lower incisor	1			1
Loose lower M1/2		1	1	2
Femur	1			1
Tibia	1	1		2
NISP	5	2	1	8
%NISP	62.5	25	12.5	
MNI	1	1	1	3
%MNI	33.3	33.3	33.3	

Table 2 Ardsallagh 5: Group 1 Number of identifiable specimens (NISP) by element and species[1].

[1] Loose teeth include loose maxillary teeth and teeth that could not be definitely classified as either mandibular or maxillary.
For calculation of MNI;
Loose teeth or unfused epiphyses were not counted. Incisors for cattle were divided by 8. M1/2s were divided by 4. With the exception of teeth, left and right were taken into account for all elements. Proximal and distal ends were taken into account for all elements where applicable.

Only cattle and sheep/goat were evident amongst the Group 2 material and the MNI values confirmed that both species were represented by a minimum of one animal.

Element	Cattle	Sheep/Goat	Total
Loose teeth		2	2
Loose lower premolar	1	1	2
Mandible		2	2
NISP	1	5	6
%NISP	16.7	83.3	
MNI	1	1	2
%MNI	50	50	

Table 3 Ardsallagh 5: Group 2 Number of identifiable specimens (NISP) by element and species[2].

The widest range of species from Ardsallagh 5 was represented by the Group 3 collection of bone remains i.e. the range of individual archaeological features that are not stratigraphically linked. Horse was represented by a single loose tooth with cat also represented by a single specimen. Dog was evident due to only two specimens. A minimum of two cattle were present and for all other species the MNI value was one animal. Consequently a minimum of seven animals were represented by the Group 3 assemblage. A dP4 and a distal humerus were both confirmed as sheep following morphological characteristics as outlined by Payne (1985, 139-147) and Prummel & Frisch (1986, 574) respectively.

[2] Loose teeth include loose maxillary teeth and teeth that could not be definitely classified as either mandibular or maxillary.
For calculation of MNI;
Loose teeth or unfused epiphyses were not counted. Premolars were divided by 6. With the exception of teeth and phalanges, left and right were taken into account for all elements. Proximal and distal ends were taken into account for all elements where applicable.

Element	Cattle	Sheep/Goat	Pig	Horse	Dog	Cat	Total
Horncore	2						2
Cranium	1	1					2
Loose teeth	6	4		1			11
Loose lower incisor	1						1
Loose lower premolar	4	1					5
Loose lower M3	1						1
Mandible	2	1	1		1		5
Atlas	1						1
Scapula	1	1					2
Humerus	1	1				1	3
Radius	1						1
Metacarpal	1						1
Pelvis	5				1		6
Tibia	2		1				3
Astragalus	1						1
Metatarsal	1	1					2
Phalanx 1	1		1				2
Phalanx 2	1		1				2
NISP	33	10	4	1	2	1	51
%NISP	64.7	19.6	7.8	2.0	3.9	2.0	
MNI	2	1	1	1	1	1	7
%MNI	28.6	14.3	14.3	14.3	14.3	14.3	

Table 4 Ardsallagh 5: Group 3 Number of identifiable specimens (NISP) by element and species[3].

3.2 Ageing Data

In analysing mammalian bone remains, two ageing methods are used. These include recording the state of tooth eruption and wear, which is recognised as the more reliable ageing method. In general, tooth eruption and wear is recorded for cattle, sheep/goat and pig teeth wherever the occlusal surface of the mandibular dP4 (deciduous fourth premolar), P4 (fourth premolar), M1/2 (first or second molar) or M3 (third molar) survives. For cattle and pig, tooth wear stages followed Grant (1982) while for sheep tooth wear stages were after Payne (1973 and 1987). In the case of loose mandibular M3s, as this is the innermost tooth, a mandible wear stage (MWS) was assigned following Higham (1967, 104-106). For mandible specimens with teeth remaining in situ, if the innermost tooth was present a MWS was also assigned. The more problematic ageing method (Watson 1978, 97-101) entails

[3] Loose teeth include loose maxillary teeth and teeth that could not be definitely classified as either mandibular or maxillary. Cranium includes either zygommatic arch or tooth row where 3 or more teeth of the dP4/P4-M3 tooth row were present.
For calculation of MNI;
Loose teeth or unfused epiphyses were not counted. Incisors for cattle were divided by 8. Premolars were divided by 6, M3s were divided by 2 and phalanges were divided by 8. With the exception of teeth and phalanges, left and right were taken into account for all elements. Proximal and distal ends were taken into account for all elements where applicable.

recording state of epiphyseal fusion for appropriate elements. Establishing the stage of epiphyseal fusion of a specimen involves examining the rate of development the metaphysis or epiphysis has reached. The metaphysis is the growing end of the shaft of a developing long bone while the epiphysis is a part of a bone that develops from a separate ossification centre but later fuses with the bone (Davis 1987, 16). For cattle, sheep and pig, interpretation of epiphyseal fusion data followed Reitz and Wing (1999, 76). States of epiphyseal fusion for horse and dog are after Silver (1969, 285-286) and for cat are after Habermehl (1961, 146-153).

3.2.1 Tooth wear

Tables A1-A10 of the Appendix detail all of the tooth wear and mandible wear it was possible to record for Ardsallagh 5. This data is of very limited value as in the majority of cases specimens were not the innermost tooth (M3) and therefore a mandible wear stage and correlating estimated age range could not be applied. Two sheep/goat mandibles from Group 2 did have the M3 surviving in situ and a mandible wear stage of 17 was observed for both (Table A5). This indicates that the animals to which they belonged had lived long enough to become adult i.e. over 28 months old (Higham 1967, 106). One loose mandibular cattle M3 was recorded amongst the Group 3 assemblage as having a mandible wear stage of 17 (Table A6). This signifies that the animal it represents had reached an age of at least 32-33 months before death (*Ibid*, 104).

3.2.2 Epiphyseal Fusion

All of the recorded epiphyseal fusion data is illustrated in Tables A11-A17 of the Appendix. That recorded for cattle included examples of fused and unfused specimens. The presence of an unfused proximal femur and proximal tibia from Group 1 (Table A11) indicates that the animal (or animals) represented had not reached the age of 42 or 42-48 months old before death (Reitz and Wing 1999, 76). Both fused and unfused cattle specimens were observed amongst the Group 3 material, the unfused nature of a cattle pelvis (Table A13) represents a very young animal that had died before reaching the age of 6-10 months (*Ibid*). Contrasting with this, the presence of a fused proximal humerus (Table A12) signifies a mature animal that had reached an age of at least 42-48 months old before its death (*Ibid*). Any sheep/goat elements with state of epiphyseal fusion recorded were assumed to be

sheep rather than goat when assigning age ranges. Fusion data was recorded for a total of three sheep specimens and each one was observed as fully fused. From Group 1 a fused distal tibia (Table A14) represented an animal that had reached an age of at least 15-24 months (*Ibid*). Data from the Group 3 material (Table A15) indicated the presence of an animal at least in the age range of 3-10 months old (*Ibid*). In the case of pig both fused and unfused specimens were present amongst the Group 3 collection. A fused proximal phalanx 1 (Table A16) signifies an animal that had reached an age of at least 24 months before death (*Ibid*). The unfused state of a distal tibia (Table A17) represents an animal that had not lived to reach the age of 24 months (*Ibid*). Fusion data was recorded in one case for dog and also for the one cat specimen present. Both were part of the Group 3 collection. The presence of a fused dog pelvis (Table A18) indicates that the animal it belonged to had lived to at least 6 months old (Silver 1969, 286). The fully fused distal cat humerus (Table A19) signifies the presence of an animal that reached a minimum age of 8.5 months old (Habermehl 1961).

3.3 Metrical Data

It was possible to record a small amount of metrical data for Ardsallagh 5 but as no longbone specimens allowed greatest length (GL) or greatest lateral length (GLl) measurements, no estimated shoulder heights (ESH) could be calculated. Metrical data did facilitate determination of sex for one cattle metacarpal (Section 3.4).

3.4 Sex Determination

Sex determination of certain mammalian bone remains is possible through examination of specified characteristics. In the case of pig, the morphology of the root of the permanent canine tooth or the alveolus (where the canine is absent) should be considered in order to distinguish males and females (Schmid 1972, 81). Goat horncores may be classified as male or female based on morphological traits. Cattle metacarpals may be defined as male or female through calculation of the slenderness index (McCormick 1992). Alternatively, if complete metacarpals are few, sex determination may be attempted through examination of the greatest distal width (Bd) of metacarpals (McCormick 1997, 822). The presence of antlers for deer or baculum (*os penis*) for carnivores would indicate male animals. Sex was determined for two

elements amongst the Ardsallagh 5 assemblage. Only the base of the canine tooth survived in the pig mandible from Group 3, however enough of the element remained in tact to deduce that this was a male specimen. A greatest distal width of 52.4mm was recorded for a Group 3 cattle metacarpal fragment. Analysis of a very large collection of distal cattle metacarpals from the Viking levels at Fishamble Street, Dublin led McCormick to the finding that a distal width measurement less than 56mm represents a female animal while a distal width greater than 57.5mm is male with measurements in between being classed as indeterminate, (*Ibid*). Therefore it may be concluded that the Ardsallagh 5 cattle metacarpal belonged to a female animal.

3.5 Butchery/Gnawing/Burning/Pathology/Injury

No evidence for gnawing or burning was present in the Ardsallagh 5 assemblage. Amongst the recorded material one example of butchery and one of pathology was noted. A small chopmark was observed on the collum of a cattle scapula while a partially polished surface indicated traces of eburnation on the pubis edge of a cattle pelvis acetabulum. This demonstrates degenerative joint disease (Roberts and Manchester 1995, 105) and may be due to stresses placed on weight-bearing joints. One developmental defect was noted in a loose mandibular cattle incisor from Group 1 as the root of this tooth was quite severely curved. One other case of butchery was observed. This was in the case of a non-countable specimen, i.e. a specimen classified as low-grade and therefore not included in quantification of the assemblage. It was a bovid/equid/cervid vertebral fragment which had 3 large chopmarks visible on its interior.

4. Conclusion

The species of cattle, sheep/goat, pig, horse, dog and cat were all represented in the mammalian bone assemblage from Ardsallagh 5. Amongst the sheep/goat collection it was possible to positively identify three specimens as sheep. Ageing data was recorded for all species except horse through applying the principles of tooth eruption and wear and/or epiphyseal fusion. The ageing evidence has been discussed above and is concisely detailed in the tables of the Appendix. In two cases sex determination was possible, the remains of a canine tooth facilitated classification of a pig mandible as belonging to a male animal. The greatest distal width was recorded for a cattle metacarpal fragment and this specimen was determined as representing a

female animal. Palaeopathology was observed in one case where traces of eburnation on a cattle pelvis signified degenerative joint disease. Butchery was noted in two cases in the form of chopmarks, one on a cattle scapula and three on a non-countable bovid/equid/cervid vertebral fragment. This summarises the main zooarchaeological evidence recorded for the Ardsallagh 5 assemblage.

5. Recommendations

It is recommended that all of the elements referred to in this report (both recordable and non-countable) be stored in National Museum approved low-acid boxes (as used by ACS Ltd.) and be left ready for transfer to NMI along with the other significant mammalian bone remains retrieved from archaeological excavation along the route of the M3 Clonee to North of Kells Road Scheme. This version of the mammalian bone remains analysis report has purposely recorded the zooarchaeological information in as much detail as possible. In the future, if publication is being considered, it might be more appropriate to provide a more concise version of the report. The current author would be happy to do so if requested.

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Appendix

Element	Grant TWS	Higham MWS
M1/2	d	N/A

Table A1 Ardsallagh 5: Group 1 Tooth wear stage for loose mandibular pig tooth following Grant (1982, 94).

Element	Payne TWS	Higham MWS
M1/2	9A	N/A

Table A2 Ardsallagh 5: Group 1 Tooth wear stage for mandibular sheep/goat tooth after Payne (1973 and 1987).

Element	Grant TWS	Higham MWS
P4	c	N/A

Table A3 Ardsallagh 5: Group 2 Tooth wear stage for loose mandibular cattle tooth following Grant (1982, 92).

Element	Payne TWS	Higham MWS
P4	8A	N/A

Table A4 Ardsallagh 5: Group 2 Tooth wear stage for mandibular sheep/goat tooth after Payne (1973 and 1987).

Sheep/Goat Mandible	Payne TWS					Higham MWS
	dP4	P4	M1	M2	M3	
	-	-	-	9A	11G	17
	-	-	-	9A	11G	17

Table A5 Ardsallagh 5: Group 2 Tooth wear stages for sheep/goat teeth in mandibles after Payne (1973 and 1987) and mandible wear stages assigned following Higham (1967, 106).

Element	Grant TWS	Higham MWS
dP4	d	N/A
dP4	h	N/A
dP4	j	N/A
dP4	k	N/A
M3	d	17

Table A6 Ardsallagh 5: Group 3 Tooth wear stages for loose mandibular cattle teeth following Grant (1982, 92) and mandible wear stage assigned to M3 following Higham (1967, 104).

Element	Payne TWS	Higham MWS
dP4	14L	N/A

Table A7 Ardsallagh 5: Group 3 Tooth wear stage for mandibular sheep/goat tooth after Payne (1973 and 1987).

Cattle Mandible	Grant TWS					Higham MWS
	dP4	P4	M1	M2	M3	
		A	o	X	-	N/A

Table A8 Ardsallagh 5: Group 3 Tooth wear stages for cattle teeth in mandible following Grant (1982, 92).

Pig Mandible	Grant TWS					Higham MWS
	dP4	P4	M1	M2	M3	
		b	j	c	X	N/A

Table A9 Ardsallagh 5: Group 3 Tooth wear stages for pig teeth in mandible following Grant (1982, 94).

Sheep/Goat Mandible	Payne TWS					Higham MWS
	dP4	P4	M1	M2	M3	
		V	9A	4A	X	N/A

Table A10 Ardsallagh 5: Group 3 Tooth wear stages for sheep/goat teeth in mandible after Payne (1973 and 1987).

CATTLE		Age in months
Late Fusing	femur p.	42
	tibia p.	42-48

Table A11 Ardsallagh 5: Group 1 unfused cattle specimens present, classified as early, middle or late fusing after Reitz and Wing (1999, 76).

CATTLE		Age in months
Early Fusing	radius p.	12-18
	acetabulum	6-10
	metapodium p.	fused before birth
	phalanx 1 p.	18-24
	phalanx 2 p.	18-24
Middle Fusing	tibia d.	24-30
	metapodium d.	24-36
Late Fusing	humerus p.	42-48

Table A12 Ardsallagh 5: Group 3 fused (fused and fusing) cattle specimens present, classified as early, middle or late fusing after Reitz and Wing (1999, 76).

CATTLE		Age in months
Early Fusing	acetabulum	6-10
Late Fusing	femur p.	42

Table A13 Ardsallagh 5: Group 3 unfused cattle specimens present, classified as early, middle or late fusing after Reitz and Wing (1999, 76).

SHEEP		Age in months
Middle Fusing	tibia d.	15-24

Table A14 Ardsallagh 5: Group 1 fused (fused and fusing) sheep specimens present, classified as early, middle or late fusing after Reitz and Wing (1999, 76).

SHEEP		Age in months
Early Fusing	humerus d.	3-10
	metapodium p.	fused before birth

Table A15 Ardsallagh 5: Group 3 fused (fused and fusing) sheep specimens present, classified as early, middle or late fusing after Reitz and Wing (1999, 76).

PIG		Age in months
Early Fusing	phalanx 1 p.	24
	phalanx 2 p.	12

Table A16 Ardsallagh 5: Group 3 fused (fused and fusing) pig specimens present, classified as early, middle or late fusing after Reitz and Wing (1999, 76).

PIG		Age in months
Middle Fusing	tibia d.	24

Table A17 Ardsallagh 5: Group 3 unfused pig specimens present, classified as early, middle or late fusing after Reitz and Wing (1999, 76).

Bone	**Ossification Centre**	**Age of Fusion**
Pelvis	Fusion of main bones	6 mts

Table A18 Ardsallagh 5: Group 3 fused dog pelvis after Silver (1969, 286).

Bone	Ossification Centre	Age of Fusion
Humerus	Distal epiphysis	8.5 mts

Table A19 Ardsallagh 5: Group 3 fused cat humerus after Habermehl (1961).

APPENDIX 10 Bead report: Cecily Cropper

The Beads

by Cecily Cropper

The assemblage comprised a total of 34 beads from 12 individual sites. T hirty of these are glass, 2 are of faience and one each is of bone and stone. A final object is a possible bead fragment of amber.

Classification

Within the glass, both monochrome and polychrome beads are represented including annular, globular, barrel, segmented, cable and dumb-bell beads. This report has drawn upon various classifications including those proposed by Beck (1927), Guido (1978) and Hirst (2000). In the bead inventory within this report, dimensions include L = Length, D = Diameter, PD = Perforation Diameter. The amber bead includes W = Width and Dp = Depth.

Manufacture

This report does not go into great detail on individual bead manufacture, as much is already written on methods of manufacture on beads from archaeological contexts, such as Guido (1978) and Küçükerman (1988). Further invaluable reference can also be taken from modern-day bead makers such as Adams (2005).

All perforated beads, unless otherwise stated, have been wound, that is manufactured by winding molten glass around a thin metal rod (or mandrel) which is then heated to fuse and soften joins and irregularities within the bead.

The glass for the dumb-bell beads has been gathered, where a gob of molten glass has been picked up on the end of a rod. Whilst hot, the molten glass has then been cinched in the middle to form the two lobes. In the case of the blue toggle from Roestown 2, the cracking-off point at the end of one lobe is still visible, where it has been knocked off from the rod in order to cool.

Monochrome Translucent Blue

Blue beads came predominantly from both Castlefarm 1 and Roestown 2 with one also from Ardsallagh 2, ranging in tone from pale blue-tinted to appearing opaque in reflected light.

Blue annular and globular beads are renowned for being ubiquitous and long-lived, certainly from the Iron Age onwards, and thus not a great deal of help for dating. This infamy is caused no doubt in part, by the fact that blue glass, in most cases coloured by cobalt, is the easiest glass to make (Küçükerman, 1988, 81). It is likely however, that a proportion of the beads from the M3 excavations are of an Iron Age date, notably the one from Ardsallagh 2 and perhaps the darker blue examples from both Castlefarm 1 and Roestown 2. Guido (2000, 175) recognised that whilst this type of bead is not closely datable overall, a more significant number of Irish examples tend to come from sites or contexts dating from the 7th to the 10th centuries AD. This latter statement is well supported by finds of similar cobalt blue beads from a long list of sites including but certainly not limited to: Lough Gur, Co. Limerick (O Riordain, 1949), Lough Faughan Crannog, Co. Down (Collins, 1955), Garryduff, Co Cork (O'Kelly, 1963) and Feltrim Hill, Co. Dublin (Hartnett & Eogan, 1964).

The two barrel beads from Roestown 2 are both distinctive having the same paler grey-blue colour with a lot of small internal bubbles and a high gloss on the external surface. One (492:01) has the faint impression of a spiral pattern on opposing sides, as if a coloured glass had been applied there but perhaps not fused, possibly due to non-compatible coefficients of expansion. The pattern and general barrel shape is similar to a bead from Garryduff I, Co. Cork (O'Kelly, 1963, p.69, Fig.13, no.282) that is light blue with applied opaque white spirals on opposing sides and with an early medieval date. Both these beads from Roestown 2 have some residue on the perforation surface, most likely remnants of a ceramic-based bead release or former used to facilitate removal of a bead from the metal rod.

Blue segmented glass beads are also relatively common on early medieval sites in Ireland, even those comprising four units that have been recovered along with two and three segmented beads also, including Lough Gur (O Riordain, 1949, p.90, Fig.19, no.91), Lagore Crannog (Hencken, 1950, p.141; Fig.67, nos.51, 680, p.139), Garryduff (O'Kelly, 1963, p.69, Fig.13, nos. 484,485; p.76) and Deer Parks Farm, Co. Antrim (Hamlin & Lynn, 1988, p.47, Fig.56).

Castlefarm 1

1 A017/001:562:01 Translucent green-blue tinted, globular. L 5.5-7 mm; D 9 mm; PD 3.5-4 mm

2 A017/001:319:01 Translucent dark blue, annular. L 4.5-5.5 mm; D 7.5 mm; PD 3.5

3 A017/001:208:11 Translucent mid-blue, globular. l 4-6 mm; D 7.5 mm; PD 4-4.5 mm

4 A017/001:208:12 Translucent mid-blue annular. L 3.5-4 mm; D 7 mm; PD 4.5 mm

Ardsallagh 2

5 A008/034:4:01 Translucent dark blue, globular. l 5.5-6.5 mm; D 7.5 mm; PD 3.5-4 mm.

Roestown 2

6 A008/002:400:70 Translucent dark blue, globular. l 3.5-4 mm; D 6.5 mm; PD 3.75 mm.

7 A008/002:1081:01 Translucent dark blue, globular. L 5-5.5 mm; D 9 mm; PD 4-4.5 mm.

8 A008/002:492:01 Translucent light grey-blue, barrel. Faint spiral pattern on two sides. L 9 mm; D 8 mm; PD 4 mm.

9 A008/002:1182:01 Translucent light grey-blue, barrel. Reddish-brown residue on perforation surface. L 9 mm; D 9.5 mm; PD 6 mm.

10 A008/002:400:10 Translucent mid-blue, segmented. Comprising four segments. L 14 mm; D 9 mm; PD 4.5-5 mm.

Monochrome Opaque Yellow

The two opaque yellow beads both come from Roestown 2. The partial but diagnostic bead is an example of Guido's Class 8 (1978, 73-6), the main characteristics being the flattened perforation surfaces, and also the 'dull egg-yellow colour'. In Ireland, examples from a burial at Loughey, Donaghadee, Co. Down were found in association with a Meare Lake spiral bead

dating from the 3rd to 2nd centuries BC and a fibula dating to the mid-1st century BC (ibid., 74-5). Other examples however, concentrating in Somerset and Moray in Scotland give a broader general date range for this bead type of the 3rd to 2nd centuries BC until about AD 50 (ibid., 76). The second opaque yellow (A008/002:566:03) is not illustrated and is too fragmentary to be diagnostic. However, it is more likely to be globular bead rather than an annular.

11 A008/002:400:69 Partial opaque yellow annular bead, flattened perforation sides. L 2.5 mm; D 8 mm; PD 3 mm.

A008/002:566:03 Partial opaque yellow bead. *Not illustrated*

Cable (both monochrome and polychrome)

There are 5 beads made with one, two and three twisted and flattened cables. Three of these come from Roestown 2, and one each from Castlefarm 1 and Baronstown 1. Two further more conventionally-shaped cable beads come from Ardsallagh 5 and Dowdstown 2.

The tightly twisted rilled bead (491:03b) from Roestown can be compared to a similar example from the Viking burial assemblage from Kilmainham, Co. Dublin. This is labelled 'g' in Armstrong's illustration (Armstrong, 1921, p.72, Fig.1), a 'D'-shaped bead that Guido, in a more recent analysis of this particular assemblage, likens to contemporary metal examples, particularly from Scandinavia, but also copied from examples such as the bronze sword mounting from Lisnacrogher, Co. Antrim of a probable 9th century date (1985, 101).

491:03a is a roughly twisted single cable that is pretty much a flattened version of 491:03b, though not as finely twisted. The join is still visible where the ends have fused, often the case with these types of folded beads (Guido, 1978, 8).

The three remaining beads (Roestown 2, Castlefarm 1 and Baronstown 1) consist of multiple cables fused together and also have in common the remnants of an opaque yellow vitreous glass or paste present all around the cables and in between twists. The Baronstown cable has been further fused rather unevenly onto a solid flattened core of translucent blue glass. This compares particularly with Nos.11 and 109 from Cush (O Riordain, 1940, p.147, Fig.35), but particularly No.11 that has also been fused onto a blue core. There is also an example (No. 35) from Garryduff (O'Kelly, 1963, p.69, Fig.13; p.76) that Beck classified as Saxon and from Feltrim Hill, Co. Dublin (Hartnett & Eogan, 1964, p.31, Fig.15, No.535).

The bead from Ardsallagh 5 is of 2 polychrome cables wound to form herringbone pattern comparable to one (no. 239) from Lough Gur (O Riordain, 1949, p.90, Fig.19) dating to approximately the 8th to 11th centuries. An example (no. 1289, unillustrated) from Lagore Crannog Period II is of similar colours, yellow and green glass fused onto a blue core (Hencken, 1950, 139) as is one from White Fort, Co. Down (Waterman, 1956, p.86, Fig.10, No.1). More complex herringbone beads came also from Lagore (Hencken, 1950, p.138-9, Fig.66-7, nos.283, 984), Garryduff I (O'Kelly, 1963, p.69, Fig.13, no.346) and Seacash, Co. Antrim (Lynn, 1978, p.66, Fig.9, no.1), the latter being dated to the 9th to 10th centuries AD.

What is interesting to note that technically the Ardsallagh 5 herringbone bead could be interpreted as being the finished stage of manufacture of the cable bead from Baronstown 1 that has the same colouration. Does this mean that the roughly twisted and crudely fused cable beads are perhaps unfinished? And if this were the case, it is then interesting to note

the presence of these very similar beads at the three sites of Roestown, Baronstown and Castlefarm.

The annular from Dowdstown 2 has most likely been manufactured by winding a single *reticella* cable around a mandrel. Comparative beads, with this fine *reticella* cabling, can be seen in beads dating to the 6th-8th centuries AD from County Antrim, that Brugmann describes as having 'applied twisted trails' (2004, Fig.134).

Roestown 2

12 A008/002:491:03b Translucent colourless blue-green tinted rilled bead comprised of a single finely twisted rod, the ends overlapping where fused together. L 2.25 mm; D 9 mm; PD 5.5 mm.

13 A008/002:491:03a Translucent colourless blue-green tinted bead comprised of a single twisted rod. L 5 mm; D 9 mm; PD 5 mm.

14 A008/002:491:02 Opaque light yellow-green bead of two twisted rods, with remnants of an opaque yellow glass/paste trailed between both rods and individual twists. L 8 mm; D 8.5 mm; PD 5 mm.

Castlefarm 1

15 A017/01:34:01 Partial bead comprised of three twisted cables (aligned in the same direction) of opaque yellow-green glass fused together with the remains of opaque yellow vitreous paste between each cable and within some of the twists. Remnants of the same opaque yellow and some opaque red on the perforation surface, the latter possibly left over from a clay core used as a former. L 7.5 mm; D 10 mm; PD 5 mm.

Baronstown 1

16 A008/017:5012:01 Partial bead comprised of three twisted cables of gree-blue tinted glass fused onto a core of translucent blue glass. Remnants of opaque vitrous paste/glass between the two types of glasses, and between the cables and twists of the blue-green glass. L 6.5; D c.11 mm; PD c.7 mm.

Ardsallagh 5

17 A008/038:38:1 Opaque blue annular bead with an opaque yellow/translucent light green cable composed of two separate twisted rods forming a herringbone pattern. L 4.5-6.5 mm; D 9 mm; PD 4mm.

Dowdstown 2

18 A008/033:101:132 Translucent globular *reticella* bead comprising three twists of blue with very fine opaque white cables, creating a zig-zag pattern. L 5 mm; D 7 mm; PD 3.5 mm.

Polychrome Annular

Although this type of bead and decoration are relatively common bead throughout the Iron Age and early medieval periods the blue-green tinted bead itself is possibly re-used Roman glass. The red opaque applied glass forming the decorative but irregular wave pattern has weathered considerably.

19 Lismullin 1 A008/021:753:01 Translucent light green-blue globular bead with applied, opaque red trail. L 7 mm; D 14 mm; PD 4 mm.

Dumb-bells (both monochrome and polychrome)

There are 3 solid double-segmented objects that are known as 'dumb-bell' beads due to their shape and lack of perforation (Beck, 1927, 40). Two are from Roestown 2 and the third from Castlefarm 1, the latter being decorated with circular blobs of possibly opaque yellow or discoloured white glass. Dumb-bell beads are well represented in Ireland, mostly known from a number of crannog sites including Ballinderry Crannog 2, Co. Offaly (Hencken, 1942, 51; Fig.21, no.251, 57), Moylarg Crannog, Co. Antrim (Buick, 1893, 33, 35-6), Lagore Crannog, Co. Meath (Hencken, 1950, p.139, Fig.67, no.1471) all of an early medieval date. However, very similar Iron Age examples also come from the Isle of Man, including a pair from the fort at Scarlett on the southern coast (Gelling, 1958, p.94, Fig.4, nos.5-6), and a trio from a settlement site at Braust (Isle of Man Government, 2008).

Wilde described this type as a 'medieval double bead' and part of a composite object, being attached by wire around the central indent to a metal pin (1857, 163-4, Fig.118, No.42). Hencken (1942, 51) places them as buttons or toggles rather than beads.

Castlefarm 1

20 A017/001:795:3 Translucent light green bead. Each lobe has three applied dots of creamy white opaque glass approximately 3 mm in diameter. The smaller lobe has a large internal bubble. L 13 mm; D 9.5 mm.

Roestown 2

21 A008/002:400:44 Translucent cobalt blue bead. Cracked off pontil mark present (diameter 2 mm). L 11 mm; D 6 mm.

22 A008/002:552:01 Translucent green-blue tinted bead. Chipped on one lobe. Vestigial pontil on intact lobe (diameter 2.5 mm). L 11 mm; D 6.5 mm.

Post-Medieval

The following beads are most likely post-medieval in date, with some exhibiting weathering consistent with that period. The two faceted beads are both from Rath Hill 1 and have been made in the same fashion. The facets have been produced by pressing the bead onto a flat surface or marver, rather than cutting. They are not particularly well made. Although the site of Boyerstown 1 is of 12^{th}-14^{th} century date, the black bead would appear to be post-medieval, perhaps even 20^{th} century.

Philpotstown 1

23 A008/024:32:01 Partial translucent blue globular bead, iridescent weathering. L 8.5 mm; D c.10.5 mm; PD 3.5 mm.

Philpotstown 4

24 A008/083:10:01-03 Three translucent pale lemon yellow globular beads, opalescent weathering. L 7.5 mm; D 7.5 mm; PD 2.5 mm.

Boyerstown 1

25 A023/013:4:4320 Opaque black globular bead, high gloss. L 7.5 mm; D 10 mm; PD 2.5 mm.

Rath Hill 1

26 A017/018:89:02 Translucent blue-green faceted bead. L 10.5 mm; PD 3 mm.

27 A017/018:132:03 Translucent blue faceted bead, opalescent weathering. L 13 mm; PD 3 mm.

Faience

Faience melon beads are not found in pre-Roman contexts and the example from Lismullin 1 is likely to be of a c. mid 2nd century AD manufacture (Dr. Alison Sheridan[4], pers.comm.). Interestingly, good comparisons to the melon bead can be found from Garranes, Co. Cork (O Riordain, 1942) that have not been distinguished as being faience although their descriptions imply a glazed surface rather than an entirely glass bead. A further example of what is certainly faience (again, a note of a blue glazed surface only) comes from Ballinderry Crannog 2 (Hencken, 1942, 51; Fig.21, no.12, 52) dated as Roman but from an early medieval context. Faience is well evidenced in Britain and Ireland during the Bronze Age period, from the early 2nd millennium BC to approximately 1500BC and in Britain it is most well known from sites concentrated around Stonehenge, attributed to the Wessex culture, and Scotland (Sheridan 2005, 218). Blue segmented faience beads are the most common type in the Bronze Age (Williams et al, 1991, 55) so it is possible that the small bead from Calliaghstown is indeed of this period.

Lismullin 1

A008/021:160:06 Partial melon bead with light turquoise blue glaze on external and internal surfaces. L 10 mm; D c.15 mm; PD 8.5 mm.

Calliaghstown 1

A030/002:118:01 Partial segmented ?bead. Light turquoise blue glaze on external surface. L 5 mm; D 4-4.5 mm; PD 2 mm.

Bone

There is little further to say about this; identification of animal source is impossible without thin section analysis.

Boyerstown 1

A023/013:4:388 Globular bead, polished external surface. Remains of tool marks on one perforation side. L 6 mm; D 6 mm; PD 2.5-3 mm.

Stone

Calliaghstown 1

[4] Head of Early Prehistory, Archaeology Department, National Museums Scotland

A030/002:212:01 Partial opaque ivory-white annular bead. External surface highly polished. Possibly of a fine-grained impure marble. L 3.5 mm; D c.6 mm; PD c.4 mm.

Amber

The single find of amber has possibly been worked and if so is a fragment only of a larger object. It is a common material on Early Christian sites and is not out of place at Roestown 2.

Roestown 2

A008/002:570:02 Small irregular fragment of weathered orange amber, in two pieces. L 10 mm; W 8 mm; Dp 5 mm.

Discussion

The assemblage points towards imports, possibly from as early as the Bronze Age in the form of a small segmented bead of faience recovered from the ring-fort of Calliaghstown 1. Recent analysis has indicated significantly different chemical compositions between Bronze Age faience from Egypt and the Mediterranean and that occurring within Britain, Scotland and Ireland, enough to suggest discrete manufacturing centres in the south of England and Scotland, rather than long distance trade (Sheridan, 2005, 224). Faience also occurs as a 2nd century Roman import at the Iron Age site of Lismullin 1, not an isolated occurrence as others have been located from the long-lived sites of Garranes (also yielding Roman pottery) and Ballinderry Crannog 2. A bead of possibly re-used Roman glass also comes from Lismullin 1.

The assemblage also points towards continuity. Dumb-bell beads show a Celtic origin, not just from Ireland but interestingly a significant number also coming specifically from Iron Age sites on the Isle of Man. The dumb-bell beads also show a continuity of bead type, whether through continued manufacture or just through heirloom status, from the Iron Age and throughout the early medieval period as evidenced through the two from Roestown 2 and the third from Castlefarm 1. This continuity from Iron Age to early medieval is also seen in the Iron Age type of opaque yellow annular, also from Roestown 2.

As well as external trade the assemblage also points towards internal interaction, at least. All the cable beads are typically early medieval, and can be readily and easily compared to others from significant early medieval sites dating from the 6th to the 10th centuries such as Lagore Crannog, Garranes, Garryduff, Cush and Lough Gur, amongst others throughout Ireland. The similarity between the cable beads from Roestown 2, Castlefarm 1 and Baronstown 1 certainly indicates local interaction and on a wider scale, trade, though perhaps not necessarily in high-quality finished products.

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APPENDIX 11 Chipped and worked stone assemblage Dr. Eimear Neilis*:*

M3 Batch 2

CHIPPED AND WORKED STONE ASSEMBLAGE

ANALYSIS, CATALOGUES AND REPORTS

Bennetstown 1 (A017/003)
Bennetstown 3 (A017/005)
Knocks 1 (A017/022)
Leshamstown 1 (A017/025)
Knockmark 1 (A017/028)
Merrywell 1 (A017/029)
Drumree 1 (A017/027)
Johnstown 2 (A017/020)
Johnstown 3 (A017/021)
Ardsallagh 1 (A008/035)
Ardsallagh 2 (A008/034)
Ardsallagh 4 (A008/037)
Ardsallagh 5 (A008/038)
Kennastown 1 (A023/001)
Garretstown 2 (A008/008)

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NOVEMBER 2007

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Table 5.1: Knockmark 1 (A017/028) showing basic 22

terminations present on flake debitage and modified tools.

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Introduction

During a programme of archaeological testing at the M3 Clonee-North of Kells PPP scheme, an assemblage of chipped, worked and unworked stone was recovered from a total of fifteen sites, namely: Bennetstown 1 (A017/003: 8 pieces); Bennetstown 3 (A017/005: 1 piece); Knocks 1 (A017/022: 45 pieces); Leshamstown 1 (A017/025: 4 pieces); Knockmark 1 (A017/028: 34 pieces); Merrywell 1 (A017/029: 3 pieces); Drumree 1 (A017/027: 5 pieces); Johnstown 2 (A017/022: 10 pieces); Johnstown 3 (A017/021: 16 pieces); Ardsallagh 1 (A008/035: 20 pieces); Ardsallagh 2 (A008/034: 35 pieces); Ardsallagh 4 (A008/037: 2 pieces); Ardsallagh 5 (A008/038: 1 piece); Kennastown 1 (A023/001: 1 piece); Garretstown 2 (A008/008: 17 pieces). For each site assemblage, a similar analytical methodology has been applied (see *Methodology* below). The analysis for each site assemblage is presented individually (Sections 1-15); within each section, the assemblages are quantified and presented in catalogue form, and the composition of the assemblage is discussed in detail; the distribution of the assemblages is discussed, and the assemblages are discussed in their broader analytical context.

Methodology

All recovered artefacts have been presented for analysis, and have been studied visually and catalogued, and subject to statistical analysis based on the following attributes: contextual information (including context/feature/sample number etc), basic condition, extent of abrasion, material, colour, cortex, basic character and detailed classification, platform and termination type (where relevant for chipped stone), detail of working (where relevant), length (L), breadth (B), thickness (T), fragment size (given in mm) and mass (g). The criteria upon which these attributes have been selected, and the analytical methodology deployed, are presented in further detail elsewhere (Nelis 2003).

Section 1: Bennetstown 1 (A017/003)

Introduction

A total of eight chipped flint artefacts were recovered from Bennetstown 1 (A017/003; Table 1.1; Fig 1.1), where features including a burnt spread and a roughly circular setting of posts were excavated. Flint artefacts were recovered from C13 (the fill of a pit), C16 (burnt spread), C30 and C31 (redeposited natural) and C132 (topsoil). The fill of pit C13 yielded a single piece of micro-flake shatter; from C16, the burnt spread, was recovered the only modified tool within the assemblage (A017/003:16:1: scraper). The redeposited natural deposits yielded a piece of burnt flake shatter from C31, and from C30 a core and two flakes that seem to belong to a single knapping episode. A small trimming flake and the distal fragment of a small blade were found in topsoil (C132).

Analysis and discussion

The assemblage is mainly comprised of knapping debitage (7/8 pieces): specifically, flake debitage (6 pieces) and a single core were found (1 piece); one modified tool, a well produced scraper, was also found (Table 1.1).

Unique No	Context	Material	Condition	Cortex	Character	Classification	Frag size (mm)	Length (mm)	Breadth (mm)	Thickness (mm)	Mass (g)
A017/003:13:1	13	Flint	Fresh	Tertiary	Flake	Platform shatter proximal	12	-	5	3	0.07
A017/003:16:1	16	Flint	Patinated	Tertiary	Modified	Scraper	-	37	25	11	6.91
A017/003:30:1	30	Flint	Patinated	Secondary	Flake	Core trimming	-	22	14	4	1.01
A017/003:30:2	30	Flint	Patinated	Secondary	Core	Single platform partially flaked	-	22	25	30	15.98
A017/003:30:3	30	Flint	Patinated	Secondary	Flake	Core trimming	-	25	19	6	2.46
A017/003:31:1	31	Flint	Burnt	Tertiary	Flake	Indeterminate shatter flake	12	-	6	2	0.19
A017/003:132:1	132	Flint	Patinated	Secondary	Flake	Platform blade shatter distal	21	-	11	3	0.78
A017/003:132:2	132	Flint	Patinated	Tertiary	Flake	Small percussion trimming	-	15	12	3	0.36

Table 1.1: Bennetstown 1 (A017/003): showing basic attributes of the flint artefacts.

Primary debitage: cores and flakes

The primary debitage assemblage accounts for all but one artefact within the assemblage, and consists of a core (C30:2) and flake debitage (6 pieces), all of which were produced by platform reduction techniques. The flake debitage assemblage is comprised of three small trimming flakes (C30:1; C30:2; C132:2), as well as three pieces of flake shatter (C13:1; C31:1 and C132:1). All of the flakes and the core are small in scale (the largest complete flake being 25mm in maximum length, and the core measuring just 37mm in maximum length). The beach-rolled cortex found on the C30 debitage show that small-scale beach-rolled flint pebbles were exploited for use.

The core (A017/003:30:2) is a small single platform core formed on what may have been a flake, taken from a small beach-rolled pebble. It is probable that the core had been fully exhausted, given the fact that it was small in scale, but also because its reduction has rendered it heavily overshot and of limited further potential; however, the morphology of the core and flakes found in C30, and the distribution of cortex, suggest that the raw material which was exploited for use had always been small in scale, and so only a few flakes could have been removed from any one core. The platform evident on the core has been facetted by percussion flaking, showing an effort to prepare the platform edge prior to knapping. Such efforts are evidence of an attempt to tightly control the primary technology, and are echoed by the flake debitage assemblage: where the striking platforms have survived (on the trimming flakes C30:1; C30:2; C132:2), all were small planar examples with substantial platform edge trimming.

Unique No	Context	Character	Classification	Platform	Termination
A017/003:13:1	13	Flakes	Platform shatter proximal	Splintered	Not present
A017/003:16:1	16	Modified	Scraper	Planar <5mm with edge prep	Plunging
A017/003:30:1	30	Flakes	Core trimming	Planar <5mm with edge prep	Plunging
A017/003:30:2	30	Cores	Single platform partially flaked	Planar <5mm with edge prep	Plunging
A017/003:30:3	30	Flakes	Core trimming	Planar 5+ with edge preparation	Plunging
A017/003:31:1	31	Flakes	Indeterminate shatter flake	Not present	Not present
A017/003:132:1	132	Flakes	Platform blade shatter distal	Not present	Feathered
A017/003:132:2	132	Flakes	Small percussion trimming	Planar <5mm with edge prep	Feathered

Table 1.2: Bennetstown 1 (A017/003): showing further technical attributes of the flint artefacts.

Cores and flakes: refit groups

From C30, a core (A017/003:30:2) and two complete flakes (A017/003:30:1 & 3) were found. A successful attempt was made to refit these flakes, with A017/003:30:1 belonging to an earlier stage of the knapping process than A017/003:30:3 (Plate 1.1 and 1.2). While they could not be directly refitted to the core found within the same context, it remains a possibility that they were derived from it. As such, within the excavated assemblage, the refitted flakes are an isolated element of the original production sequence; despite their limitations, however, they appear to derive from a single-platform core.

Modified tools

A single modified tool was found (A017/003:16:1; Plate 1.3). This was a small, finely produced scraper with a 'teardrop' shape, minimally modified at its distal end only using fine pressure flaking. It is based on a flake with similar technical attributes to those present on the core and flake debitage assemblage: it was formed on a small flake, with a carefully prepared platform; therefore, while it cannot be conclusively proven, it is probable that this piece was derived from a core similar to that found in C30, and even possible that it was directly derived from it.

Discussion

A small but intriguing assemblage of worked flint was recovered from Bennetstown 1. The assemblage was comprised of a platform core, a quantity of platform flake debitage and a single scraper. The water-rolled, crazed cortex found on the C30 debitage shows that small-scale beach-rolled flint pebbles were exploited for use. In order to maximise the potential of raw material, a finely controlled reduction strategy was deployed, wherein small platforms were prepared and trimmed in order to encourage greater control in the production of flakes. Together with the small scale of the raw material (shown by the core and refitted flakes recovered from C30), it is probable that a limited supply of raw material also determined the use of controlled reduction techniques. The finely produced scraper recovered from the burnt spread C16 had not been subject to burning. This piece had been finely retouched, but not elaborately so, using only the minimum of modification required in order to produce a well-made tool. The assemblage as a whole is therefore suggestive of an industry that could draw on

relatively skilled knapping abilities, capable of controlling the production of flakes and the subsequent production of quite fine tools.

The chronological context of the assemblage is, however, unclear: the assemblage includes none of the few chronologically distinct technical traits found in flint artefacts in an Irish context. This might be so because of the particular pressure evident within this assemblage: that is, the limited quantity and scale of available raw material and functional requirements, together with skilful execution, have dictated the morphological content of the assemblage, and may have suppressed any distinctive chronological attributes, which in less constrained circumstances may otherwise have been present. The assemblage therefore displays evidence of having been produced in limiting conditions, and therefore it is these limitations which will largely dictate the content of any given assemblage. In an Irish context, the use of a controlled platform reduction technique in the knapping of small scale pebbles is found throughout the island where raw material availability is limited and where skilful ability is present, and this behaviour is largely confined to the Neolithic period (thereafter, the limitations of small scale raw material tends to be accompanied by the use of bipolar reduction techniques); however, platform reduction and the production of scrapers may continue into the Early Medieval period in Ireland, and therefore the precise dating of these deposits cannot be offered by the lithic assemblage.

Section 2: Bennetstown 3 (A017/005)

Introduction

At Bennetstown 3, a number of pits and postholes were excavated, the dating and function of which was unclear. A single chipped flint artefact was recovered from topsoil (A017:005:29:5; Table 2.1).

Analysis and Discussion

Unique No	Context	Material	Condition	Cortex	Character	Classification	Platform	Termination	Length (mm)	Breadth (mm)	Thickness (mm)	Mass (g)
A017/005:29:5	29	Flint	Patinated	Secondary	Blade: platform	Possible Late Mesolithic broad blade	Large planar	Plunging with cortical distal	56	28	14	23.96

Table 2.1: Bennetstown 3 (A017/005): showing basic attributes of the flint artefact.

This piece is a broad blade with a large, minimally prepared platform and a corticated distal end; it has been knapped from a uni-plane core, using a simple, plain platform, and based on a water-rolled pebble (Plate 2.1). It bears no evidence for having been utilised or modified further. Its simple morphology and technology are reminiscent of Late Mesolithic reduction techniques, and therefore it may date to this period; subsequent to this period, simple reduction techniques did continue, although more complex techniques began to develop and became dominant. In isolation, it is impossible to conclusively determine the date of this artefact, but it may have been produced as early as the Late Mesolithic. If this is the case, it has of course been residually redeposited into a modern context, having been recovered from topsoil. A limited C14 dating programme was implemented, which gives no indication of Late Mesolithic activity at the site, but points to Bronze Age activity. It is not possible to determine if this flint artefact was in any way related to this later activity.

Section 3: Knocks 1 (A017/022)

Introduction

Excavations at Knocks 1 (A017/022) uncovered a burnt stone spread enclosed by a ditch; beneath the stone spread a number of shallow pits and an alignment of post and stake holes were found, and in its earliest phase, the ditch had been segmented, before being opened up. The ditch is thought to date to the Neolithic period, with later activity relating to the Bronze Age period. These features yielded an assemblage of 45 flint artefacts (Table 3.1 and 3.2).

Assemblage composition

The flint assemblage included a small quantity of unworked material (2 pieces), with most being primary knapping debitage (1 core, 25 flake debitage, 3 angular shatter). The assemblage also included a substantial component of modified tools (14/45 pieces), accounting for almost one in three artefacts.

Distribution

Context No	Description	Unworked	Core	Flake Debitage	Angular shatter	Modified	TOTAL
28	Burnt mound spread	-	-	1	-	-	1
35	Loose clay deposit overlying natural	2	1	19	3	10	35
43	Clay/silty deposit	-	-	5	-	2	7
113	Upper fill in pit	-	-	-	-	1	1
187	Stone fill	-	-	-	-	1	1
	TOTAL	2	1	25	3	14	45

Table 3.1: Knocks 1 (A017/022): showing assemblage composition and distribution.

The majority of the assemblage was found in C35, a clay deposit (35/45 pieces) (Table 3.1); these included most of the modified tools (10/14 pieces) and flake debitage (19/25 pieces), as well as all of the unworked material, angular shatter and the only core in the assemblage. Most of the remaining flake debitage (5 pieces) and modified tools (2 pieces) were recovered from the clay deposit C43. The burnt mound spread C28 yielded a single piece of flake debitage; the fills C113 and C187 both produced modified tools.

Unique No	Context	Condition	Cortex	Character	Classification	Fragment size (mm)	Length (mm)	Breadth (mm)	Thickness (mm)	Mass (g)
A017/022:28:1	28	Fresh	Secondary	Flake	Platform distal blade shatter	21	-	15	8	2.51
A017/022:35:1	35	Fresh	Tertiary	Modified	Hollow based arrowhead fragment	24	-	17	3	.65
A017/022:35:2	35	Patinated	Tertiary	Flake	Burin spall	-	21	7	2	.35
A017/022:35:3	35	Abraded	Tertiary	Unworked	Thermal flake	-	43	25	9	10.08
A017/022:35:4	35	Abraded	Secondary	Flake	Platform proximal flake shatter	31	-	30	8	7.28
A017/022:35:5	35	Abraded	Tertiary	Flake	Platform medial blade shatter	31	-	17	5	3.18
A017/022:35:6	35	Patinated	Tertiary	Flake	Platform core trimming	-	17	20	4	.69
A017/022:35:7	35	Abraded	Secondary	Flake	Bipolar complete	20	-	17	3	.81
A017/022:35:8	35	Patinated	Secondary	Modified	Scraper	25	-	25	10	6.57
A017/022:35:9	35	Patinated	Tertiary	Angular shatter	Angular shatter	22	-	12	8	2.71
A017/022:35:10	35	Fresh	Tertiary	Flake	Platform small percussion	-	12	8	4	.34
A017/022:35:11	35	Fresh	Secondary	Modified	Scraper	35	-	26	9	8.97
A017/022:35:12	35	Abraded	Tertiary	Modified	Utilised	17	-	13	3	.72
A017/022:35:13	35	Abraded	Secondary	Flake	Platform core trimming	-	28	15	8	2.84
A017/022:35:14	35	Abraded	Tertiary	Flake	Platform distal blade shatter	28	-	14	7	2.46
A017/022:35:15	35	Fresh	Secondary	Flake	Platform distal flake shatter	15	-	15	3	.79
A017/022:35:16	35	Abraded	Tertiary	Flake	Platform proximal flake shatter	20	-	22	3	1.18
A017/022:35:17	35	Abraded	Secondary	Flake	Platform distal blade shatter	23	-	11	8	1.79
A017/022:35:18	35	Abraded	Tertiary	Flake	Platform core trimming	-	22	18	4	1.78
A017/022:35:19	35	Fresh	Secondary	Cores	Single platform partially flaked	-	22	32	20	18.63
A017/022:35:20	35	Abraded	Tertiary	Modified	Scraper	-	21	17	3	1.18
A017/022:35:21	35	Patinated	Tertiary	Flake	Platform proximal blade shatter	29	-	17	4	3.08
A017/022:35:22	35	Abraded	Secondary	Flake	Platform core trimming	-	22	35	8	3.73
A017/022:35:23	35	Abraded	Secondary	Unworked	Thermal flake	25	-	18	9	4.24
A017/022:35:24	35	Abraded	Secondary	Modified	Scraper	38	-	19	10	8.56
A017/022:35:25	35	Abraded	Secondary	Flake	Platform medial blade shatter	21	-	13	3	1.31
A017/022:35:26	35	Patinated	Secondary	Flake	Platform core trimming	-	22	16	7	1.69
A017/022:35:27	35	Patinated	Secondary	Flake	Platform core trimming	-	25	20	3	1.31
A017/022:35:28	35	Abraded	Secondary	Modified	Scraper	-	31	20	13	9.12
A017/022:35:29	35	Patinated	Secondary	Angular shatter	Angular shatter bipolar	-	17	15	11	2.93
A017/022:35:30	35	Patinated	Tertiary	Angular shatter	Angular shatter	-	9	6	3	.28
A017/022:35:31	35	Patinated	Tertiary	Modified	Edge retouched	-	35	20	8	3.65
A017/022:35:32	35	Abraded	Tertiary	Modified	Arrowhead tip	7	-	5	2	.21
A017/022:35:33	35	Abraded	Secondary	Modified	Edge retouched	-	64	33	11	18.72
A017/022:35:34	35	Abraded	Secondary	Flake	Platform complete	-	31	18	5	3.03
A017/022:35:35	35	Fresh	Tertiary	Flake	Platform small percussion	-	15	8	3	.40
A017/022:35:36	35	Patinated	Secondary	Flake	Platform distal blade shatter	21	-	15	8	2.51
A017/022:35:37	35	Abraded	Tertiary	Modified	Knives	-	61	15	9	9.56
A017/022:43:1	43	Patinated	Secondary	Flake	Platform distal blade shatter	28	-	18	6	3.98
A017/022:43:2	43	Patinated	Tertiary	Flake	Platform complete	-	32	25	6	5.01
A017/022:43:3	43	Burnt	Secondary	Flake	Platform distal blade shatter	35	-	21	7	5.97
A017/022:43:4	43	Patinated	Secondary	Modified	Scraper	-	17	21	6	3.04
A017/022:43:5	43	Patinated	Tertiary	Modified	Scraper	-	37	21	9	9.26
A017/022:43:6	43	Patinated	Secondary	Flake	Platform proximal flake shatter	17	-	31	8	2.31
A017/022:43:7	43	Patinated	Secondary	Flake	Platform medial flake shatter	20	-	30	7	3.97
A017/022:113:1	113	Patinated	Tertiary	Modified	Knives	-	61	15	9	9.56
A017/022:187:1	187	Patinated	Secondary	Modified	Knives	-	48	35	9	12.28

Table 3.2: Knocks 1 (A017/022): showing basic attributes of the flint artefacts.

Condition

Over one-half of the assemblage was in an abraded condition, having suffered post-depositional damage (Table 3.3); these artefacts, as well as the bulk of the remainder of the assemblage, had also been subject to weathering and were fully patinated. All of the abraded artefacts, and most of the patinated material, were found in C35 and C43. Only a small number of artefacts were in a fresh condition, and most of these were found in C35. None of the artefacts seem to have been subject to burning.

Condition	Unworked	Core	Flake Debitage	Angular shatter	Modified	TOTAL
Fresh	-	-	4	-	3	7
Patinated	-	-	9	1	5	15
Abraded/edge damaged	2	1	12	2	6	23
TOTAL	2	1	25	3	14	45

Table 3.3: Knocks 1 (A017/022): showing assemblage composition and condition.

Assemblage analysis

Unworked

Two thermally produced flakes were recovered during excavation of C35. These were small pieces of heavily abraded and patinated flint, which were not further worked or put to use.

Primary debitage: cores and flakes

Knapping debitage accounted for the majority of the assemblage, and included a single core, flake debitage (25 pieces) and angular shatter (3 pieces). The core (A017/022:35:19; Plate 3.1) was found in C35, and could not be refitted to any of the artefacts within the assemblage. It is a small, heavily reduced single platform core, bearing the scars of 4-5 small flake scars; its platform is facetted, and evidence for core edge trimming remains. These attributes point to a controlled technology and intensive reduction strategy and, bearing in mind its fully exhausted state, it is possible that a limited availability of raw material was behind the heavy working of this core.

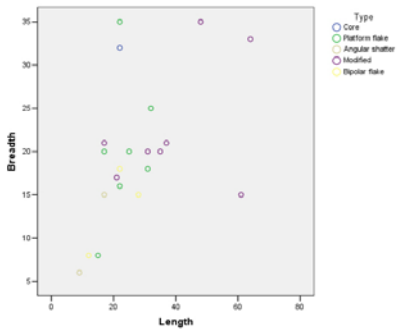

Fig 3.1: Knocks 1 (A017/022): Length by breadth (mm) of complete artefacts, showing different types.

In addition to the core, the bulk of the flake debitage was produced using platform reduction techniques (21/25 pieces). Of these, most were fragmentary flakes (3 proximal, 1 medial, 1 distal) or blades (1 proximal, 2 medial, 5 distal), and a burin spall was also found. The complete flakes (7 pieces) included a number of core trimming preparation flakes (5 pieces), but no complete blades were found. The remaining flake debitage had been produced using bipolar reduction techniques (4 pieces), most of which were complete flakes (3 pieces), but one of which was fragmentary. Table 3.4 shows that a variety of platforms and terminations were found on complete and shattered flake debitage: platforms varied from simple planar types, to those with edge preparation and trimming, and platform faceting; the majority of terminations were feathered, which in most cases would be the desired outcome, but plunging and hinging terminations were also found. This suggests that a range of reduction techniques were deployed, and it is possible that a knapping strategy could vary during the course of reducing a single core. The complete flake debitage was relatively small in scale, ranging between 12mm and just 32mm in maximum length, with three-quarters measuring 25mm in length or less. There was no difference noted between the dimensions of the platform and bipolar debitage, and although bipolar debitage tends to occupy the smaller scale debitage within an assemblage, this is not the case at Knocks 1. As such, at Knocks 1 it is unlikely that bipolar methods were deployed in order to work with particularly small scale material, as can often be the case; indeed the heavily reduced nature of the platform core indicates that platform methods were deployed quite intensively on small scale raw material.

Unique No	Context	Character	Classification	Platform	Termination
A017/022:28:1	28	Flake	Platform distal blade shatter	Broken	Feathered
A017/022:35:1	35	Modified	Hollow based arrowhead fragment	Retouched	Retouched
A017/022:35:2	35	Flake	Burin spall	Punctiform	Feathered
A017/022:35:4	35	Flake	Platform proximal flake shatter	Corticated	Broken
A017/022:35:5	35	Flake	Platform medial blade shatter	Broken	Broken
A017/022:35:6	35	Flake	Platform core trimming	Planar - <5mm	Feathered
A017/022:35:7	35	Flake	Bipolar complete	Bipolar	Broken
A017/022:35:8	35	Modified	Scraper	Broken	Retouched
A017/022:35:10	35	Flake	Platform small percussion	Bipolar	Feathered
A017/022:35:11	35	Modified	Scraper	Broken	Plunging
A017/022:35:12	35	Modified	Utilised	Planar - <5mm	Broken
A017/022:35:13	35	Flake	Platform core trimming	Corticated	Feathered
A017/022:35:14	35	Flake	Platform distal blade shatter	Broken	Plunging
A017/022:35:15	35	Flake	Platform distal flake shatter	Broken	Feathered
A017/022:35:16	35	Flake	Platform proximal flake shatter	Pressure facetted *chapeau de gendarme*	Broken
A017/022:35:17	35	Flake	Platform distal blade shatter	Broken	Feathered
A017/022:35:18	35	Flake	Platform core trimming	Bipolar	Feathered
A017/022:35:19	35	Cores	Single platform partially flaked	Multiple large facets	Hinged
A017/022:35:20	35	Modified	Scraper	Corticated	Hinged
A017/022:35:21	35	Flake	Platform proximal blade shatter	Planar <5mm with edge prep	Broken
A017/022:35:22	35	Flake	Platform core trimming	Planar <5mm with edge prep	Feathered
A017/022:35:24	35	Modified	Scraper	Broken	Retouched
A017/022:35:25	35	Flake	Platform medial blade shatter	Broken	Broken
A017/022:35:26	35	Flake	Platform core trimming	Corticated	Feathered
A017/022:35:27	35	Flake	Platform core trimming	Dihedral - 2 large facets	Feathered
A017/022:35:28	35	Modified	Scraper	Bipolar	Retouched
A017/022:35:31	35	Modified	Edge retouched	Splintered	Feathered
A017/022:35:32	35	Modified	Arrowhead tip	Broken	Broken
A017/022:35:33	35	Modified	Edge retouched	Splintered	plunging
A017/022:35:34	35	Flake	Platform complete	Planar - <5mm	Feathered
A017/022:35:35	35	Flake	Platform small percussion	Planar <5mm with edge prep	Feathered
A017/022:43:1	43	Flake	Platform distal blade shatter	Broken	Plunging
A017/022:43:2	43	Flake	Platform complete	Planar - 5+mm	Plunging
A017/022:43:3	43	Flake	Platform distal blade shatter	Broken	Plunging
A017/022:43:4	43	Modified	Scraper	Corticated	Retouched
A017/022:43:5	43	Modified	Scraper	Pressure facetted	Retouched
A017/022:43:6	43	Flake	Platform proximal flake shatter	Planar winged	Broken
A017/022:43:7	43	Flake	Platform medial flake shatter	Broken	Broken
A017/022:113:1	113	Modified	Knife	Retouched	Retouched
A017/022:187:1	187	Modified	Knife	Retouched	Plunging

Table 3.4: Knocks 1 (A017/022): showing platforms and terminations of flake debitage and modified tools.

None of the flake debitage could be directly conjoined with the core, nor could any of the flake debitage be conjoined with each other; however, many artefacts carried similar attributes, such as small, prepared platforms, and evidence on their dorsal faces of having been removed from heavily worked and complex cores. That is, like the core, some of the flake debitage was produced by a tightly controlled, intensive reduction strategy. For example, similarities can be drawn between C35:6, C35:16, C35:22, C35:26 and C35:27; these artefacts were core trimming flakes with multiple flake scars on their dorsal face (showing complexity in the reduction of the core from which they were knapped). They also had

complex, pressure facetted platforms, in some cases similar to the types of platforms used in the production of hollow scrapers (ie C35:16 and C35:27: although it should be noted that no hollow scrapers were found within the assemblage). It is possible that these flakes derive from a single knapping episode, although none of them could be directly conjoined with one another.

Angular shatter

A small quantity of angular shatter was found in C35 (3 pieces), one of which may be derived from bipolar knapping. All of this material was patinated and was small in scale, measuring less in 22mm in maximum dimensions.

Modified tools

Context \ Type	Scraper	Knives	Edge retouched	Utilised	Arrowhead	TOTAL
113	-	1	-	-	-	1
187	-	1	-	-	-	1
28	-	-	-	-	-	-
35	5	-	2	1	2	10
43	2	-	-	-	-	2
TOTAL	7	2	2	1	2	14

Table 3.5: Knocks 1 (A017/022): the distribution of the modified tools.

In total, 14 modified tools were recovered during excavations, constituting almost one-third of the assemblage. The majority of these are extensively worked, formal tool types: one-half are scrapers (7/14 pieces), two knives and two arrowhead fragments were also found. A small number of informal tools were found: these include minimally retouched tools which may have functioned as cutting tools (2 pieces), and a utilised fragment of unclear purpose. The modified tools were mainly recovered from C35 (10 pieces), including most of the scrapers, the arrowheads, and the edge retouched and utilised tools; two scrapers were found in C43 and the knives were found in C113 and C187 (Table 3.5).

Scrapers

In total, seven scrapers were found during excavations (C35: 5 pieces; C43: 2 pieces). They were quite varied in morphology and size, as well as the type of blank upon which they were formed, and the extent of retouch deployed in their manufacture. Only one of these was formed on a blank which could be considered naturally suitable for the production of classic scrapers (eg C43:4; Plate 3.2). In most cases, they were based on the distal fragments of seemingly unsuitable flakes or blades (eg C35:8; C35:11; C35:24; Plate 3.3) or on an irregular flake (C43:5; Plate 3.4) whereas in another case the ventral face of a small flake was naturally suitable for the production of a scraper, requiring very little retouch (C35:20; Plate 3.5); elsewhere, a bipolar-split pebble was the basis of a scraper (C35:28; Plate 3.6). This varied approach to the selection of blanks would suggest that, in some cases at least, existing debitage may have been opportunistically reused, rather than individually produced. Such behaviour is suggestive of a need to make the most of a limited availability of raw material and blanks, as well as a casual and flexible approach to the production of scrapers.

All of the scrapers could be described as small in scale, with none measuring more than 38mm in length; two of these could be described as thumbnail scrapers (C43:4 and C35:20), measuring just 17mm and 21mm in length respectively. The morphology of the scraping edge of these tools varied from convex (eg C35:20; C35:28; C43:4; C43:5), to being slightly irregular (C35:11) to being quite square (C35:8; C35:24).

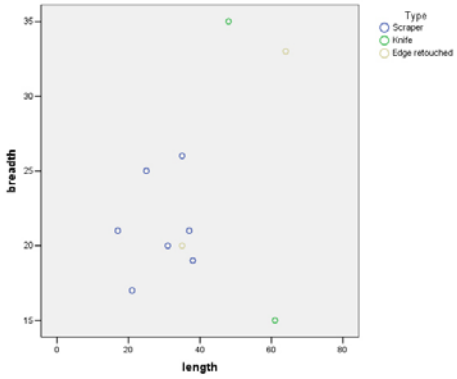

Fig 3.2: Knocks 1 (A017/022): Length by breadth (mm) of complete modified tools.

The dating of the scraper assemblage is, as is often the case in an Irish context, slightly vague. This is because the morphology of scrapers tend to vary

immensely, depending on access to (and dimensions of) raw material, technical ability, and widely variable functional requirements; all this, together with their longevity as a tool type, being found throughout the prehistoric period, results in a tool type which is difficult to tie down chronologically. The examples within this assemblage, however, carry some attributes which may help to narrow their chronological range: the small scale of the tools is something which tends to be found well into the Neolithic period (from the Middle Neolithic period onward, although this will ultimately be dictated by raw material dimensions). The assemblage also includes a small number of thumbnail scrapers, which seem to be first found in an Irish context during the Final Neolithic/Grooved ware period, and become very common by the Early Bronze Age (C35:20; C43:4; Nelis 2003). The small bipolar-split pebble scraper is also chronologically distinctive, as these are mainly found during the Early/Middle Bronze Age, when this becomes a common production technique (although these may too originate during the Final Neolithic; ibid). As such, it is probable that most of the scraper assemblage significantly post-dates the Early Neolithic period, and a few in particular probably date to the Final Neolithic and/or Early/Middle Bronze Age.

Knives

Two well produced knives were found (A017/022:187:1; A017/022:113:1); both of which are excellent examples of their type; however, unfortunately, the dating of these artefact types is a subject of debate. C187:1 is a commonly found type of knife: these are bilaterally retouched with a pointed tip, and a broad haft area. In this case, it is based on a flake which is narrow at the proximal end (which becomes the tip) and flares out toward a wide distal end (where it is hafted) (Plate 3.7). The other knife (C113:1) is a plano-convex example (in that it is fully retouched, and plano-convex in section) and is historically known (in an Irish context) as a ‘slug’ knife, due to its similarity in morphology (Plate 3.8). It would seem that ‘slug’ plano-convex knives are tools which generally have had their cutting edge(s) frequently resharpened, resulting in quite narrow tools which often have quite steep retouched cutting edges; they are found from the Early Neolithic onward, and possibly as late as the Early/Middle Bronze Age, although their chronological context is often unclear. On this piece, a small degree of ventral retouch is present, at the proximal end, thereby reducing the bulb of percussion and probably producing the tip of the knife. It is extremely long and thin, and heavily retouched along the right lateral edge; the left edge being only minimally

retouched and naturally quite steep. Given its intensive retouch along the right lateral edge, it is probable that the blank upon which it was based was once much broader than its final form; in this case, it is likely that the intensive retouch is the result of repeated sharpening along its main cutting edge (ie the right lateral edge).

One might wonder how effective as a cutting tool this may have been, given its steep edges, but the steep edges would also have contributed to its strength, making it less likely to break during use. It is therefore probable that this tool has witnessed a long period of use and was subject to considerable curation, during which repeated sharpening would mean that its morphology changed continually throughout its use-life. At the point of its deposition, it is tempting to suggest that its use may have been exhausted and it therefore may have been intentionally discarded rather than simply lost, although this is of course impossible to determine.

Arrowheads

Two arrowhead fragments were found (A017/022:35:1; A017/022:35:32) both of which were small pressure flaked projectiles. The more complete of the two (C35:1) is a fragmentary hollow based arrowhead, which is missing one barb (Plate 3.9). Although it was very finely retouched, it is possible that it was unfinished as its edge remains slightly irregular (something which might have been tidied once all other work was completed); however, this would not mean that the arrowhead could not be used. Such tools were once thought to date to the Neolithic period, but are now known to relate to the Early/Middle Bronze Age, and are typologically linked to Barbed and Tanged arrowheads (Nelis 2003). The remaining piece (C35:32) is a small tip fragment of a completed arrowhead, but it is not possible to determine the type of arrowhead to which it belonged (Plate 3.10).

Edge retouched and utilised tools

A small number of less formally produced tools were found (3 pieces), all from C35. These include two edge retouched pieces which seem to have been used as cutting tools (A017/022:35:31; A017/022:35:33). One of these was formed on a small flake (C35:31) (Plate 3.11); it had a minimally retouched notch as well as a straight area with some use-wear. Another piece, based on a large core

rejuvenation flake, had some retouch along a straight edge to create a cutting tool (C35:33; Plate 3.12). Such minimally retouched cutting tools are extremely commonly found throughout the Neolithic and Bronze Age period in particular, and they tend to be quite opportunistically produced and seem to be casually discarded; they are often formed on flakes which would be unsuitable for any other purpose, but which may have a fine, sharp edge which could easily be used as a cutting tool.

In addition to these pieces, a small flake fragment seems to have been used as a cutting tool without retouch (A017/022:35:12); however, given its fragmentary state it is not possible to say much more than this.

Discussion

An assemblage of 45 flint artefacts were found during excavations at Knock 1 (A017/022), where a segmented ditch underwent recutting and associated occupation activity; these features are thought to span the Neolithic and Bronze Age periods. The assemblage is mainly comprised of primary knapping debitage (1 core, 25 flake debitage, 2 angular shatter), but also includes a large number of modified tools (14 pieces), which account for one-third of the assemblage. Most of all of the artefacts were found in C35, and this includes the single core found on site, as well as most of the flake debitage and modified tools, and all of the unworked material and angular shatter.

The majority of primary knapping debitage are platform flakes, many of which are core trimming flakes, derived from the reduction of cores; none of the flake debitage was clearly derived from the secondary modification of tools. Like the core C35:19, the core trimming flakes indicate an intensive reduction strategy, deploying multiple and complex platforms in order to make the most of what may have been a limited supply of flint. Such techniques cannot be specifically dated, since they are found, in an Irish context, throughout the Neolithic period where a limited availability of flint is accompanied by a reasonably skilful knapping ability. That there is only limited evidence for the use of bipolar reduction techniques (a less controlled bashing/splintering method also used on small scale raw material) might suggest that most of the primary debitage assemblage dates to the Neolithic period, because bipolar techniques are more commonly found during the Bronze Age, but this argument can only be a generalisation. The flake debitage also includes examples which may be related to hollow scraper technology, a very

specific flake production technique which uses dihedral and *chapeau de gendarme* platforms to create trapezoidal flakes (eg C35:16; C35:27); however, no hollow scrapers were found within the assemblage, but the presence of these techniques may point to Middle Neolithic activity at the site.

Such a large component of modified tools is unusual, with most contemporary assemblages containing an average of 5-10% of modified tools. The composition of the assemblage at Knocks 1 might suggest that tools tended to be used rather than produced in the area of the excavated features. This is perhaps endorsed by a lack of cohesion between the flake debitage and modified tools, which appear to be unrelated: that is, the modified tools have not obviously been derived from the knapping which has taken place. Furthermore, the opportunistic reuse of flake debitage in the production of some of the scrapers, as well as the edge retouched tools, suggests that suitable debitage was not specifically produced for manufacture; rather, existing debitage was used, as and when a tool was required. It is interesting to note that such opportunism was found within the scraper assemblage, which is a little unusual since most assemblages would contain at least a few quite formally produced examples on more appropriate flake blanks. This indeed may indicate a limited availability of suitable blanks and perhaps raw material. In fact, there is also great variability within the scraper assemblage, in terms of dimensions, extent and quality of retouch, edge morphology, and therefore it is probable that these tools served a variety of functions (as scrapers often did) over an extended period of time.

It is likely that the extensively worked tools within the assemblage, in particular the knives and arrowheads, were subject to considerable curation; given the effort committed to their production, it is improbable that these tools were merely used in the area within which they were produced, and more likely that they were retained and carried from place to place. Again, this would mean that these tools would probably be unrelated to the debitage assemblage. This is likely to be particularly the case with the ‘slug’ knife (C113:1), which had been repeatedly sharpened and probably had quite an extensive use-life.

The dating of the artefacts at Knocks 1 is unclear, and is in fact symptomatic of a problem found at similar ditched sites throughout Ireland where multiple phases of activity have taken place during the Neolithic and Bronze Age periods (eg Lyle’s

Hill and Donegore Hill, Co Antrim; Nelis 2003). The difficulty with comparing recently excavated sites such as Knocks 1 with sites such as Lyle's Hill, for example, is that much of the information regarding context and phasing at these older excavations has often been lost in the interim. Consequently, residual deposition of the Neolithic artefacts into the later, Bronze Age, contexts at these early excavations has often failed to be fully understood and has further confused matters, sometimes leading to the incorrect interpretation of Neolithic tool types as later Bronze Age types. This has been problematic in establishing the dating of hollow based arrowheads, for example, but more challenging has been the confusion it has brought to the dating of the knives and scrapers: such tools are generically produced for millennia and identifying particular attributes which are specifically datable is not always possible, even in clearly phased contexts.

At Knocks 1, it is probable that the small thumbnail scrapers within the assemblage date to the Final Neolithic/Early Bronze Age, but the date of the remaining scrapers can only be broadly seen as spanning the Neolithic and Bronze Age periods; the dating of the knives is similarly vague, and they too could date to any point during the Neolithic, and much of the Bronze Age; and while it was once thought that hollow based arrowheads date to the Neolithic period, it is now known that they belong to the Bronze Age period (ibid). They are probably broadly contemporary with barbed and tanged arrowheads (the presence of the tang being the only significant difference between the two types, meaning that they would require different hafting methods), but they do seem to be less commonly found than their typological cousins.

The assemblage, therefore, includes a large component of tools, at least some of which have probably been produced beyond the area of excavation. Skill is evident in both the primary and modified assemblages, with the latter containing examples of opportunism (ie edge retouched tools, scrapers) as well as items of value (ie knives, arrowheads). It is probable that the assemblage represents multiple periods of use and some of the contexts may contain residually redeposited elements that might be further clarified through the analysis of more chronologically diagnostic artefact groups, such as the ceramic assemblage, but the evidence of the chipped stone assemblage suggests that most of this activity relates to the Neolithic and Early Bronze Age periods.

Section 4: Leshemstown 1 (A017/025)

Introduction

At Leshamstown 1 (A017/025) a fulacht fiadh was excavated, consisting of a crescent-shaped mound, a deep trough and a series of pits. From these deposits, four chipped stone artefacts were recovered (Table 4.1).

Analysis and Discussion

The assemblage consisted of a minimally used core (1 piece: C39:1) and flake debitage (3 pieces). No refit groups were present, and none of the artefacts appeared in any way related. The core was a small chert chunk, bearing some evidence for limited bipolar flaking. The flake debitage included two heavily fractured fragments: one seems to have been a distal flake fragment (C25:1: it was not clear if it was platform or bipolar derived), with the other possibly being a proximal bipolar flake fragment (C30:1). The remaining piece is a small patinated bipolar flake (C36:1).

Unique No	Context	Material	Condition	Cortex	Character	Classification	Fragment size (mm)	Length (mm)	Breadth (mm)	Thickness (mm)	Mass (g)
A017/025:21:1	21	Flint	Patinated	Tertiary	Flake shatter	Distal flake fragment	11	-	25	6	0.92
A017/025:30:1	30	Flint	Patinated	Secondary	Bipolar flake shatter	Proximal	20	-	10	5	0.98
A017/025:39:1	39	Chert	Abraded	Tertiary	Core	Bipolar flaked chunk	-	18	28	26	19.51
A017/025:68:1	68	Flint	Patinated	Tertiary	Flake	Bipolar flake complete	-	22	18	7	2.21

Table 4.1: Leshamstown 1 (A017/025): showing basic composition of assemblage.

The assemblage shows evidence for the limited knapping of flint and chert, mainly (and possibly exclusively) using bipolar reduction techniques; this might point to a limited need for the use of stone tools, as well as possible limitations on access to raw material. Activities at the site also seem to have caused these artefacts to be

smashed, but it is of note that none have been subject to burning. Beyond these limited observations, however, the assemblage is too limited in quantity and quality to allow a comment on its chronological context.

Section 5: Knockmark 1 (A017/028)

Introduction

At Knockmark 1 (A017/028) a number of archaeological areas were excavated (Areas 1, 2 and 3). Across these areas, cremation deposits, a hearth and associated features, pits and field boundaries were excavated; in addition, a number of tree boles were found and these predated much of the occupation activity. The bulk of occupation at the site is thought to date to the Neolithic period.

Unique No	Context	Material	Condition	Cortex	Character	Classification	Fragment size (mm)	Length (mm)	Breadth (mm)	Thickness (mm)	Mass (g)
A017/028:4:1	4	Flint	Patinated	Secondary	Modified	Minimally retouched knife	-	47	27	6	8.71
A017/028:4:2	4	Chert	Abraded	Tertiary	Flake	Bipolar flake complete	-	21	25	5	2.84
A017/028:4:3	4	Flint	Patinated	Secondary	Angular shatter	Angular shatter	10	-	5	3	.11
A017/028:4:4	4	Chert	Fresh	Tertiary	Flake	Bipolar shatter	35	-	16	8	3.98
A017/028:4:5	4	Flint	Patinated	Secondary	Core	Bipolar core	-	27	22	8	6.81
A017/028:4:6	4	Flint	Patinated	Secondary	Flake	Bipolar flake complete	-	28	15	14	5.95
A017/028:4:8	4	Flint	Patinated	Tertiary	Flake	Platform flake complete	-	12	18	2	.13
A017/028:4:9	4	Flint	Patinated	Secondary	Modified	Cutting/piercing	-	31	30	8	8.14
A017/028:4:10	4	Flint	Patinated	Secondary	Modified	Scraper	-	19	15	8	1.56
A017/028:4:11	4	Flint	Patinated	Tertiary	Angular shatter	Angular shatter	15	-	10	7	.99
A017/028:4:12	4	Chert	Fresh	Tertiary	Flake shatter	Bipolar medial flake shatter	19	-	15	6	1.03
A017/028:4:13	4	Chert	Burnt	Secondary	Unworked	Thermal flake	-	28	19	6	3.23
A017/028:4:14	4	Flint	Patinated	Tertiary	Angular shatter	Angular shatter	-	26	15	8	3.88
A017/028:4:15	4	Flint	Burnt	Secondary	Flake shatter	Platform distal blade shatter	31	-	17	6	2.85
A017/028:4:16	4	Flint	Patinated	Secondary	Flake	Platform blade complete	-	25	11	2	.73
A017/028:4:17	4	Flint	Patinated	Secondary	Flake	Bipolar core trimming	-	13	15	3	.51
A017/028:4:18	4	Flint	Burnt	Secondary	Flake	Bipolar flake complete	-	19	11	6	1.29
A017/028:4:19	4	Flint	Patinated	Secondary	Flake	Platform core trimming	-	11	17	5	.93
A017/028:4:20	4	Flint	Patinated	Secondary	Flake	Platform core trimming	-	17	21	4	1.64
A017/028:4:21	4	Flint	Burnt	Primary	Flake shatter	Indeterminate shatter	-	25	16	6	2.32
A017/028:4:22	4	Flint	Patinated	Tertiary	Flake	Platform core trimming	-	20	16	6	1.43
A017/028:4:23	4	Flint	Fresh	Tertiary	Flake shatter	Pressure flake shatter proximal	16	-	16	2	.70
A017/028:4:24	4	Flint	Patinated	Secondary	Flake	Bipolar core trimming	-	32	22	9	6.25
A017/028:4:27	4	Flint	Abraded	Secondary	Unworked	Unworked	-	54	56	44	182.53
A017/028:4:28	4	Flint	Patinated	Secondary	Modified	Minimally retouched knife	-	48	16	6	5.39
A017/028:5:1	5	Flint	Abraded	Secondary	Unworked	Nodule	-	17	12	11	3.43
A017/028:36:1	36	Flint	Patinated	Secondary	Flake	Bipolar flake complete	-	25	17	8	14.40
A017/028:39:1	39	Flint	Patinated	Primary	Flake	Bipolar flake complete	-	25	14	6	2.57
A017/028:71:1	71	Flint	Burnt	Tertiary	Flake shatter	Platform distal flake shatter	17	-	17	4	.62
A017/028:96:1	96	Flint	Patinated	Secondary	Flake	Bipolar core trimming	-	14	15	7	1.04
A017/028:97:1	97	Flint	Patinated	Secondary	Flake	Platform small percussion	-	11	11	3	.38
A017/028:134:1	134	Flint	Patinated	Tertiary	Flake	Platform blade complete	-	77	38	10	32.19
A017/028:145:1	145	Flint	Fresh	Tertiary	Flake shatter	Pressure flake shatter distal	10	-	5	1	.11
A017/028:154:1	154	Flint	Patinated	Secondary	Flake	Bipolar flake complete	-	22	16	5	1.15

Table 5.1: Knockmark 1 (A017/028): showing basic catalogue of assemblage.

Assemblage composition

A total of 34 chipped stone artefacts were found during excavations at Knockmark 1 (Table 5.1). A small amount of unworked material was recovered (3 pieces), but the assemblage was mainly comprised of primary knapping debitage: a single core was found (C4:5), and most of the remainder is flake debitage (23 pieces); a small quantity of angular shatter was also recovered (3 pieces). The assemblage also included a small number of modified tools (4/34 pieces), accounting for almost one in ten artefacts (Table 5.2). The majority of the assemblage is flint (30/34 pieces), but a small quantity of chert was also found (4/34 pieces) (Table 5.3).

Distribution

The bulk of the assemblage was found in a naturally occurring deposit (C4: 25/34 pieces), into which they had presumably been residually redeposited. Single artefacts were found in the following contexts: C5, C36, C39, C71, C96, C97, C134, C145, C154; 9 pieces in total) (Table 5.2). All of the chert artefacts were found in C4.

Context No	Description	Unworked	Core	Flake Debitage	Angular shatter	Modified	TOTAL
4	Natural	2	1	15	3	4	25
5	Topsoil	1	-	-	-	-	1
36	Lower fill in spread	-	-	1	-	-	1
39	Lower fill in pit	-	-	1	-	-	1
71	Tree bole fill	-	-	1	-	-	1
96	Pit fill	-	-	1	-	-	1
97	Upper ditch fill	-	-	1	-	-	1
134	Tree bole fill	-	-	1	-	-	1
145	Tree bole fill	-	-	1	-	-	1
154	Shallow deposit	-	-	1	-	-	1
	TOTAL	3	1	23	3	4	34

Table 5.2: Knockmark 1 (A017/028): showing assemblage composition and distribution.

Condition

Some of the assemblage remains in a fresh condition (4 pieces), but most of the assemblage has been subject to weathering and is in a patinated condition (22/34 pieces); a further few had suffered post-depositional damage, causing abrasion

(3/34 pieces), and a number had been subject to burning (5 pieces) (Table 5.3). The burnt artefacts include unworked material (1 thermal flake), flake debitage (1 platform distal flake shatter; 1 distal blade shatter, 1 indeterminate shatter, 1 complete bipolar flake); most were found in C4, with the exception of the platform distal flake shatter, which was found in the tree bole C71.

	Unworked	Core	Flake Debitage	Angular shatter	Modified	TOTAL
Material						
Flint	2	1	20	3	4	30
Chert	1	-	3	-	-	4
Condition						
Fresh	-	-	4	-	-	4
Patinated	-	1	14	3	4	22
Abraded	2	-	1	-	-	3
Burnt	1	-	4	-	-	5
TOTAL	3	1	23	3	4	34

Table 5.3: Knockmark 1 (A017/028): showing assemblage composition in relation to material and condition.

Assemblage analysis

Unworked

Three pieces of unworked stone were recovered (2 flint, 1 chert). Two of these were small, abraded and thermally damaged chunks (C4:13 chert; C5:1 flint), but the remaining piece was a large flint nodule (C4:27), with a maximum diameter of approximately 54mm and a mass(g) of 182.53g. Unlike the smaller unworked material, which are probably found occurring naturally within the local geology, It is possible that this piece was a curated nodule, intended for knapping, since such large examples of unworked material appear to be unusual in this area. It is of course impossible to put a date to this putative curation.

Primary debitage: cores and flakes

The majority of the assemblage was comprised of primary knapping debitage (ie material resulting from the knapping process: cores, flake debitage, angular shatter). A single bipolar core was found (C4:5): this was a small heavily reduced piece, formed on a small water-rolled beach pebble which bears 3-4 bipolar flake scars. Its base is in fact quite sharp, and it is possible that this piece was used as a wedge tool (ie for splitting materials such as bone and wood); such use for bipolar cores is quite common during the Neolithic period in Ireland, with examples

being found at sites such as Thornhill, Co Derry and Ballynagilly, Co Tyrone (Nelis 2003). This piece refits with one of the flakes (C4:6), a small bipolar piece: the fracture which divides them appears to be a genuine knapping episode because its technical traits concur with the remaining technical traits on the core. The flake was knapped prior to the artefacts being patinated and so, after knapping, both pieces were subject to similar weathering (Plate 5.1).

The remainder of the flake debitage assemblage includes similar quantities of platform and bipolar derived artefacts (12 platform debitage, 11 bipolar debitage) (Table 5.4). The platform debitage included complete (7 pieces: 6 flakes, 1 blade) and shattered (5 pieces) examples, all of which were flint. Most were found in C4, but some were also found in the ditch fill C97 (1 complete core trimming), as well as the tree boles C71 (1 distal flake shatter: burnt), C134 (1 complete blade) and C145 (1 pressure flake distal fragment). The complete platform debitage was generally very small in scale, ranging in maximum length from 11-77mm in length, although all but one piece measured 25mm or less.

The majority of the platforms had been simply formed, requiring little preparation prior to knapping: for the most part, these were planar examples, or the knappers made use of the plain surface of the cortex. Most of these flakes were small scale core trimming flakes, associated with core edge preparation. Only one of the platform pieces (C134:1: blade: by far the largest at 77mm) and two of the modified tools had evidence for core edge preparation (C4:1; C4:28). It is interesting that these tended to be the larger and finer flakes and blades within the assemblage, evidenced by the fact that two of the three were selected for the production of knives. It seems that greater care was taken in their production, probably because they were the objective of the knapping, and flaked with the intention of being a good quality flake for reuse. The example found in C134 was significantly larger and finer than most within the assemblage: it is tempting to suggest that such a fine blade was curated with a view to being retouched and utilised as required; this piece does not seem to have been used, although it could easily have been made into a fine knife, and so it may have been discarded or lost before being needed.

Some of the smaller flakes (ie (C4:8; C4:23) showed evidence of having been produced using a pressure flaking technique (unlike the percussion technique,

which accounts for the remainder of the assemblage). It is likely that these flakes (as well as C145:1, whose platform was missing) were related to secondary technology, that is, resulting from fine flake preparation or tool production.

Unique No	Context	Material	Character	Classification	Fragment size (mm)	Fragment size (mm)
A017/028:4:1	4	Flint	Modified	Minimally retouched knife	Planar <5mm with edge prep	Feathered
A017/028:4:2	4	Chert	Flake	Bipolar flake complete	Bipolar	Hinged
A017/028:4:4	4	Chert	Flake	Bipolar shatter	Splintered	Bipolar
A017/028:4:5	4	Flint	Core	Bipolar core	Bipolar	Bipolar
A017/028:4:6	4	Flint	Flake	Bipolar flake complete	Corticated	Bipolar
A017/028:4:8	4	Flint	Flake	Platform flake complete	Punctiform	Feathered
A017/028:4:9	4	Flint	Modified	Cutting/piercing	Corticated	Retouched
A017/028:4:10	4	Flint	Modified	Scraper	Corticated	Retouched
A017/028:4:12	4	Chert	Flake shatter	Bipolar medial flake shatter	Broken	Broken
A017/028:4:15	4	Flint	Flake shatter	Platform distal blade shatter	Broken	Plunging
A017/028:4:16	4	Flint	Flake	Platform blade complete	Corticated	Feathered
A017/028:4:17	4	Flint	Flake	Bipolar core trimming	Corticated	Feathered
A017/028:4:18	4	Flint	Flake	Bipolar flake complete	Bipolar	Bipolar
A017/028:4:19	4	Flint	Flake	Platform core trimming	Corticated	Feathered
A017/028:4:20	4	Flint	Flake	Platform core trimming	Corticated	Feathered
A017/028:4:21	4	Flint	Flake shatter	Indeterminate shatter	Broken	Broken
A017/028:4:22	4	Flint	Flake	Platform core trimming	Planar - <5mm	Feathered
A017/028:4:23	4	Flint	Flake shatter	Pressure flake shatter proximal	Punctiform	Broken
A017/028:4:24	4	Flint	Flake	Bipolar core trimming	Bipolar	Feathered
A017/028:4:28	4	Flint	Modified	Minimally retouched knife	Planar <5mm with edge prep	Feathered
A017/028:36:1	36	Flint	Flake	Bipolar flake complete	Bipolar	Bipolar
A017/028:39:1	39	Flint	Flake	Bipolar flake complete	Bipolar	Bipolar
A017/028:71:1	71	Flint	Flake shatter	Platform distal flake shatter	Broken	Hinged
A017/028:96:1	96	Flint	Flake	Bipolar core trimming	Bipolar	Bipolar
A017/028:97:1	97	Flint	Flake	Platform small percussion	Planar - <5mm	Feathered
A017/028:134:1	134	Flint	Flake	Platform blade complete	Planar <5mm with edge prep	Feathered
A017/028:145:1	145	Flint	Flake shatter	Pressure flake shatter distal	Broken	Feathered
A017/028:154:1	154	Flint	Flake	Bipolar flake complete	Bipolar	Plunging

Table 5.4: Knockmark 1 (A017/028): showing platforms and terminations present on core, flake debitage and modified tools.

The remaining flake debitage was comprised of bipolar debitage (11 pieces), most of which were complete (9 pieces); both of the bipolar shattered pieces were chert (C4:12: 1 medial flake shatter; C4:4: 1 distal flake shatter), as was one of the complete bipolar flakes (C4:2). Complete bipolar flakes were found in C36, C39, C96 and C154, and the remaining complete and shattered debitage were found in C4 (7 pieces).The bipolar debitage was small in scale, with complete pieces measuring between 13-32mm in maximum length, and most measuring less than

25mm (>75%). One of the complete bipolar flakes (C4:6) could be conjoined with the core (C4:5), but no other refit groups were present within the assemblage.

Angular shatter

A small number of shattered angular fragments were found (3 pieces). All were flint, and all were found in C4. These were small in scale, with the largest measuring 26mm in maximum dimensions. It seems that they are a by-product of the knapping process, but little further comment can be made.

Modified tools

A small number of modified tools were found during excavation (4 pieces), all of which were flint and were in a patinated condition. These include two minimally retouched knives (C4:1: Plate 5.2; C4:28: Plate 5.3), as well as an edge retouched tool which may have primarily served as a piercer, but could have been used for cutting (C4:9: Plate 5.4). The remaining piece is a thumbnail scraper (C4:10: Plate 5.5). It is unfortunate that all were found to have been residually redeposited into a naturally occurring deposit (C4), and therefore cannot be directly related to any of the archaeological remains in particular.

Both of the knives have been minimally retouched, but are formed on long flakes (C4:1) or blades (C4:28) produced through platform reduction. Despite being minimally worked, the quality of the retouch, as well as that of the flakes themselves, is quite fine, and their cutting edges are perfectly straight. This is of note since it is more common for minimally retouched cutting tools to be more irregular and less finely worked. C4:1 has been retouched long one edge only, with its other side being blunted (in this case, by an area of cortex); such ‘backed’ knives are commonly found during the Neolithic period in Ireland, but they are such simplistic and common tools in terms of morphology and longevity that it is possible that they continue into the Bronze Age. C4:28 is also a commonly found type of knife: it has been finely retouched along one edge but also has some irregular nibbling (possibly a later modification) along its other edge. Unlike C4:1, this piece also has a distinct tip, making use of the proximal/platform end, which in this case (unusually) has not been further retouched. It is likely that it was hafted at the flaring distal end. Like C4:1, these knives are also unhelpful in terms of refined dating; they too are commonly found throughout the Neolithic period in Ireland and possibly into the Bronze Age.

The remaining tools are based on bipolar flakes. The edge retouched tool (C4:9) is based on a broad flake derived from a small water-rolled beach pebble. It carries fine retouch along its lateral edges which concave gently towards a point. It is a difficult piece to interpret because its lateral edges do not seem long enough to function adequately as cutting edges, nor does its tip seem sharp enough to function as a piercer. It does, however, appear to combine both these purposes, and the working is quite skilful. In terms of dating, such tools represent opportunism and a lack of regard for form; as such, it could have been produced at any point during the Neolithic or Bronze Age periods. The assemblage also included a single scraper (C4:10). This is a small minimally, but finely, produced tool, formed on a small bipolar flake. Such scrapers do not make an appearance in Ireland until the Final Neolithic/Grooved ware period at the earliest, and are particularly commonly found during the Early Bronze Age; therefore, this tool undoubtedly belongs to one of these two periods during Irish prehistory.

Discussion

A flint and chert assemblage of 34 artefacts was found during excavations at Knockmark 1. They were comprised of unworked material (3 pieces), a core (1 piece), flake debitage (23 pieces), angular shatter (3 pieces) and modified tools (4 pieces). The core was a small bipolar example, which could have been used as a wedge tool, for splitting softer materials, such as wood or bone. The core could be conjoined with a bipolar flake from the flake debitage assemblage, and the remainder of the flake debitage assemblage was similarly comprised of bipolar, as well as platform derived, material. The majority of the debitage assemblage was produced by quite simplistic techniques: bipolar reduction requires no preparation, and the platform techniques showed little sign of preparation. The debitage was also quite small in scale, related to core trimming and preparation, and some may have derived from the secondary production of tools, but three pieces stood apart: these were larger pieces with more complex platforms. Two of these (a long flake and a blade) had been selected for manufacture as knives, and the remaining piece (C134:1) significantly larger than the remainder of the assemblage at 77mm) would have made a fine knife, had it been modified. It is probable that this selection of blank was not accidental: either (a) the blanks were knapped elsewhere and curated to Knockmark 1, perhaps even the subject of trade/exhange, or (b) the aim of the platform knapping strategy was the production

of these blanks. If the latter was the case, based on the trends within the platform debitage assemblage, the *chaine operatoire* would be that simple knapping techniques were used in core reduction until the point where a good quality blade could be produced; at this point, the core would be carefully prepared before this flake would be knapped. All this is, of course, conjecture; not least because the debitage assemblage is arguably the product of numerous knapping episodes (*ex hypothesi* most cannot be refitted, and the majority were found in non-archaeological deposits). The remaining tools were formed on bipolar flakes, and these include a thumbnail scraper and an unusual piece which seems to be a cutting/piercing tool (but not overtly or clearly a knife). The thumbnail scraper is the only tool which can be placed within a narrow chronological framework: they are first found in an Irish context during the Final Neolithic/Grooved ware period and are very commonly found during the Early Bronze Age (Nelis 2003). The remainder of the assemblage is compatible with these dates, but it need not necessarily be contemporary with the thumbnail scraper, because the contexts of deposition are varied, or are non-archaeological.

Section 6: Merrywell 1 (A017/029)

Introduction

Excavation at Merrywell 1 (A017/029) uncovered the Medieval remains of a ridge and furrow field system and a large well or cistern. A large assemblage of Medieval pottery was found, in addition to wooden structural remains and small finds. Lithic artefacts were found in C5, C25 and C29 (Table 6.1).

Analysis and Discussion

Three piece of flint were found (Table 6.1), including flake debitage (2 pieces) and a small scraper (1 piece). The flakes were produced using platform reduction methods, whereas bipolar techniques had been deployed in the production of the scraper. All of the artefacts were small in scale, with the flake debitage measuring 31mm or less in length, and the scraper measuring just 28mm in length.

Unique No	Context	Material	Condition	Cortex	Character	Classification	Platform	Termination	Length (mm)	Breadth (mm)	Thickness (mm)	Mass (g)
A017/029:5:6	5	Flint	Patinated	Tertiary	Flake	Platform core trimming	Winged	Hinged	17	22	2	.98
A017/029:25:54	25	Flint	Fresh	Secondary	Modified	Bipolar Scraper	Bipolar	Feathered	28	20	8	5.48
A017/029:29:1	29	Flint	Fresh	Tertiary	Flake	Platform blade complete	Splintered	Plunging	31	15	4	1.28

Table 6.1: Merrywell 1 (A017/029): showing basic catalogue of assemblage.

The scraper was based on a small bipolar flake, derived from a small beach-rolled flint pebble. Its scraping edge was formed on its proximal end and has been retouched using quite fine edge retouch and semi-invasive pressure flaking to produce a shallow scraping edge. Along one lateral edge, similarly fine pressure flaking has produced a straight edge which may have been useful for cutting as well as scraping (Plate 6.1). None of the artefacts were directly related, and none could be refitted. None of the artefacts could be closely dated: generic scrapers, such as this piece, can be found during any period ranging from the Neolithic through to the historic period, although they are often thought to relate to the Late Neolithic period and Early/Middle Bronze Age.

Section 7: Drumree 1 (A017/027)

Introduction

At Drumree 1 (A017/027), a series of archaeological features, including a possible burnt mound, as well as post and stake holes, were found. From these deposits, a total of five lithic artefacts were found (Table 7.1).

Analysis and Discussion

Four flint artefacts and a single chert piece were recovered (Table 7.1). These were comprised of flake debitage (3 pieces), as well as angular shatter (1 chert piece) and a fragment of a modified tool, possibly of a knife. The flake debitage and the modified tool were found in topsoil, with the chert angular shatter being found in the rectangular pit C77. All of the flake debitage was derived from platform reduction techniques, and included small scale debitage, included a core trimming flake and a blade fragment.

Unique No	Context	Material	Condition	Cortex	Character	Classification	Platform	Termination	Fragment size (mm)	Length (mm)	Breadth (mm)	Thickness (mm)	Mass (g)
A017/027:4:1	4	Flint	Fresh	Tertiary	Flake	Platform core trimming	Pressure facetted	Feathered	-	20	15	3	0.67
A017/027:4:2	4	Flint	Patinated	Secondary	Flake	Platform complete	Cortical	Hinged	-	15	10	4	0.28
A017/027:4:3	4	Flint	Patinated	Tertiary	Flake	Platform Proximal blade shatter	Punctiform	Broken	25	-	8	3	0.38
A017/027:4:4	4	Flint	Patinated	Tertiary	Modified	Knife fragment	Punctiform	Retouched	-	23	17	8	3.04
A017/027:77:1	77	Chert	Fresh	Tertiary	Angular shatter	Angular shatter	Not relevant	Not relevant	-	28	17	8	3.03

Table 7.1: Drumree 1 (A017/027): showing basic catalogue of assemblage.

The modified tool appears to be the tip fragment of a knife, which may have been reused subsequent to breakage (Plate 7.1). When complete, the knife may have been a long narrow tool formed on a blade, and the tip would have been formed on the proximal end of the blade, as was commonly the case with such tools. Some crushing damage at the tip, and pressure flaking located along the break (and therefore necessarily undertaken after the break had occurred) suggest that the fragment was reused; the purpose of this reuse is unclear, but given the

nature of the damage, the fragment may have been used as a wedge or as a scraper.

Given its incomplete state, and its subsequent reuse, the knife fragment is difficult to place within a chronological framework, although such knives were found during the Neolithic and Bronze Age periods. The attempted reuse of such a small piece of flint represents opportunism and economy in the exploitation of good quality flint, which appears to have been valued, retained and reused where possible.

Section 8: Johnstown 2 (A017/020)

Introduction

Excavations at Johnstown 2 (A017/020) revealed numerous archaeological features over three discrete areas. These features included circular bowl furnaces, pits and a kiln.

Analysis and Discussion

A small assemblage of flint and quartz artefacts was recovered from the surface deposit C4 (3 pieces), and the fills of a sub-circular pit (C33: 4 pieces) and C36 (3 pieces) (Table 8.1). One-half of the assemblage was unworked (5 pieces: 4 flint, 1 quartz), including all of the artefacts found in C36, and two of the four artefacts found in C33. The remainder of the assemblage was comprised of a core (1 piece), flake debitage (3 pieces) and a modified tool – an edge retouched flake (1 piece: Plate 8.2). Two of the flakes constitute the remaining artefacts found in C33. The core and the edge retouched tool, as well as a small flake, were found in C4.

Unique No	Context	Material	Condition	Cortex	Character	Classification	Fragment size (mm)	Length (mm)	Breadth (mm)	Thickness (mm)	Mass (g)
A017/020:4:1	4	Flint	Fresh	Secondary	Cores	Bipolar	-	28	25	10	4.25
A017/020:4:2	4	Flint	Fresh	Tertiary	Flake	Bipolar complete	-	21	7	4	0.52
A017/020:4:3	4	Flint	Patinated	Tertiary	Modified	Edge retouched	-	30	20	6	3.59
A017/020:33:1	33	Flint	Fresh	Tertiary	Flake	Medial blade shatter	20	-	10	3	0.61
A017/020:33:2	33	Flint	Abraded	Secondary	Unworked	Abraded lump	-	11	10	6	0.68
A017/020:33:3	33	Flint	Patinated	Secondary	Unworked	Abraded lump	-	7	5	2	0.13
A017/020:33:4	33	Flint	Patinated	Tertiary	Flake	Pressure blade	-	10	5	1	0.07
A017/020:36:1	36	Flint	Patinated	Tertiary	Unworked	Abraded lump	-	7	4	3	0.11
A017/020:36:2	36	Flint	Patinated	Tertiary	Unworked	Abraded lump	-	7	5	5	0.22
A017/020:36:3	36	Quartz	Abraded	Tertiary	Unworked	Abraded lump	-	13	8	7	1.03

Table 8.1: Johnstown 2 (A017/020): showing basic catalogue of assemblage.

The core is a small bipolar example, formed on a small flake (Plate 8.1). Of the three flakes, one exhibited bipolar reduction techniques (C4:2); the remaining flakes included a shattered blade (C33:1) and a small blade resulting from pressure flaking (C33:4: possibly as a result of core preparation or tool

production). The modified tool also appears to be unrelated to the primary debitage assemblage (C4:3). It is a small, minimally retouched tool formed on a small platform flake, apparently functioning as a piercer and also possibly as a cutting tool (Plate 8.2).

Given the small quantity of worked artefacts recovered, little can be said regarding the reduction strategy evident at Johnstown 2. The core and flake debitage appear to be unrelated, and therefore it is probable that the assemblage represents the remains of numerous, individual knapping episodes. Both platform and bipolar reduction techniques were known, and both percussion and pressure flaking is also in evidence. A date for the assemblage cannot be established more satisfactorily than to say that the assemblage post-dates the Mesolithic period, and that all elements could have been produced at any point spanning the Neolithic to the historic period.

Section 9: Johnstown 3 (A017/021)

Introduction

At Johnstown 3 (A017/021) a series of structural remains, comprised of an occupation horizon, post holes, pits and industrial activity, were excavated. These features are thought to date to prehistory, in particular to the Neolithic period.

Assemblage composition

An assemblage of flint artefacts was recovered during excavation (16 pieces; Table 9.1). The majority of these were flake debitage (11 pieces), with a single piece of angular shatter, and a number of modified tools (4 pieces) being found. No unworked material or cores were found.

Unique No	Context	Material	Condition	Cortex	Character	Classification	Fragment size (mm)	Length (mm)	Breadth (mm)	Thickness (mm)	Mass (g)
A017/021:70:1	70	Flint	Fresh	Tertiary	Angular shatter	Angular shatter	-	11	5	4	.39
A017/021:71:1	71	Flint	Patinated	Secondary	Modified	Edge retouched	-	38	15	4	3.62
A017/021:71:2	71	Flint	Patinated	Primary	Flake	Bipolar flake complete	-	32	25	10	8.59
A017/021:130:1	130	Flint	Burnt	Secondary	Modified	Knives	-	32	15	6	3.80
A017/021:130:2	130	Flint	Burnt	Secondary	Flake	Indeterminate shatter	17	-	8	2	.35
A017/021:130:3	130	Flint	Fresh	Tertiary	Flake	Indeterminate shatter	10	-	5	1	.15
A017/021:131:2	131	Flint	Fresh	Tertiary	Flake	Platform distal shatter	11	-	14	3	.31
A017/021:131:3	131	Flint	Fresh	Tertiary	Flake	Pressure flake	-	5	4	1	.12
A017/021:131:7	131	Flint	Burnt	Tertiary	Flake	Indeterminate shatter	11	-	8	2	.29
A017/021:133:13	133	Flint	Patinated	Tertiary	Flake	Bipolar proximal shatter	25	-	15	7	2.34
A017/021:134:1	134	Flint	Patinated	Tertiary	Modified	Scraper	-	28	25	14	10.56
A017/021:134:7	134	Flint	Patinated	Tertiary	Flake	Indeterminate shatter	25	-	12	7	.96
A017/021:136:4	136	Flint	Patinated	Tertiary	Flake	Platform flake complete	-	17	17	3	.13
A017/021:139:2	139	Flint	Abraded	Tertiary	Flake	Platform core edge rejuv	-	28	15	5	2.32
A017/021:139:3	139	Flint	Burnt	Tertiary	Modified	Arrowhead - blank	10	-	16	5	.87
A017/021:139:4	139	Flint	Burnt	Tertiary	Flake	Indeterminate shatter	-	18	15	3	.91

Table 9.1: Johnstown 3 (A017/021): showing basic catalogue of assemblage.

Distribution

The assemblage was recovered from a small number of deposits (Table 9.2). A small quantity were found in ditch fills C70 (1 angular shatter) and C71 (1 flake debitage, 1 edge retouched tool), and a similar number were found in pit fills C134 (1 flake debitage, 1 scraper) and C136 (1 flake debitage). The remainder were found within various spreads and deposits (C130: 2 flake debitage, 1 burnt knife;

C131: 3 flake debitage; C133: 1 flake debitage; C139: 2 flake debitage, 1 burnt arrowhead fragment).

Context No	Description	Unworked	Core	Flake Debitage	Angular shatter	Modified	TOTAL
70	Ditch fill	-	-	-	1	-	1
71	Ditch fill	-	-	1	-	1	2
130	Shallow deposit atop rubbish tip	-	-	2	-	1	3
131	Clay/silty deposit	-	-	3	-	-	3
133	Deposit with burnt stones and cremated bone	-	-	1	-	-	1
134	Fill of pit	-	-	1	-	1	2
136	Fill of pit	-	-	1	-	-	1
139	Cleaning layer of the site	-	-	2	-	1	3
	TOTAL	-	-	11	1	4	16

Table 9.2: Johnstown 3 (A017/021): showing assemblage composition and distribution.

Condition

The majority of the assemblage was in a fresh (4 pieces) or partially patinated (6 pieces) condition, and had therefore suffered limited weathering; one piece of flake debitage had been more substantially weathered, and was in an abraded condition. A significant element of the assemblage, however, had suffered burning (5/16 pieces), and these included flake debitage (C130:2; C131:7; C139:4), as well as a knife (C130:1: Plate 9.2) and an arrowhead fragment (C139:1: Plate 9.4).

Condition	Unworked	Core	Flake Debitage	Angular shatter	Modified	TOTAL
Fresh	-	-	3	1	-	4
Patinated	-	-	4	-	2	6
Abraded	-	-	1	-	-	1
Burnt	-	-	3	-	2	5
TOTAL	-	-	11	1	4	16

Table 9.3: Johnstown 3 (A017/021): showing assemblage composition in relation to condition.

Assemblage analysis

Unworked

No unworked artefacts were found during excavation.

Primary debitage: cores and flakes

No cores were found, but the majority of the assemblage was comprised of flake debitage (11/16 pieces). These included a small number of bipolar pieces, with a proximal bipolar (unburnt) fragment being found in the burnt deposit C133, and a complete bipolar flake being found in the ditch fill C71. The majority, however, had been produced by platform reduction techniques (9/11 flake debitage); in all likelihood this includes the heavily fractured flake fragments found in the deposits C130 (C130:2 and 3) and C131 (C131:7), the pit fill C134 (C134:7), and the cleaning layer C139 (C139:4) (5 pieces: Table 9.1). The remaining flake debitage included a less comprehensively shattered flake fragment (C131:2) and a small number of complete flakes. These complete pieces were found in the deposit C131 (C131:3), the pit fill C136 (C136:4) and the cleaning deposit C139 (C139:2). These included a core preparation flake (C139:4) and a small pressure flake, possibly resulting from tool production (C131:3). The complete platform debitage was small in scale, ranging in length from just 5-28mm; the complete bipolar flake measured 32mm in length. In the few cases where platforms survived (ie on the complete platform debitage), they tended to be quite small and carefully prepared, showing a controlled and well planned reduction strategy.

Angular shatter

A single piece of angular shatter was found in a ditch fill C70. It was a small, fresh, uncorticated piece of flint with a maximum length of just 11mm.

Modified tools

One-quarter of the assemblage was comprised of modified tools (4 pieces). These included an edge retouched blade which was probably used as an expedient cutting tool, found in the ditch fill C71 (C71:1) (Plate 9.3). This made use of a fine bipolar blade, derived from a beach-rolled pebble. From C130, a burnt knife was found (C130:1) (Plate 9.2). This was a small plano-convex knife, with steep cutting edges on both laterals; due to their appearance, such tools are known as ‘slug’ knives. It has been heavily burnt, and bears fine semi-invasive pressure flaking along all edges and its tip, retaining some cortex on its dorsal ridge. In some

cases, their diminutive size can be the result of multiple phases of resharpening, but in this case it is probable that it had always been a small tool. In an Irish context, knives are notoriously difficult to date: this is largely because they follow few typological patterns during their period of use, which itself extends for millennia, from the Early Neolithic through to the Bronze Age at least. Small plano-convex knives such as this can be found from the Early Neolithic period onward.

A scraper was also found (C134:1) (Plate 9.1): this is a small round scraper with a steep convex scraping profile around most of its edge. The type of blank which was used is not clear: the unretouched face does not carry ventral features, and therefore it does not seem to have been formed on a flake; this may be because the retouch is located on the ventral face, and it is the dorsal face which is left unworked, but this cannot be established. A flake has also been removed from the unretouched face, and it may be that an attempt was made to rework the scraper after its initial use was exhausted. The date of this piece cannot be clearly established: scrapers of all forms and sizes are found throughout the Neolithic period and Early/Middle Bronze Age, but there is a general tendency for their size to diminish as these periods progress. This piece, however, is quite unusual, and therefore cannot be seen as a 'typical' scraper; as such, it is reasonable to suggest that it need not necessarily belong to the Late Neolithic/Early Bronze Age periods, during which small scrapers are particularly common.

The assemblage also included a burnt fragment of a small unfinished arrowhead (C139:3) (Plate 9.4). It is possible that the 'burning' occurred due to an over-zealous attempt to heat-treat the flint, and it seems to have been broken during manufacture. Some initial pressure flaking and edge crushing is evident, but the projectile was far from finished. Small pressure flaked arrowheads such as these are particularly common during the Early Neolithic, are found to a lesser extent during the Middle Neolithic period and are not thought to be found (in this form) during the Late Neolithic period. During the Early Neolithic period, they are found at both domestic and ritual sites, but they seem to be less commonly found at domestic sites during the Middle Neolithic period, although they continue to be found at ritual sites (Nelis 2003; Nelis 2004).

Discussion

A small and interesting assemblage of flint artefacts was recovered from Johnstown 3, mainly containing flake debitage, but also containing a number of modified tools. While it is not known if the phases of activity at Johnstown 3 span a short or protracted period of time, or if the artefacts are thought to have been found within their context of deposition or have been residually redeposited, both the knife (C130:1) and the arrowhead fragment (C139:3) are compatible with a date during the Early to Middle Neolithic period. Both the edge retouched tool (C71:1) and the scraper (C134:1) could relate to any period during prehistory, but the scraper would be more unusual in an Early Neolithic context than one dating to the Middle/Late Neolithic (or even Early Bronze Age). The remainder of the assemblage is comprised of platform and bipolar debitage; both reduction techniques are found throughout the Neolithic and Bronze Age periods, with bipolar techniques being more commonly found where raw material resources are diminutive and of limited availability; although bipolar techniques are known from the Early Neolithic onward, they become more common from the Middle Neolithic period onward. The presence or exclusion of this reduction methods, however, is not a reliable chronological indicator, as it bears more relation to the state of the raw material resources and (to a lesser extent during the Neolithic, and a greater extent during the Bronze Age) to access to skilled knapping. A date for this assemblage during the Neolithic is feasible, if not conclusively determinable by analysis of these artefacts alone.

Section 10: Ardsallagh 1 (A008/035)

Introduction

An assemblage of 20 pieces of worked and unworked flint and chert was recovered during excavations at Ardsallagh 1 (A008/035) (Table 10.1). These artefacts were recovered from a number of features, including topsoil (C4: 13 pieces), gravecuts (C35:1 piece; C78: 1 piece), pits (C231: 1 piece) and a ringditch (C132: 1 piece; C171: 1 piece; C177: 1 piece; C221: 1 piece) (Table 10.1 and 10.2).

Unique No	Context	Material	Condition	Cortex	Character	Classification	Fragment size (mm)	Length (mm)	Breadth (mm)	Thickness (mm)	Mass (g)
A008/035:4:54	4	Flint	Fresh	Primary	Flake	Bipolar	-	19	11	5	1.22
A008/035:4:59	4	Flint	Patinated	Tertiary	Angular shatter	Angular shatter	-	29	17	14	5.46
A008/035:4:100	4	Flint	Burnt	Tertiary	Flake	Indeterminate shatter flake	22	-	15	6	2.06
A008/035:4:105	4	Flint	Patinated	Tertiary	Flake	Bipolar	-	28	17	7	4.24
A008/035:4:128	4	Flint	Fresh	Tertiary	Flake	Bipolar	-	18	16	8	2.21
A008/035:4:140	4	Flint	Patinated	Tertiary	Angular shatter	Angular shatter	-	26	11	6	1.32
A008/035:4:232	4	Chert	Abraded	Tertiary	Flake	Core trimming	-	21	16	8	1.69
A008/035:4:233	4	Flint	Burnt	Secondary	Flake	Core trimming	-	14	18	7	1.82
A008/035:4:234	4	Chert	Patinated	Tertiary	Flake	Bipolar: core trimming	-	16	11	6	1.05
A008/035:4:236	4	Chert	Abraded	Secondary	Angular shatter	Angular shatter	-	31	24	8	10.39
A008/035:4:237	4	Flint	Fresh	Tertiary	Flake	Regular flake	-	21	20	4	1.95
A008/035:4:239	4	Flint	Abraded	Tertiary	Flake	Bipolar	-	28	17	6	2.65
A008/035:4:240	4	Flint	Patinated	Tertiary	Angular shatter	Angular shatter - bipolar	-	22	19	18	8.88
A008/035:35:1	35	Flint	Abraded	Secondary	Unworked	Abraded lump	-	20	15	9	2.62
A008/035:78:1	78	Flint	Patinated	Tertiary	Angular shatter	Angular shatter	-	25	19	14	6.78
A008/035:132:1	132	Flint	Patinated	Tertiary	Unworked	Abraded lump	-	17	15	9	2.24
A008/035:171:1	171	Flint	Patinated	Secondary	Modified	Scraper	-	28	26	11	9.67
A008/035:177:1	177	Flint	Patinated	Secondary	Flake	Distal blade shatter	30	-	11	5	2.31
A008/035:221:1	221	Flint	Abraded	Secondary	Angular shatter	Angular shatter	-	11	8	6	0.41
A008/035:231:1	231	Flint	Abraded	Secondary	Unworked	Abraded lump	-	30	25	21	12.99

Table 10.1: Ardsallagh 1 (A008/035): showing basic catalogue of assemblage.

Assemblage composition

The majority of artefacts are flint (17 pieces), and a small number of chert artefacts were also found (3 pieces) (Table 10.3). The assemblage is mainly comprised of flake debitage (10 pieces), with most of the remainder being angular shatter (6 pieces) and unworked material (3 pieces); no cores were recovered, and a single modified tool – a scraper - was found (Plate 10.1).

Context No	Description	Unworked	Core	Flake Debitage	Angular shatter	Modified	TOTAL
4	Topsoil	-	-	9	4	-	13
35	Upper fill of possible gravecut inside ringditch	1	-	-	-	-	1
78	Upper fill of gravecut (Burial 6) inside ringditch	-	-	-	1	-	1
132	Fill in ringditch	1	-	-	-	-	1
171	Re-cut fill in ringditch	-	-	-	-	1	1
177	Fill of ringditch	-	-	1	-	-	1
221	Stoney fill in ringditch	-	-	-	1	-	1
231	Pit fill	1	-	-	-	-	1
	TOTAL	3	-	10	6	1	20

Table 10.2: Ardsallagh 1 (A008/035): showing assemblage composition and distribution.

Condition

Most of the artefacts have been weathered, and are in a patinated (9 pieces) or abraded (6 pieces) condition (Table 10.3). A small number survive in a fresh condition (3 pieces), and two pieces had been subject to burning; both of these were flake debitage, and recovered from topsoil (C4:100; C4:233).

	Unworked	Core	Flake Debitage	Angular shatter	Modified	TOTAL
Material						
Flint	3	-	8	5	1	17
Chert	-	-	2	1	-	3
Condition						
Fresh	-	-	3	-	-	3
Patinated	1	-	3	4	1	9
Abraded	2	-	2	2	-	6
Burnt	-	-	2	-	-	2
TOTAL	3	-	10	6	1	20

Table 10.3: Ardsallagh 1 (A008/035): showing assemblage composition in relation to material and condition.

Distribution

Most of the assemblage (13 pieces), including the majority of flake debitage (9/10 pieces) and angular shatter (4/6 pieces), was found in topsoil (C4) (Table 10.2); the chert artefacts were also recovered from topsoil. The remainder of the features yielded individual stone artefacts: these included unworked pieces from the gravecut fill C35, the ringditch fill C132 and pit fill C231. The remaining pieces of angular shatter were found in the gravecut fill C78 and the ringditch fill C221. A single piece of flake debitage was found in C177, a fill of the ringditch. One modified tool, a scraper, was found in a fill of a re-cut of the ringditch C171.

Assemblage analysis

Unworked

Three small pieces of unworked flint were found in the gravecut fill C35, the ringditch fill C132 and the pit fill C231. All of these were small pieces of abraded flint (the largest measuring just 30mm in maximum dimension). It is likely that such material is naturally found in local soils, rather than being curated to the site for future use.

Primary debitage: cores and flakes

No cores were found within the assemblage, but limited attempts were made to re-use the scraper, using bipolar reduction techniques. One-half of the assemblage was flake debitage (Table 10.4). These were mainly found in topsoil (C4), but a single piece was recovered from the ringditch fill C177. Similar quantities of platform (4 pieces) and bipolar (5 pieces) were found, with the method of production of the remaining shattered (and burnt) piece being indeterminate (1 piece: C4:100). In addition to flint debitage, two pieces of chert indicate that this material was also knapped in the vicinity of Ardsallagh 1; both were found in topsoil, and they represent both platform (C4:232) and bipolar (C4:234) reduction techniques.

All of the flake debitage is quite small in scale: the complete platform debitage measuring between 14-21mm in length, and the complete bipolar debitage measuring between 16-28mm in length. With such a small assemblage, the potential to comment on the reduction strategy is limited; however, the platform debitage tends to have been quite intricately prepared prior to production, with the surviving platforms being small and showing signs of edge preparation. This

suggests that attempts were made to carefully control the knapping process. Together with the presence of bipolar debitage, it is possible that the control evident in the platform knapping technique indicates that a limited supply of raw material, which was itself small in scale, was a dominant factor in determining the methods of production used. However, it must be remembered that the assemblage was mainly recovered from topsoil, and it is probable that the assemblage is the result of numerous knapping episodes over a protracted period of time.

Unique No	Context	Material	Character	Classification	Platform	Termination
A008/035:4:54	4	Flint	Flake	Bipolar	Bipolar	Bipolar
A008/035:4:100	4	Flint	Flake	Indeterminate shatter flake	Broken	Broken
A008/035:4:105	4	Flint	Flake	Bipolar	Bipolar	Feathered
A008/035:4:128	4	Flint	Flake	Bipolar	Bipolar	Bipolar
A008/035:4:232	4	Chert	Flake	Platform: core trimming	Punctiform	Plunging
A008/035:4:233	4	Flint	Flake	Platform: core trimming	Splintered	Plunging
A008/035:4:234	4	Chert	Flake	Bipolar: core trimming	Bipolar	Feathered
A008/035:4:237	4	Flint	Flake	Platform flake	Planar <5mm with edge prep	Feathered
A008/035:4:239	4	Flint	Flake	Bipolar	Punctiform	Feathered
A008/035:171:1	171	Flint	Modified	Platform: scraper	Planar 5+mm with edge prep	Retouched
A008/035:177:1	177	Flint	Flake	Platform: distal blade shatter	Broken	Plunging

Table 10.4: Ardsallagh 1 (A008/035): showing platforms and terminations present on flake debitage and modified tools.

Angular shatter

Six pieces of angular shatter were found, most of which were flint (5 pieces); a single piece of chert was also found (C4:236). Most of the angular shatter was found in topsoil (4 pieces), with single pieces also being found in the gravecut fill C78 and the ringditch fill C221. Angular shatter ranged in size from 11-31mm in maximum dimensions, with most measuring being at the larger end of this scale. These artefacts tended to be weathered, either being patinated (4 pieces) or abraded (2 pieces). Further technical information could not be gleaned from these artefacts, although one piece may be the by-product of bipolar knapping (C4:240).

Modified tools

A single scraper was found within the assemblage, recovered from C171, a re-cut fill of the ringditch (Plate 10.1). This was a small tool, with a convex, steep scraping edge. It carries an intriguing combination of flaking methods: although formed on a minimally prepared platform flake (using existing cortex as a platform), attempts have been made to reuse it after abandonment, because some post-use bipolar flaking is evident. This bipolar reduction has caused bipolar crushing at the platform, and also at the scraping end.

Discussion

A small assemblage of flint and chert was found during excavations at Ardsallagh 1. The assemblage was mainly comprised of flake debitage and angular shatter, with a small quantity of unworked material, and a single modified tool (a scraper) being found. Most of the assemblage was recovered from topsoil, with single artefacts being recovered from deposits relating to gravecuts and a pit, as well as fills of the ringditch (including a re-cut of this feature). As such, most of the assemblage has been residually redeposited into later contexts, and therefore the integrity of the context of deposition of the majority (if not all) of the assemblage is questionable; this is borne out by the C14 dating from numerous contexts, which span the Late Bronze Age through to the Early Medieval period. This residuality precludes a meaningful consideration of the chronological context of the flint and chert assemblage, and the assemblage itself does not include any artefacts which can be finely dated on typological grounds: both the platform and bipolar debitage assemblage could relate to any period spanning the Neolithic and Bronze Age periods at least; similarly, the scraper could date to any time within this broad chronological spectrum. However, small scrapers such as this piece are mainly found during the Late/Final Neolithic and Early Bronze Age, and it may be that this piece was produced within this timeframe.

Section 11: Ardsallagh 2 (A008/034)

Introduction

An assemblage of 35 pieces of unworked and worked stone was recovered during excavations at Ardsallagh 2 (A008/034) (Table 11.1). The archaeological remains comprised two roundhouse structures, pits, cremation pits and a ringditch.

Unique No	Context	Material	Condition	Cortex	Character	Classification	Fragment size (mm)	Length (mm)	Breadth (mm)	Thickness (mm)	Mass (g)
A008/034:4:2	4	Flint	Abraded	Secondary	Angular shatter	Angular shatter	12	12	8	5	0.44
A008/034:4:3	4	Flint	Abraded	Tertiary	Unworked	Thermal flake	-	25	12	6	2.08
A008/034:4:4	4	Flint	Abraded	Tertiary	Unworked	Thermal flake	-	54	34	14	19.59
A008/034:4:5	4	Flint	Abraded	Secondary	Unworked	Lump	-	36	28	11	9.74
A008/034:6:1	6	Flint	Fresh	Tertiary	Flake	Pressure flake complete	-	12	11	2	0.29
A008/034:16:1	16	Flint	Fresh	Secondary	Flake	Platform flake complete	-	28	31	3	3.98
A008/034:23:1	23	Flint	Burnt	Secondary	Flake	Platform small percussion	-	11	12	3	0.36
A008/034:26:1	26	Flint	Patinated	Secondary	Flake	Platform core trimming	-	17	22	11	4.19
A008/034:26:2	26	Flint	Patinated	Secondary	Flake	Platform core trimming	-	17	28	13	3.81
A008/034:26:3	26	Flint	Patinated	Tertiary	Flake	Platform flake complete	-	31	17	6	2.42
A008/034:26:4	26	Flint	Burnt	Tertiary	Flake shatter	Indeterminate	25	-	16	7	1.32
A008/034:32:1	32	Flint	Fresh	Tertiary	Flake	Platform flake complete	-	5	3	1	0.09
A008/034:34:1	34	Flint	Fresh	Secondary	Flake	Platform small percussion	-	8	6	2	0.18
A008/034:34:2	34	Flint	Fresh	Secondary	Core tool	Flake core possible scraper	-	14	20	10	3.24
A008/034:42:1	42	Flint	Patinated	Secondary	Flake	Core face rejuvenation	-	48	35	18	32.16
A008/034:47:1	47	Flint	Burnt	Tertiary	Flake shatter	Indeterminate	17	-	15	6	0.91
A008/034:51:1	51	Flint	Fresh	Tertiary	Flake	Bipolar complete	-	18	18	4	1.12
A008/034:68:1	68	Chert banded	Patinated	Tertiary	Unworked	Thermal flake	-	29	24	8	3.87
A008/034:68:2	68	Flint	Fresh	Secondary	Modified	Scraper	25	-	14	8	4.06
A008/034:94:1	94	Flint	Burnt	Secondary	Angular shatter	Angular shatter	-	9	6	4	0.19
A008/034:99:1	99	Flint	Fresh	Tertiary	Flake shatter	Indeterminate shatter	8	-	5	1	0.13
A008/034:153:1	153	Flint	Fresh	Tertiary	Flake	Platform small percussion	-	15	14	3	0.55
A008/034:153:2	153	Sandstone	Abraded	Tertiary	Unworked	Lump	-	35	31	26	31.01
A008/034:153:3	153	Sandstone	Fresh	Tertiary	Unworked	Thermal flake	-	30	26	9	7.23
A008/034:153:4	153	Flint	Patinated	Tertiary	Flake	Bipolar complete	-	22	12	5	1.28
A008/034:153:5	153	Sandstone	Abraded	Tertiary	Unworked	Lump	-	18	18	9	2.43
A008/034:153:6	153	Sandstone	Abraded	Tertiary	Unworked	Lump	-	25	15	11	3.01
A008/034:153:7	153	Flint	Abraded	Tertiary	Unworked	Lump	-	18	13	4	1.69
A008/034:157:1	157	Sandstone	Abraded	Tertiary	Unworked	Lump	-	71	47	40	148.69
A008/034:157:2	157	Sandstone	Burnt	Tertiary	Unworked	Thermal flake	-	15	15	3	0.64
A008/034:157:3	157	Basalt/Porcellanite	Fresh	Polished	Flake	Polished axe flake	-	22	22	5	2.19
A008/034:157:5	157	Sandstone	Fresh	Tertiary	Unworked	Thermal flake	-	15	12	3	0.56
A008/034:157:6	157	Basalt/Porcellanite	Fresh	Tertiary	Flake	Bifacial thinning flake	-	28	17	5	1.69
A008/034:163:1	163	Flint	Abraded	Secondary	Unworked	Lump	-	25	19	13	9.67
A008/034:173:1	173	Flint	Patinated	Tertiary	Unworked	Thermal flake	-	17	15	5	1.12

Table 11.1: Ardsallagh 2 (A008/034): showing basic catalogue of assemblage.

Assemblage composition

The assemblage was mainly comprised of flint (25/35 pieces), but also includes basalt (possibly porcellanite: 2 pieces), banded chert (1 piece), and fine grained stone (possibly sandstone: 7 pieces).

The assemblage includes a substantial element of unworked material (14/35 pieces). The unworked assemblage was comprised of flint (6 pieces), as well as the banded chert piece and all of the sandstone material. Most of the remaining artefacts were primary knapping debitage: they were mainly comprised of flake debitage (17 pieces), and included a small quantity of angular shatter (2 pieces). The remaining artefacts included a possible flake core (which may have been used as a scraper: Plate 11.1), and a scraper fragment (Plate 11.3). The majority of these artefacts were flint, including the possible core tool, the scraper fragment, the angular shatter and most of the flake debitage (15/17 pieces). The only non-flint material which had been worked were two flakes, which may be porcellanite; both of these were flakes, and both may have been derived from axes (one certainly was: C157:3; Plate 11.2).

Condition

	Unworked	Core	Flake Debitage	Angular shatter	Modified	TOTAL
Material						
Flint	6	1	15	2	1	25
Chert (banded)	1	-	-	-	-	1
Basalt/Porcellanite	-	-	2	-	-	2
Fine grain/sandstone	7	-	-	-	-	7
	14	1	17	2	1	35
Condition						
Fresh	2	1	9	-	1	13
Patinated	2	-	5	-	-	7
Abraded	9	-	-	1	-	10
Burnt	1	-	3	1	-	5
TOTAL	14	1	17	2	1	35

Table 11.2: Ardsallagh 2 (A008/034): showing assemblage composition in relation to material and condition.

The condition of the assemblage was quite varied (Table 11.2). Fresh material was common (13 pieces), as was material which had been subject to weathering,

surviving either in a patinated (7 pieces) or abraded (10 pieces) condition; some artefacts had also suffered burning (5 pieces).

Distribution

The assemblage had a scattered distribution, being recovered in small quantities from numerous contexts across Ardsallagh 2 (Table 11.3). Only a small number was recovered from topsoil (C4: 4 pieces), with the remainder being found in deposits of archaeological significance: a small quantity was found in one of the ringditch fills (C26: 4 pieces), as well as some of the pit fills (C153: 7 pieces; C157: 5 pieces). The remaining contexts yielded only one or two artefacts: single artefacts were found in the cremation pits (C6, C16), the pit fills (C23, C173), and some of the ringditch (C32, C42, C47, C51) and Roundhouse 1 fills (C94, C99); two artefacts were found in each of the following deposits (C34, C68).

Context No	Description	Unworked	Core	Flake Debitage	Angular shatter	Modified	TOTAL
4	Topsoil	3	-	-	1	-	4
6	Upper fill of cremation pit	-	-	1	-	-	1
16	Upper fill of cremation pit	-	-	1	-	-	1
23	Pit fill	-	-	1	-	-	1
26	Fill of ringditch	-	-	4	-	-	4
32	Fill of ringditch	-	-	1	-	-	1
34	Fill of ringditch	-	1	1	-	-	2
42	Fill of ringditch	-	-	1	-	-	1
47	Fill of ringditch	-	-	1	-	-	1
51	Fill of ringditch	-	-	1	-	-	1
68	Marle layer below a fill within ring ditch	1	-	-	-	1	2
94	Upper fill in Roundhouse 1	-	-	-	1	-	1
99	Upper fill in Roundhouse 1	-	-	1	-	-	1
153	Upper fill in large pit	5	-	2	-	-	7
157	Lower fill in same pit as C153	3	-	2	-	-	5
163	Upper fill in Roundhouse 2	1	-	-	-	-	1
173	Lower fill in pit	1	-	-	-	-	1
	TOTAL	14	1	17	2	1	35

Table 11.3: Ardsallagh 2 (A008/034): showing assemblage composition and distribution.

Topsoil yielded a small quantity of unworked artefacts, as well as a piece of angular shatter. Most of the material from the pits was unworked, although a small number of flakes were also found. Only flake debitage was found in the cremation pits, and most of the material from the ringditch was also flake debitage. Roundhouse 1 yielded flake debitage and angular shatter, while Roundhouse 2

yielded only a single unworked artefact. Both of the tools were found in connection with the ring ditch: the scraper fragment was found in a marle layer within the ringditch (C68), and the possible core tool was found in a fill of the ring ditch (C34).

Assemblage analysis

Unworked

In total, 14 pieces of unworked stone were recovered, constituting two of every five artefacts recovered. These artefacts covered a range of materials, including flint, possible chert and sandstone; no worked artefacts of chert or sandstone were found, and so these materials do not seem to have been exploited at the site. It is possible that they represent a sample of the local background geology. Unworked flint was found in topsoil (C4), as well as C153, C163 and C173; these tended to be small-scale thermally damaged pieces.

Primary debitage: cores and flakes

The assemblage was mainly comprised of flake debitage (17 pieces), accounting for almost one-half of all artefacts. In addition to these, a small flake fragment has been further reduced, arguably as a single platform core: the purpose of this working is not obvious, but it may be a small core tool; its function is far from clear, although it may have served as an irregular scraper or notched tool (C34:2; Plate 11.1).

Most of the flake debitage is platform derived (15/17 pieces), with only two bipolar flakes being found. The bipolar flakes were found in the ring ditch fill C51 and the pit fill C153; both were based on flint, and were small in scale, measuring 18mm and 22mm in maximum length, respectively.

Of the platform derived material (15 pieces), most were in a complete condition (12 pieces). The original form of the shattered pieces could not be determined, because they had sustained numerous breaks (C26:1; C47:1; C99:1); two of these had also been burned (C26, C47).

Most of the complete flakes were flint (10/12 pieces). These were varied in morphology and method of production, but were mostly small in scale. Where platforms survived, most were small, planar examples, often with some edge

preparation (Table 11.4). This shows that while platforms types were quite simple in execution, some element of platform preparation was undertaken, with the trimming (and therefore strengthening) of the platform edge.

Only a small number of flakes measured more than 25mm in maximum length (C16:1; C26:3; C42:1) and these included a core face rejuvenation flake (C42:1). The smaller scale debitage included flakes produced through pressure flaking (C6:1; C32:1), and it is likely that these were the product of secondary modification (ie debitage deriving from the knapping of tools, rather than the primary knapping of flakes). In addition, a further number of small scale flakes had been produced using percussion flaking, and it is probable that these relate to fine core trimming and preparation (C23:1; C34:1; C153:1); some slightly heavier core trimming flakes were also found (C26:1 and 2).

Unique No	Context	Material	Character	Classification	Platform	Termination
A008/034:6:1	6	Flint	Flake	Pressure flake complete	Punctiform	Plunging
A008/034:16:1	16	Flint	Flake	Platform flake complete	Planar - <5mm	Plunging
A008/034:23:1	23	Flint	Flake	Platform small percussion	Planar <5mm with edge prep	Plunging
A008/034:26:1	26	Flint	Flake	Platform core trimming	Corticated	Feathered
A008/034:26:2	26	Flint	Flake	Platform core trimming	Corticated	Feathered
A008/034:26:3	26	Flint	Flake	Platform flake complete	Planar <5mm with edge prep	Feathered
A008/034:26:4	26	Flint	Flake shatter	Indeterminate	Broken	Broken
A008/034:32:1	32	Flint	Flake	Platform flake complete	Punctiform	Plunging
A008/034:34:1	34	Flint	Flake	Platform small percussion	Planar <5mm with edge prep	Feathered
A008/034:34:2	34	Flint	Core tool	Flake core possible scraper	Planar - <5mm	Feathered
A008/034:42:1	42	Flint	Flake	Core face rejuvenation	Planar - <5mm	Feathered
A008/034:47:1	47	Flint	Flake shatter	Indeterminate	Broken	Broken
A008/034:51:1	51	Flint	Flake	Bipolar complete	Bipolar	Bipolar
A008/034:68:2	68	Flint	Modified	Scraper	Bipolar	Retouched
A008/034:99:1	99	Flint	Flake shatter	Indeterminate shatter	Broken	Broken
A008/034:153:1	153	Flint	Flake	Platform small percussion	Planar winged	Hinged
A008/034:153:4	153	Flint	Flake	Bipolar complete	Bipolar	Bipolar
A008/034:157:3	157	Basalt/Porcellanite	Flake	Polished axe flake	Polished axe surface	Plunging
A008/034:157:6	157	Basalt/Porcellanite	Flake	Bifacial thinning flake	Planar <5mm with edge prep	Plunging

Table 11.4: Ardsallagh 2 (A008/034): showing platforms and terminations present on core, flake debitage and modified tools.

Both of the non-flint flake debitage are thought to be porcellanite (or similarly fine grained basalt) (C157:3; C157:6; Plate 11.2). Both are bifacial thinning flakes, that is, they are the debitage produced by the production of large bifacial tools, in this

case, axes: one of these retained part of a polished axe surface, and was therefore evidence of the reworking of a polished stone axe (C157:3); the remaining flake was unpolished, and may relate either to (a) the production of a flaked axe, (b) the early, flaking stage of production of a polished axe, or possibly (c) the reworking of a polished axe after all of the polished surface had been removed. The latter possibility may seem unlikely, but the presence of C157:3 shows that the reworking of polished axes did occur.

Angular shatter

Two pieces of angular shatter were found, recovered from topsoil (C4) and Roundhouse 1 (C94). Both were flint; one was burnt (C4) and one had been subject to weathering (C94). Both were small in scale, measuring less than 12mm in maximum dimensions, and both seem to be the by-product of knapping.

Modified tools

In addition to the unusual flake core/possible scraper (C34:2), a scraper fragment was found in C68 (a layer in the ring ditch; C68:2; Plate 11.3). This was the functional end of a small convex scraper, which was broken at its mid-section. It was quite perfunctorily retouched, leaving a slightly irregular edge, and so little effort had been exerted in its production.

Discussion

A small assemblage of worked and unworked stone artefacts was recovered from Ardsallagh 2, derived from numerous archaeological contexts. The assemblage was comprised of flint, banded chert, ?sandstone and ?porcellanite, but only the flint and ?porcellanite had been worked. Unworked artefacts constituted a sizeable element of the assemblage, with most of the remaining artefacts being flake debitage; a small quantity of angular shatter was also found, as well as a scraper fragment (C68:2) and a possible core tool which may have functioned as a scraper or notched tool (C34:2).

The flake debitage assemblage was mainly comprised of complete platform flakes, although a small number of shattered flakes and bipolar flakes were also found. The complete platform flakes tended to be small in scale, and were mainly related to core trimming and preparation; in addition, some may have derived from the secondary production of tools.

The most notable element of the flake debitage assemblage is the presence of two bifacial thinning flakes from the pit fill C157 (possibly of porcellanite: C157:3; C157:6). Bifacial thinning flakes are the debitage produced by the production of large bifacial tools, in this case, axes. Attributes of bifacial thinning flakes include (a) a wide but thin platform, often with faceting and/or platform edge preparation to remove a prominent platform lip; (b) a significantly overshot or plunging profile; (c) a wide flake, but with quite a thin profile; and (d) a dorsal face carrying complex, multi-directional flake scars. These attributes are found on C157:6, but the other example (C157:3) was removed from a polished axe and therefore retained much of the polished axe surface on its dorsal face. The presence of a polished surface shows that this piece was not simply derived from the production of a flaked axe (which may or may not be polished at a later point), but in fact relates to the reworking of an axe which has already been flaked and then polished: therefore, this piece is evidence of the reuse of a polished axe, rather than the initial production of a polished axe. C157:6, on the other hand, carries no polish on its dorsal surface, but bears numerous flake scars. It is impossible to tell if this piece is related to the initial production of a flaked axe, or whether it is evidence of the intensive reworking of a polished axe. That it was found in association with a flake which does point to the reworking of a polished stone axe, suggests that the latter suggestion is a reasonable possibility; if this were so, then the lack of polish on C157:6 would suggest that the reworking of the axe had been intensive, with all evidence of polish having been removed before the production of this flake. Despite this, neither the reworked axe, nor any other associated debitage, was present within the assemblage.

The reworking of the polished stone axe could have happened at any point after its initial production, and so, while the bifacial thinning flakes date to the period after the stone axe had ceased to function as it had originally been intended, this reworking cannot be closely dated by analysis of their form; however, it can be said that the quality of the bifacial thinning is skilful, and so it is probable that the axe had been reworked by someone who was in fact capable of producing a good quality axe in the first place. In this sense, it is likely that the reworking occurred during a time when axes were still in production; therefore a broad date during the Neolithic or Bronze Age would be acceptable, if frustratingly vague. However, the reworking of polished stone axes is not commonly found during the Neolithic, but

is more commonly found during the Bronze Age (eg Donegore Hill; Nelis 2003: where polished axes were resharpened as axes and sometimes even reused as hammerstones during Bronze Age activity), and it may be that this is a behaviour which is particular to the Bronze Age; it is certainly an area of study which requires more analysis and clarification.

The remainder of the assemblage does little to tighten the chronological framework. Neither the scraper fragment, nor possible core tool, is closely datable, since such simplistic tool production occurs throughout Irish prehistory, and is not chronologically diagnostic. Similarly, the flake debitage assemblage largely consists of a finely but simply produced assemblage of platform flakes, showing simple platform preparation and knapping, where some bipolar knapping was also present. Again, such assemblages are commonly found throughout the Neolithic and Bronze Age periods. Thumbnail scrapers, which are found throughout the Irish Early Bronze Age in prodigious quantities, were not present within the assemblage; however, the limited evidence for scrapers which was found pointed to small scale tools which are also common (if less chronologically diagnostic) throughout the Late Neolithic and Bronze Age. The assemblage is limited in terms of quantity and in terms of the range of tools present and this in itself is a common factor of Bronze Age chipped stone assemblages. The assemblage is therefore compatible with any period during the Neolithic and Bronze Age, but its limited quantity and range of tools probably indicates that is more likely to date to the Bronze Age. This appears to be endorsed by the C14 dating programme, the results of which span the Early/Middle Bronze Age and Early Medieval period; the main cluster of dates, however, suggest Early/Middle Bronze Age activity.

Section 12: Ardsallagh 4 (A008/037)

Introduction

Excavations at Ardsallagh 4 (A008/037) uncovered a possible cremation pit, a series of large post holes and pits.

Analysis and Discussion

Two flint artefacts, in a fresh condition, were found in the upper fill of a pit (C34) and within a naturally occurring deposit (C4). One of these is a medial fragment of a flake (C4:1), with the remaining piece being a complete blade, with a corticated platform (C34:1). It is probable that they relate to separate knapping episodes. In such isolation, it is not possible to suggest a specific chronological context for these artefacts, other than to say that they probably relate to prehistoric knapping activity.

Unique No	Context	Material	Condition	Cortex	Character	Classification	Fragment size (mm)	Length (mm)	Breadth (mm)	Thickness (mm)	Mass (g)
A008/037:4:1	4	Flint	Abraded	Fresh	Flake	Platform medial shatter	31	-	15	5	2.33
A008/037:34:1	34	Flint	Abraded	Fresh	Flake	Platform blade complete	-	25	11	4	1.06

Table 12.1: Ardsallagh 4 (A008/037): showing basic catalogue of assemblage.

Section 13: Ardsallagh 5 (A008/038)

Analysis and Discussion

Excavations at Ardsallagh 5 (A008/038) uncovered linear ditches, pits, a drying kiln, metalled surfaces and the remains of a circular structure. A single flint artefact was recovered during the excavation of C38, a deposit similar to topsoil. The flint artefact found at Ardsallagh 5 is a complete platform flake, partially corticated, measuring 28mm in length, and carrying a large planar platform with a hinging termination. It is not possible to determine the dating of this artefact, due to its generic form and its redeposition into a secondary context.

Unique No	Context	Material	Condition	Cortex	Character	Classification	Fragment size (mm)	Length (mm)	Breadth (mm)	Thickness (mm)	Mass (g)
A008/038:38:2	38	Flint	Abraded	Secondary	Flake	Platform complete	-	28	21	6	4.32

Table 13.1: Ardsallagh 5 (A008/038): showing basic attributes of flint artefact.

Section 14: Kennastown 1 (A023/001)

Introduction

Excavations at Kennastown 1 (A023/001) uncovered numerous archaeological features, including a curvilinear gully, a series of pits and a post-Medieval field boundary.

Analysis and Discussion

Unique No	Context	Material	Condition	Cortex	Character	Classification	Fragment size (mm)	Length (mm)	Breadth (mm)	Thickness (mm)	Mass (g)
A023:001:4:1	4	Flint	Patinated	Tertiary	Modified	Knife	-	72	19	5	6.74

Table 14.1: Kennastown 1 (A023/001): showing basic attributes of flint artefact.

A single lithic artefact was recovered during a cleanback (C4). This is an exquisitely produced plano-convex knife (Plate 14.1). It is an extremely delicate and thinly worked piece, with one straight edge and one convex edge. Its dorsal face has been fully invasively pressure flaked, and some semi-invasive pressure flaking is to be found on the ventral face, particularly at the proximal end. It is rare to find such a finely worked knife in an unbroken state, as they seem to have been regularly broken during use, and it would have required exceptional skill to prevent this piece from breaking during manufacture. Such knives tend to relate to Early Neolithic activity, in an Irish context (Nelis 2003), although similarly finely produced knives may also be datable (if less commonly so) to the Early Bronze Age. The quality of pressure flaking on this example is similar to that found on arrowheads during the Early Neolithic period, and it may be that this piece dates to that particular period. It is unlikely, however, that its context of deposition is contemporary with its period of production and use, and it is probable that it has been residually redeposited into the later archaeological features found at Kennastown 1.

Section 15: Garretstown 2 (A008/008)

Introduction

During excavations at Garretstown 2 (A008/008), an assemblage of 17 pieces of flint and chert were recovered from features including boundary ditches, corn drying kilns and possible barrows (Table 15.1).

Unique No	Context	Material	Condition	Cortex	Character	Classification	Fragment size (mm)	Length (mm)	Breadth (mm)	Thickness (mm)	Mass (g)
A008/008:5:15	5	Flint	Fresh	Tertiary	Flake	Platform complete	-	35	28	10	7.87
A008/008:5:16	5	Flint	Abraded	Secondary	Flake	Platform proximal blade shatter	22	-	16	4	1.84
A008/008:5:17	5	Flint	Patinated	Tertiary	Flake	Platform small percussion	-	16	15	3	.76
A008/008:5:18	5	Flint	Patinated	Tertiary	Modified	Knife	35	-	25	6	5.70
A008/008:5:19	5	Flint	Fresh	Secondary	Flake	Platform blade complete	-	35	21	6	4.62
A008/008:47:2	47	Flint	Fresh	Secondary	Modified	Bifacial fragment	25	-	15	9	3.13
A008/008:59:1	59	Flint	Burnt	Secondary	Flake	Platform flake complete	-	23	15	8	2.68
A008/008:87:1	87	Flint	Abraded	Tertiary	Flake	Platform blade complete	-	71	29	9	29.93
A008/008:89:1	89	Flint	Patinated	Tertiary	Modified	Edge retouched: ?knife fragment	28	-	31	6	5.77
A008/008:110:1	110	Flint	Burnt	Secondary	Flake	Bipolar flake complete	-	26	22	8	4.23
A008/008:143:1	143	Flint	Patinated	Secondary	Unworked	Abraded lump	-	14	7	4	.37
A008/008:143:2	143	Chert	Patinated	Tertiary	Unworked	Abraded lump	-	10	6	5	.46
A008/008:167:1	167	Flint	Fresh	Secondary	Flake	Shatter: burin spall	-	25	10	6	1.16
A008/008:209:2	209	Flint	Fresh	Tertiary	Modified	Scraper	22	-	35	10	6.49
A008/008:217:1	217	Flint	Fresh	Tertiary	Flake	Bipolar flake complete	-	14	8	4	.35
A008/008:217:2	217	Flint	Fresh	Secondary	Flake	Bipolar flake complete	-	25	14	9	2.84
A008/008:254:1	254	Flint	Fresh	Tertiary	Flake	Platform flake complete	-	22	12	3	.81

Table 15.1: Garretstown 2 (A008/008): showing basic catalogue of assemblage.

Assemblage composition

The majority of the assemblage is flint (16 pieces), with a single unworked piece of chert being recovered. The bulk of the assemblage is flake debitage (11 pieces), with the remainder being unworked (2 pieces) or modified tools (4 pieces). No cores or angular shatter were recovered.

Distribution

Just under one-third of the assemblage was found in topsoil (C5: 5 pieces), of which most were flake debitage (4 pieces), in addition to a single modified tool, a knife fragment (C5:18). Most of the remainder of the assemblage was found in

small quantities in a number of deposits within the ringditch (C47, C209) and other ditches (C59, C87, C89, C143, C167, C217), with some artefacts also being found in other features (C110, C254) (Table 15.2). The majority of these artefacts were flake debitage, but modified tools were found in topsoil, the ringditch fills C47 and C209, and the ditch fill C89. Both unworked pieces were recovered from the ditch fill C143 (Table 15.2).

Context No	Description	Unworked	Core	Flake Debitage	Angular shatter	Modified	TOTAL
5	Topsoil	-	-	4	-	1	5
47	Top fill of ringditch C43	-	-	-	-	1	1
59	Fill of ditch C58	-	-	1	-	-	1
87	Second fill of circular ditch C46	-	-	1	-	-	1
89	Fourth fill of circular ditch C46	-	-	-	-	1	1
110	Second fill of feature C108	-	-	1	-	-	1
143	Top fill of ditch C142	2	-	-	-	-	2
167	Fill of ditch C166	-	-	1	-	-	1
209	Top fill of ringditch C208	-	-	-	-	1	1
217	Top fill of ditch C216	-	-	2	-	-	2
254	Charcoal filled feature in ditch C214	-	-	1	-	-	1
	TOTAL	2	-	11	-	4	17

Table 15.2: Garretstown 2 (A008/008): showing assemblage composition and distribution.

Condition

	Unworked	Core	Flake Debitage	Angular shatter	Modified	TOTAL
Material						
Flint	1	-	11	-	4	16
Chert	1	-	-	-	-	1
Condition						
Fresh	-	-	6	-	2	8
Patinated	2	-	1	-	2	5
Abraded	-	-	2	-	-	2
Burnt	-	-	2	-	-	2
TOTAL	2	-	11	-	4	17

Table 15.3: Garretstown 2 (A008/008): showing assemblage composition in relation to material and condition.

Most of the artefacts survived in a fresh (8 pieces) or partially patinated (5 pieces) condition, and had therefore been subject to limited weathering; two pieces had

suffered post-depositional abrasion (2 flake debitage), and a further two pieces were in a burnt condition (2 flake debitage) (Table 15.3).

Assemblage analysis

Unworked

Two small pieces of unworked material were found (1 flint, 1 chert), both of which were found in the ditch fill C143. These were small in scale, measuring 14mm or less in maximum dimensions. It is probable that they represent naturally occurring lithics within local soils and it is unlikely that they were ever intended for exploitation.

Primary debitage: cores and flakes

Unique No	Context	Material	Character	Classification	Platform	Termination
A008/008:5:15	5	Flint	Flake	Platform complete	Planar <5mm with edge prep	Plunging
A008/008:5:16	5	Flint	Flake	Platform proximal blade shatter	Pressure facetted	Broken
A008/008:5:17	5	Flint	Flake	Platform small percussion	Planar <5mm with edge prep	Feathered
A008/008:5:18	5	Flint	Modified	Knife	Retouched	Broken
A008/008:5:19	5	Flint	Flake	Platform blade complete	Splintered	Feathered
A008/008:47:2	47	Flint	Modified	Bifacial fragment	Broken	Broken
A008/008:59:1	59	Flint	Flake	Platform flake complete	Planar >5mm	Feathered
A008/008:87:1	87	Flint	Flake	Platform blade complete	Planar <5mm with edge prep	Feathered
A008/008:89:1	89	Flint	Modified	Edge retouched: ?Knife fragment	Broken	Feathered
A008/008:110:1	110	Flint	Flake	Bipolar flake complete	Bipolar	Bipolar
A008/008:167:1	167	Flint	Flake	Shatter: burin spall	Broken	Broken
A008/008:209:2	209	Flint	Modified	Scraper	Broken	Retouched
A008/008:217:1	217	Flint	Flake	Bipolar flake complete	Bipolar	Bipolar
A008/008:217:2	217	Flint	Flake	Bipolar flake complete	Bipolar	Bipolar
A008/008:254:1	254	Flint	Flake	Platform flake complete	Splintered	Plunging

Table 15.4: Garretstown 2 (A008/008): showing platforms and terminations present on flake debitage and modified tools.

While no cores were found, most of the assemblage was flake debitage (Table 15.4). Most of these were produced using platform reduction methods (7 pieces), with a small quantity of bipolar derived artefacts also being found (3 pieces); the remaining piece was a shattered burin spall fragment (C167:1). Most of the platform debitage was in a complete condition (6 pieces), and included flakes (4 pieces) as well as blades (2 pieces); the shattered piece was a proximal blade

fragment (C5:16). All of the bipolar debitage was in a complete condition. While the bipolar debitage ranged in length from 14-26mm, the platform debitage had a greater size range, and in general tended to be larger in scale, ranging from 16-71mm in length. It is possible, then, that bipolar techniques were used in order to exploit small scale raw material, which is a common feature of bipolar reduction methods. Whereas bipolar reduction indicates limited control and preparation in the reduction process, the platform assemblage at Garretstown 2 exhibited complexity and careful control in knapping, with surviving platforms invariably being small and carefully prepared before striking (Table 15.4). This indicates that a mindful approach to knapping when using the platform reduction method. No appreciable patterns were discernable within the distribution of the flake debitage assemblage, with all artefacts being found in topsoil, ditch fills and other features (C110).

Angular shatter

No angular shatter was recovered from Garretstown 2.

Modified tools

Four modified tools were found during excavations at Garretstown 2. These included a knife fragment (C5:18: Plate 15.1), an edge retouched tool (C89:2: Plate 15.2), a a scraper fragment (C209:1: Plate 15.3) and a fragment of a bifacial tool (C47:2: Plate 15.4).

The knife fragment is the tip of a minimally retouched knife with bilateral curved cutting edges (Plate 15.1). It was found in topsoil (C5:18). As is commonly the case, the tip of the knife was formed on the proximal end of the flake or blade. It is possible that the fragment was reused after breakage, possibly as a piercer, with some post-breakage retouch being found along the broken edge. As a slightly irregular example of a knife, which is also fragmentary, it is difficult to infer a chronological context for this piece, although a broad date during the Neolithic or Bronze Age would be compatible.

The complete form of the bifacial fragment (C47:2) is unclear, and the piece may have been broken during manufacture. It was found in the fill of ringditch C43. The fragment is a lateral sliver of a percussion flaked bifacial tool, perhaps similar to large projectiles (known as ‘laurel leaves: Nelis 2003) which tend to be found

during the Neolithic period; however, its condition is too fragmentary to conclusively determine that this is the case (Plate 15.2).

The remaining pieces are quite minimally worked, and are examples of opportunistically produced tools which are not typologically comparable to chronologically diagnostic tool types; as such, they are, however, typical of such perfunctorily produced tools which are found throughout the Neolithic and Bronze Age periods at least, and probably are also found during to span the Iron Age and Early Medieval periods. One of these tools, a retouched distal flake fragment, was found in the fill of the circular ditch C46 (C89:2). This piece was minimally edge retouched along one slightly irregular lateral edge and tip and appears to be the remains of a minimally retouched knife. In addition to this, the distal fragment of a minimally retouched scraper was found in the fill of ringditch C208 (C209:1). This piece was formed on a large flake, with the scraping edge being quite squared; some edge-wear along its lateral edges suggest that it may also have been utilised as a cutting tool without having first been retouched.

Discussion

A small assemblage of flint and chert artefacts was recovered from numerous deposits at Garretstown 2. Two small abraded unworked lumps were found, but the assemblage was mainly comprised of flake debitage, which included both platform and bipolar produced pieces. Platform debitage was dominant within the flake debitage assemblage, and also tended to be significantly larger in scale than the bipolar debitage. No cores were found during excavations; nor was any angular shatter recovered.

Given the small quantity of artefacts found, a significant number of modified tools were present, accounting for almost one-quarter of all lithic artefacts. All of the modified tools were fragmentary, and while their original form could, for the most part, be inferred, their incomplete condition hampered a more complete analysis of their chronological and typological significance; in the case of the bifacial fragment, its fragmentary condition was such that its original form could not be inferred, and while this piece may be datable to the Neolithic period, this could not be clearly established. The remaining artefacts include minimally modified tools, which have probably been quite opportunistically produced, and perhaps representing quite short-term use-lives. This is particularly the case with the

minimally retouched scraper fragment (C209:1) and the possible fragment of a minimally retouched knife (C89:1). The remaining piece is also a knife fragment (C5:18): although this piece has been more thoroughly worked than the other examples within the assemblage, it is still quite a minimally worked tool, with slightly irregular cutting edges. Its original form has also been altered, in that it was re-worked after breakage and possibly reused as a piercer rather than as a knife.

The characteristics of the modified assemblage point to an informal approach to the production and use of tools, mainly concerned with providing cutting, piercing and scraping functions. Given their informal morphology and fragmentary condition, little can be said of their chronological context, since such perfunctory tools were produced and used throughout both the prehistoric and historic periods in Ireland. The single C14 date was recovered from a context which did not yield lithic artefacts (ie C129), and indicated an Early Medieval date. It is unlikely that all of the lithic assemblage (if any) relates to this period, but it indicates that multi-period occupation activity occurred within the area and the lithic artefacts may have been produced over a significant chronological timeframe.

References

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M3 Batch 2

PLATES

Plate 1.1: Bennetstown 1 (A017/003): showing debitage from C30: (left to right): C30:2 core; C30:3 and C30:1 flakes.

Plate 1.2: Bennetstown 1 (A017/003): showing refitted flake debitage from C30: (striking platforms at the left side) C30:1 overlying C30:3.

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Plate 1.3: Bennetstown 1 (A017/003): C16:1: scraper.

Plate 2.1: Bennetstown 3 (A017/005): 29:5: blade.

Plate 3.1: Knocks 1 (A017/022): C35:19: Core: single platform, partially flaked.

Plate 3.2: Knocks 1 (A017/022): 43:4: Thumbnail scraper.

Plate 3.3: Knocks 1 (A017/022): 35:24: Irregular scraper, minimally worked, on distal blade fragment.

Plate 3.4: Knocks 1 (A017/022): 43:5: Scraper.

Plate 3.5: Knocks 1 (A017/022): 35:20: Thumbnail scraper: retouched on ventral face.

Plate 3.6: Knocks 1 (A017/022): 35:28 Scraper on bipolar flake showing dorsal (left) and ventral (right).

Plate 3.7: Knocks 1 (A017/022): 187:1: Knife: bilaterally retouched: proximal is tip (bottom); hafted at distal (top).

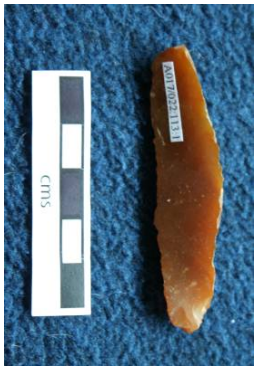

Plate 3.8: Knocks 1 (A017/022): 113:1: slug knife showing dorsal (left) and ventral (right).

Plate 3.9: Knocks 1 (A017/022): 35:1: Hollow based arrowhead fragment, missing barb; possibly unfinished and broken during manufacture.

Plate 3.10: Knocks 1 (A017/022): 35:32: Arrowhead tip: indeterminate type.

Plate 3.11: Knocks 1 (A017/022): 35:31: Edge retouched with concave (left: dorsal) and regular edge (right: ventral).

Plate 3.12: Knocks 1 (A017/022): 35:33: Edge retouched cutting tool, retouched along regular left lateral ventral edge.

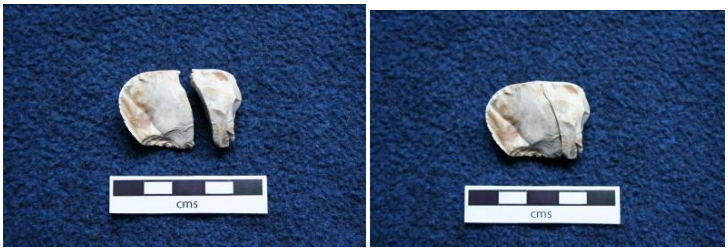

Plate 5.1: Knockmark 1 (A017/028): Bipolar core (C4:5) and bipolar flake (C4:6) (left and right respectively, in each photograph): showing separate (left) and conjoined (right).

Plate 5.2: Knockmark 1 (A017/028): C4:1: Minimally retouched 'backed' knife.

Plate 5.3: Knockmark 1 (A017/028): C4:28: Minimally retouched knife.

Plate 5.4: Knockmark 1 (A017/028): C4:9: Edge retouched tool.

Plate 5.5: Knockmark 1 (A017/028): C4:10: Thumbnail scraper.

Plate 5.6: Knockmark 1 (A017/028): C134:1: Large blade.

Plate 6.1: Merrywell 1 (A017/029): C25:54: Scraper.

Plate 6.1: Drumree 1 (A017/027): C4:4: Knife tip fragment showing dorsal (left) and ventral (right). Platform is at top of picture (at tip of fragment).

Plate 7.1: Johnstown 2 (A017/020): C4:1: Bipolar core showing both faces (left and right).

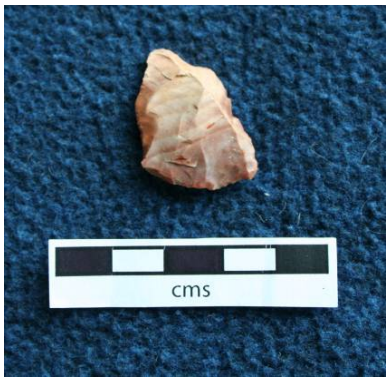

Plate 7.2: Johnstown 2 (A017/020): C4:3: Edge retouched tool.

Plate 8.1: Johnstown 3 (A017/021): C134:1: Scraper, showing retouched scraping face (left) and irregular unretouched face (right).

Plate 8.2: Johnstown 3 (A017/021): C130:1: Burnt knife.

Plate 8.3: Johnstown 3 (A017/020): C4:3: Burnt knife.

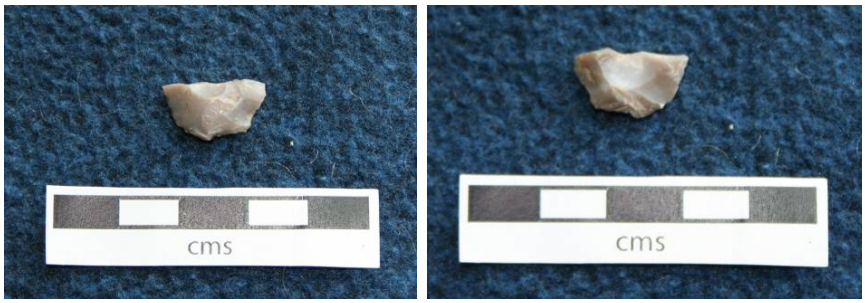

Plate 8.4: Johnstown 3 (A017/020): C139:3: Burnt arrowhead fragment.

Plate 9.1: Ardsallagh 1 (A008/035): C171:1: Scraper showing dorsal (left) and ventral (including distal damage: right).

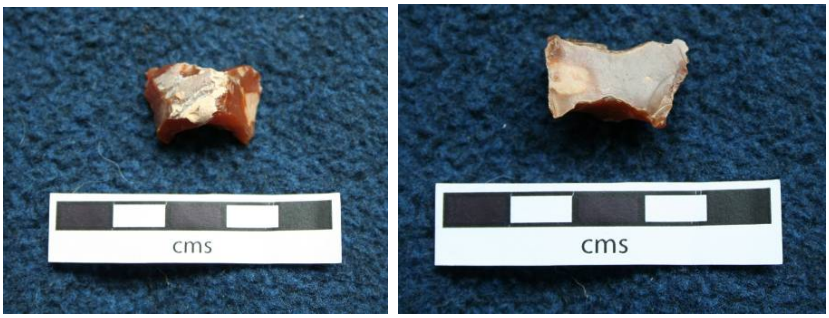

Plate 11.1: Ardsallagh 2 (A008/034): C34:2: dorsal view (left); ventral view (right): possible flake core tool: irregular scraper or notched tool.

Plate 11.2: Ardsallagh 2 (A008/034): C157:6 (left); C157:3 (right): bifacial thinning flakes.

Plate 11.3: Ardsallagh 2 (A008/034): C68:2: scraper fragment.

Plate 14.1 Kennastown 1 (A023/001): C4:1: Plano-convex knife.

Plate 15.1: Garretstown 2 (A008/008): C5:18: Knife tip fragment (showing tip or proximal end at bottom of picture).

Plate 15.2: Garretstown 2 (A008/008): C89:1: Minimally retouched knife fragment, retouched along left side.

Plate 15.3: Garretstown 2 (A008/008): C209:1: Scraper fragment.

Plate 15.4: Garretstown 2 (A008/008): C47:2: Bifacial fragment.

APPENDIX 12 Metallurgical waste: Angela Wallace

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Archaeometallurgical Report

on

material from

Ardsallagh 5

For

Archaeological Consultancy Services Ltd.

Angela Wallace MSc, MIAI

January 2009

Ardsallagh 5

F11 Sample 69

1 small round smithing hearth cake, plano-convex in profile. Width 75mm, thickness 35mm, weight 260g

2 pieces which are probably fragments of small smithing hearth cakes

Piece 1 Length 40mm, thickness 25mm, width 40mm, weight 120g

Piece 2 Length 55m, thickness 20mm, width 25mm, weight 80g

Roughly 20 small irregular fragments of slag ranging from 10-40mm in width, total weight 200g.

F13 Sample 70

4 small-medium irregular nodules of iron slag ranging from 25-45mm in width, total weight 85g.

F15 Sample 71

1 medium sized irregular piece of slag, length 55mm, width 50mm, thickness 10-25mm, weight 130g

3 small irregular pieces ranging from 20-30mm in width, total weight 43g.

F38 Sample 72

5 small irregular nodules of iron smithing slag ranging from 15-25mm in width, total weight 47g.

F39 Sample 73

Bag 1 – 11 irregular shaped pieces of smithing slag ranging from 10-50mm in width. Light brown-grey in colour, some porosity evident in these pieces, total weight 200g.

Bag 2

Fragment of a rounded smithing hearth cake, roughly plano-convex in profile, generally quite a flat piece. Width 90mm x 85mm, thickness 15-20mm, weight 350g.

10 small irregular shaped pieces smithing slag ranging from 20-40mm in width. Total Weight 200g

F73 Sample 74

1 small roughly oval shaped smithing hearth cake, plano-convex in profile, length 80mm, width 60mm, thickness 10-15mm, weight 255g.

Discussion & Conclusions

As highlighted in the interim report for this site:

> Some of the features at Ardsallagh 5 would indicate that metalworking was being carried out in the vicinity. Slag was recovered from fills of the ditch F21, the pit F26, the stone surface F39, the spread F38, the large pit F30, and from the nearby irregular cut F52 which may have overlain, or been associated with the aforementioned large pit. The sides and base were not oxidised in either F30 or in F26 (or indeed in ditch F21) and these pits are more likely to represent refuse pits containing waste products produced during/as a result of the metalworking process than to form any part of the actual metalworking process. Although the sides and base of F30 were not oxidised, the full extent of the pit was not exposed so an association with metalworking cannot be ruled out.

A total of 2.17Kg of slag waste was recovered from this site. This is a relatively small amount of slag in comparison with sizeable sag assemblages from other early Medieval sites ranging from 60Kg to in excess of one tonne. The slag material recovered on the site consists of iron smithing slag. The majority of the material was recovered from F11, the fill of ditch F21 and from F38 and F39 two stony surfaces. It is quite likely that the areas of F38 and F39 were used as areas for small-scale smithing activity on the site, the volume of material recovered is quite small and suggests that smithing was probably related to the repair of artefacts rather than manufacture.

No further analysis is recommended for this material.

APPENDIX 13 Worked bone

04_01 Ardsallagh 5
Bone Cylinder

Nicola Trzaska-Nartowski and Ian Riddler
December 2008

Bone Cylinder

A complete bone cylinder has been cut from the lower midshaft of a cattle metatarsus with the aid of a knife or small axe, and polished on its outer surface. The upper part of the bone is hollow, whilst the lower part, cut away close to the condyles, consists largely of cortile tissue. This has been perforated on the medial side of the bone. It was clearly important, therefore, that the object was hollow throughout its length.

Bone cylinders are common objects from sites of early medieval date in Ireland, but are rarely found elsewhere in Europe. They are known from urban sites in particular, which provide a reasonable indication of their dating. Almost 300 were recovered from excavations in Waterford and the majority were found in contexts of the late eleventh and twelfth century (Hurley 1997, 685-96). Over 1,000 bone cylinders were recovered from the National Museum excavations in Dublin, most of which remain unpublished. In Dublin they are also common in contexts of the eleventh and twelfth centuries, although earlier examples are possibly also known, going back to the tenth century. Equally, examples from more recent Dublin excavations include several from thirteenth-century contexts (Simpson 1995, 82; Halpin 2000, 172-4). Bone and antler cylinders from Cork have largely come from twelfth century contexts (Hurley 2003, 342-3). In general, therefore, cylinders appear to come from sites of tenth to thirteenth-century date, but mainly from contexts of the eleventh to twelfth century.

Outside of urban conurbations, bone cylinders have been found on a number of rural sites, including Dalkey Island, Illaunloughlan Island and Nendrum (Liversage 1968, fig 27.212 and 291-3; White Marshall and Walsh 2005, fig 96.340:1; Bourke 2007, 414 and fig 13.28). Several of the Dalkey examples came from the primary fill of a ditch sealed by a deposit including ceramics of thirteenth century date, whilst the bone cylinder from Illaunloughan Island came from the fill of a medieval grave (Liversage 1968, 99-100; White Marshall and Walsh 2005, 188). An important collection of bone cylinders and antler beads, apparently forming a necklace, was recovered from under a wall at St Ninian's Isle, Shetland. They were thought to be of late prehistoric date, but early medieval features were also present on site and it would be unusual for bone cylinders to belong to this early period, given that all other examples come from early medieval contexts (Small 1973, 7 and fig 6).

The majority of cylinders are made of bone, although small numbers produced in antler have been found in Dublin and Waterford (Hurley 1997, 685). The most common bone to have been used in their manufacture is the cattle metatarsus, as is the case here. Several forms of cylinder can be identified, essentially on the basis of the part of the bone from which they derive (Figure 001). Type A has been cut from the proximal end of the bone and has an axial perforation through the articular surface. A bone cylinder from Farrandreg belongs to this type (Murphy 1998, fig 5.95E109.5:3). Type B stems from the midshaft and has usually been sawn neatly at either end. This part of the bone is naturally hollow. The majority of the Waterford bone cylinders belong to this type, which includes both long examples, encompassing most of the central part of the midshaft, and shorter cylinders. The Ardsallagh cylinder falls into type C, which is cut from the distal end of the bone, from which the

condyles have been removed. Cortile tissue is present over a part of the inner surface, and this is normally perforated, to ensure that the bone is hollow.

Many bone cylinders have been neatly sawn at either end and fashioned with some care. They are often polished along the interior perforation as well as the outer surface, and are frequently worn and abraded at their ends. The Ardsallagh cylinder is a cruder version of the object type, with rough, knife cut ends. It can be compared in this respect with several bone cylinders from Knowth, as well as the example from Farrandreg, cut from the upper end of the same bone type (Eogan forthcoming, object nºs 23181 and 23190; Murphy 1998, fig 5.95E109.5:3). The use of saws in the manufacture of most examples suggests that they were produced by antler and bone workers, for whom the saw was one of their most important tools (Riddler forthcoming). In contrast, cylinders cut fairly crudely by knife, as here, could have been produced by anybody with access to domestic animal bone.

The precise function of bone cylinders remains to be established. They are frequently polished on both their inner and outer surfaces. This probably stems from extensive wear and handling, particularly if they were grouped together on a string of rope or leather, as with examples from Dublin and Waterford. A group of seven from Christchurch Place in Dublin were found strung together on a leather strip and a cylinder from Waterford retained a section of cordage through its centre (White Marshall and Walsh 2005, 188; Hurley 1997, 685). Eight bone cylinders were found together at Peter Street in Waterford and sixteen cylinders were found in a single context at Winetavern Street in Dublin, echoing the presence of thirteen, together with seven bone beads, at St Ninian's Isle (Hurley 2003, 342; Halpin 2000, 172; Small 1973, fig 6). Hurley (1997, 685) has summarised their possible functions, amongst the most plausible of which are large beads – which may be borne out by the St Ninian's Isle assemblage – net spacers and devices for the twisting or rolling of cordage. Less plausible interpretations include counters for an abacus and loomweights. The latter suggestion can be ruled out because of the light weight of most examples, alongside the preference at this time in Ireland for the vertical two-beam and horizontal looms, neither of which required loomweights.

A008/038:14:1

Complete bone cylinder, cut from the lower midshaft of a cattle metatarsus. Separated from the remainder of the bone at both ends with the aid of a knife. Cortile tissue on the medial side of the bone towards the distal end has been perforated, so that the bone is hollowed throughout. Otherwise unmodified. Polished throughout on the upper surface.

Length:	86.3 mm
Width:	39.7 mm
Thickness:	32.0 mm
Perforation Diameter:	8.7 mm
Weight:	77.1g

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M3 Clonee-North of Kells Motorway Scheme

Bird and other Animal Bones

S. Hamilton-Dyer

07 January 2009

Introduction

Bird bones from several excavations of the road scheme were submitted for analysis. All bones, including those that proved to be of mammals, were fully recorded to element and taxon as far as practicable. Taxonomic identifications were made using the reference collections of the author. Recently broken bones were counted as single specimens. Measurements follow von den Driesch (1976) in the main and are in millimetres.

Ardsallagh 5

Context 39, cut 52
The single bird bone is the distal portion of a goose right humerus. The Bd (distal breadth) of 21.7 is smaller than would be expected for domestic goose, or its wild progenitor the greylag. The bone matches best with *Anser albifrons*, the white-fronted goose, a winter visitor.

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Cereal Drying and Metallurgy at Lismullin, Co. Meath: A Preliminary Analysis

Jonathan Kinsella

21 June 2007

Report Prepared for Archaeological Consultancy Services Ltd

Introduction

This paper will focus on the cereal-drying kilns and possible metallurgical features at Lismullin, Co. Meath, to assess their function and likely date. This research is also relevant for an overall understanding of kilns and metallurgical features, such as furnaces and smithing hearths, in Ireland as they constitute recurring features in the archaeological record that have thus far received only minor scholarly attention. Firstly, I will examine the morphological evidence for kilns, furnaces and smithing hearths to identify specific typological characteristics. In relation to cereal-drying kilns, this evidence is used to identify a preliminary chronological development from oval and sub-oval types, dating to the Iron Age, figure-of-eight examples, which approximately date from the transitional late Iron Age/early medieval period until the seventh century, and keyhole-shaped kilns, which date mainly from the c. 800/900s through the high middle-ages. Regarding metallurgical features, it is apparent that this technology altered little between late prehistory and the seventeenth century, until the introduction of the blast furnace and, as a result, these features remained largely constant over the centuries. Through an investigation of the typology and deposits of cereal-drying kilns and metallurgical features, this paper will demonstrate that it should be possible, in most cases, to distinguish between their functions and, in relation to cereal-drying kilns, to ascribe a relative date based on their morphology. To conclude, the available archaeological evidence for cereal-drying kilns will be used to identify the possibility for the indigenous development of arable farming practices and technology from the late Iron Age until approximately the ninth/tenth centuries and this will be supported by evidence from pollen analysis. The archaeological evidence from Lismullin must, therefore, not be considered in isolation but as part of the broader evidence nation-wide.

Cereal-drying kilns

Typology

- Oval and sub-oval kilns – Theses kilns appear oval and sub-oval in plan.
- Figure-of-eight kilns – These kilns appear as a figure-of-eight in plan.

- Dumbbell kilns – These are similar to figure-of-eight kilns but have a wider waist. It is probable that figure-of-eight and dumbbell kilns are related (Monk and Kelleher 2005).
- Keyhole-shaped or tobacco-pipe kilns – In plan the kilns appears keyhole-shaped while in cross-section they resembles a pipe.
- L-shaped or comma-shaped kilns – Part of the kiln is set at an angle to the other forming an L- or comma- shaped kiln when the flue is curving.

Approximate dimensions of cereal-drying kilns can be derived from the research of Monk and Kelleher (2005, 81-2) and through a glance at the appendices at the back of this paper. Oval and figure-of-eight-shaped kilns have approximate lengths of between 2m and 3m. The keyhole kilns cited in Monk and Kelleher's work range in length between 1.2m and 8.5m with the majority falling between 1.2m and 4m. The keyhole kilns at Leggetsrath West, Co. Kilkenny (Lennon 2006) and Derrinsallagh 3, Co. Laois (Kenny 2007a) are 4.6m and 7m long respectively (see Appendix I) indicating that the latter kilns are generally longer than oval and figure-of-eight examples.

Oval and figure-of-eight kilns at Colp West, Co. Meath (Murphy and Clarke 2001a; Appendix II), and Solsborough, Co. Tipperary (Murphy and Clarke 2001b), were described as being wider and deeper at the firing end and not so wide and shallower at the drying chamber end. The base of the flue typically rose in height from the fire spot to the drying chamber. The firing bowls of figure-of-eight kilns had approximate diameters of c. 1m while the drying chamber were slightly smaller with average diameters of c. 0.80m. An examination of the Colp West kilns shows that the largest firing bowl diameter was 1.36m while the smallest was 0.60m. At the drying chamber end, the largest bowl diameter was 1.30m and the smallest was 0.60m (see Appendix II). The firing area of keyhole kilns had an average diameter of between 0.80m and 1.50m while the diameter of the drying chambers ranged from 0.32m to 1.60m (Monk and Kelleher 2005, 81). Generally, therefore, the firing area for oval, figure-of-eight and keyhole kilns is wider and deeper than the drying chamber.

Depths of the features depended on the level of truncation at each site but the oval and figure-of-eight kilns at Colp West had an average depth of c. 0.50m (see Appendix II) while the depths of the drying chambers for keyhole-shaped kilns ranged on average between 0.65m and 1m (Monk and Kelleher 2005, 82).

Function

A kiln is a structure designed specifically for the drying of a commodity. Hot air, from an open fire, reaches the cereals within the drying chamber via the flue. Experiments by Monk and Kelleher (2005, 101-4), on keyhole-shaped kilns, have shown that a number of factors were essential in determining their success when drying cereals. An important aspect was the temperature of the air, when entering the kiln, and this was influenced by such things as the weather, the direction of the wind and the proximity of the fire. It was demonstrated that the temperature could be controlled by placing the fire within a depression, just before the mouth of the flue, and through the regular opening of the roof on the kiln superstructure. The wind could be controlled through the correct alignment of the kiln and by the use of windbreaks. The flue length was a key factor because longer flues were less likely to result in the accidental burning of the cereals. For shorter flues, baffle stones were sometimes used as they prevented sparks from the fire reaching the drying chamber. The more successful experiments were also carried out in kilns where the drying chamber was set at a higher level than the flue mouth.

The orientation of the kiln and the location of the drying chamber, in relation to the flue, were essential in maximising efficiency. Orientation was influenced by local factors such as topography, wind direction and the proximity of settlement. In their study of kiln orientation, Monk and Kelleher (2005, 83) have demonstrated that the majority were aligned either north/south or east/west. It was also noted that many were set into slopes, with the chambers upslope, or boundaries such as ditches or field fences (ibid., 84).

Kilns are essential for cereal crop processing and especially to ripen the crop after damp harvests and/or in short growing seasons. However, the drying of cereals prior to threshing, following a damp harvest or a short growing season, is only one aspect of a

kiln's function. An equally important function of the cereal-drying kiln is to harden the grain to allow for effective milling (Monk 1994, 217). This was relevant both for small-scale and larger-scale production as grinding the grain, without prior drying, was more difficult and resulted in the clogging of the quern surface. Cereal-drying kilns were used for the production of malt and evidence for this has been detected at Corbally, Co. Kildare (Tobin 2003). They were also utilised for the drying of grain, to reduce the moisture content prior to storage, and to fumigate for insect pests (Monk 1994, 218).

Preliminary kiln chronology based on morphology and available radiocarbon results

Introduction

Monk and Kelleher (2005, 105-6) have devised a preliminary chronological framework for the development of cereal-drying kilns in Ireland. They suggest that figure-of-eight kilns, and related dumbbell kilns, date to the early medieval period followed by keyhole-shaped kilns which are predominantly associated with the high middle-ages. The problems pertaining to devising such a chronological framework are related to the lack of fully published excavation reports. This problem is furthered because drying kilns rarely produce evidence for their close dating as samples taken are usually derived from later deposits. When radiocarbon dates are forthcoming, it is not clear what material was used and from what layer the sample was taken (Monk and Kelleher 2005, 105). Baring these factors in mind, the following chronological sequence for the development of cereal-drying kilns in Ireland is a preliminary one and may be subject to change with increased publication and more precise sampling strategies. Monk and Kelleher's (2005) dating of figure-of-eight and keyhole kilns, to the early and later middle ages respectively, is followed although I believe there is preliminary evidence now to date figure-of-eight kilns to an approximate period between the fourth and seventh centuries. Also, I argue that there is evidence for oval and sub-oval kilns dating to the Iron Age and that these were precursors for the slightly later figure-of-eight and dumbbell types. Indeed, both types of kiln may have functioned contemporaneously for a short period until it was realised perhaps that the figure-of-eight kiln functioned more efficiently.

Oval and sub-oval kilns (Middle-late Iron Age - c. seventh century)

The excavations at Colp West produced at least seventeen kilns with two possible further examples. What was most striking about the results was the number which returned radiocarbon dates from the Iron Age (see Appendix II). It became clear that the kilns, which returned exclusively Iron Age radiocarbon dates, were either oval or sub-oval in plan except for one example which was a figure-of-eight type. The remaining figure-of-eight kilns spanned dates between the late Iron Age/early medieval transitional period and the early middle ages up to approximately the seventh century.

In all cases, charcoal was sampled and many of the samples came from primary contexts (see Appendix II). The kilns at Colp West were associated with archaeological features of both Iron Age and early medieval date and in many cases they predated the construction of the ringfort in proximity. It is evident, therefore, through a combination of radiocarbon dates from primary contexts, the stratigraphy of the archaeological complex and the association of the kilns with Iron Age features, such as a hut site, that some of the kilns were utilised in the Iron Age. Three of these kilns were oval-shaped while one was a figure-of-eight type.

A number of oval and sub-oval kilns were excavated at Solsborough. Three oval and sub-oval types produced radiocarbon dates between the fifth and seventh centuries from primary contexts (see Appendix I). An oval kiln was also dated between AD 2-79 although it contained only one deposit consisting of a brown clay that was flecked with charcoal. The charcoal increased in density towards the base in the wider deeper end of the kiln which was the firing end. However, this fill may have consisted of dump material from the site so we can not be overly confident of its date especially as only one sample was taken. However, like Colp West, the kilns were associated with features which returned both Iron Age and early medieval dates and it may be suggested that they were part of a multi-period archaeological complex in which the settlement evidence lay beyond the roadtake.

Both Colp West and Solsborough, therefore, have produced oval, sub-oval and figure-of-eight cereal-drying kilns. Although the sample of kilns is small, it is argued that there is sufficient evidence to devise a preliminary chronological and typological framework for the use of oval and sub-oval kilns dating to the Iron Age. There is also evidence for figure-of-eight kilns dating to the Iron Age at Colp West and oval examples dating between the fifth and seventh centuries from Solsborough while similar kilns are slightly later in date at Johnstown, Co. Meath (Clarke 2004; Clarke and Carlin forthcoming; see Appendix I). In the Iron Age, probably during the last centuries BC and the beginning of the first millennium, oval cereal-drying kilns began to be used in Ireland. This technology was adapted, possibly to enhance its functionality, and was gradually succeeded by figure-of-eight type-kilns from approximately the third century AD. This change in kiln type possibly occurred at different speeds throughout the country and there is some evidence that they functioned contemporaneously during the transitional period, between the late Iron Age and early medieval period, until oval kilns were finally replaced by figure-of-eight and dumbbell types.

Figure-of-eight & dumbbell kilns (c. AD 400-700)

Monk and Kelleher (2005) site figure-of-eight kilns from Corbally, Co. Kildare (Tobin 2003), Jordanstown, Co. Dublin (Tobin 2002), and Raystown, Co. Meath (Seaver 2006), as possible early medieval kilns but also stress that it may be too soon to devise such a chronological framework. Corbally has produced at least 26 kilns, the majority figure-of-eight types, yet radiocarbon dates are awaited. A geophysical examination of the site, however, revealed a large sub-rectangular enclosure which may date to the early medieval period. The kilns at Jordanstown also await radiocarbon dates but are not associated with any obvious early medieval features.

Two published archaeological sites which have produced datable evidence from figure-of-eight cereal-drying kilns are Glebe/Laughanstown, Co. Dublin (Seaver 2005) and Raystown. At both sites, the radiocarbon dates suggest use between the fourth and seventh centuries (see Appendix I). Cereal grains were sampled and dated at Raystown while the datable samples from Glebe/Laughanstown varied between charcoal and cereal

grains (Seaver 2005, 150; 2006, 134). Unfortunately, it is not stated which context the samples came from but cereals are short-lived species so we can be relatively confident about their date. As noted earlier, a number of kilns have also been radiocarbon dated from Colp West. In all cases, charcoal was sampled and in many cases the dates were retrieved from primary fills. The excavators have described the kilns as oval and keyhole in plan yet the keyhole-shaped kilns clearly resemble figure-of-eight and dumbbell types which date mostly between the fourth and seventh centuries (see Appendix II). Currently, there is a general lack of dating evidence relating to figure-of-eight kilns. However, based on the initial evidence, dated examples from Laughanstown/Glebe, Raystown and Colp West suggest that they were utilised most commonly between the fourth and seventh centuries. It is worth noting that both Seaver (2005) and Murphy and Clarke (2001a) have suggested that many of the figure-of-eight kilns predated the respective ringforts at Laughanstown/Glebe and Colp West and, interestingly, the radiocarbon results can be interpreted as assigning the kilns within the late Iron Age/early medieval transitional period prior to the construction of ringforts in Ireland c. AD 600 (see Stout 1997 for ringfort chronology, 24-8). I believe that this type of cereal-drying technology marks the approximate middle point between oval and sub-oval kilns, which originated in the late Iron Age, and the keyhole-shaped kilns which become common towards the end of the first millennium.

Keyhole-shaped kilns (c. AD 800/900s – late medieval period)

Monk and Kelleher (2005, 105) have argued convincingly that keyhole-shaped kilns tend to date to the later middle ages citing Kilferagh, Co. Kilkenny (Hurley 1987) and Ballysimon, Co. Limerick (Collins and Cummins 2001, cited in Monk and Kelleher 2005) as examples which date between the thirteenth and fourteenth centuries. Furthering their argument, they demonstrate the higher proportion of wheat and the presence of pulses, peas and beans in many keyhole-shaped kilns which are not traditionally found in early medieval contexts. More recent excavations, from both published and grey literature, at Legetsrath West, Derrinsallagh and Kileany, Co. Laois (Kenny 2007b; also see Appendix I), identify that keyhole-shaped kilns also functioned in the latter part of the early middle-ages from approximately the ninth or tenth century onwards.

Ferrous and Non-Ferrous Metallurgical Features

Introduction

It has been preliminary suggested that some of the archaeological features at Lismullin represent smithing hearths or metallurgical features relating to non-ferrous or glass working (Grogan & O'Connell *et al* 2007). This section will briefly outline the recent archaeological evidence for ironworking, non-ferrous metalworking and glass working from excavations in advance of the M4 and M7/8 road schemes to determine the possible function of the Lismullin kiln/furnaces. The two features in question can be described as follows. Firstly, on the north side of the site at Lismullin is a kiln or furnace set into the north-facing slope overlooking the wetland area. This consists of two bowl-shaped depressions with the larger deep funnel-shaped fire pit on the northern side. The bowls were joined by a shallow flue. Fired material extracted from all three elements of this feature was from the clay lining which was produced at high temperatures over more than one firing. Immediately to the north of the post enclosure is another, slightly unusual, furnace. Although figure-of-eight-shaped the clay lined eastern bowl is elongated and separated from the other side by a vertical stone slab. A decorated projecting ring headed pin, dating to the late Iron Age (O'Connor 2007), was recovered from the upper fill of this feature.

Typology (Ferrous working)

- Smelting furnaces:

Smelting furnaces are archaeologically identifiable as bowl-shaped pits which typically contain slag. The majority of furnaces from the M4 excavations had diameters of between 0.40m and 0.70m and depths of between 0.10m and 0.20m (Carlin, Ginn and Kinsella forthcoming). At Derrinsallagh 4, Co. Laois, 46 archaeological features have been initially identified as bowl furnaces with the smaller furnaces measuring between 0.20m and 0.30m in diameter and the larger examples between 0.40m and 0.80m. The depths ranged between 0.10m and 0.20m for the smaller furnaces and between 0.15m and 0.35m for the larger types (Lennon 2007).

- Smithing hearths:

Rectangular smithing hearths - The majority of the smithing hearths from the M4 had a distinctive rectangular plan with steep sides and a flat base. Most were 1.0m to 1.60m in length and between 0.10m and 0.40m deep (Carlin, Ginn and Kinsella forthcoming). It has been suggested that these were utilised for bloomsmithing (ibid.).

Bowl-shaped smithing hearths - Smithing occurred in bowl-shaped hearths and was also conducted in previous smelting furnaces (Scott 1990). It is very difficult, therefore, to archaeologically distinguish the difference between smelting furnaces and smithing hearths unless specialist analysis of the slag has been undertaken.

- Figure-of-eight smithing hearths/furnaces:

Although less well represented in the archaeological record, figure-of-eight-shaped metallurgical features have recently been discovered in advance of the M4 and M7/8 road schemes. At Killickaweeny, tests for magnetic susceptibility revealed that some of the fills contained high levels of iron which was suggestive that the figure-of-eight metallurgical feature functioned as a smithing hearth (Walsh and Carlin forthcoming). Three figure-of-eight metallurgical features excavated at Derrinsallagh 4 have been described as furnaces (Kenny 2007c; Lennon 2007) although they may have functioned as smithing hearths; their exact function will not be known until specialist analysis has occurred on the residues. One example measured 1.21m in length, was 0.64m wide and had a depth of 0.43m. The primary fills consisted of vitrified clay while the upper deposits contained frequent slag inclusions. The vitrified clay is suggestive that the bowls were clay-lined or indicates the presence of a superstructure. However, both furnaces and smithing hearths could have contained covering structures so only specialist analysis can determine the feature's function.

Typology (Non-ferrous metalworking)

Bronze working furnaces were generally similar in morphology to ferrous working furnaces (Laing 2006). They are, however, less frequent in the archaeological record and produce much lower volumes of residue. Also, bronze was more highly valued than iron

during the Iron Age and early medieval periods and both furnaces and hearths were thoroughly cleaned and any residues kept as a result. Moynagh Lough crannog, Co. Meath, produced abundance evidence for non-ferrous metalworking in the form of furnaces, crucibles, mould fragments, motif pieces, heating trays, ingots and metalworking tools (Bradley 1993). A furnace from Phase Y consisted of a bowl-shaped depression, with an average diameter of 0.45m, which was lined with calcareous mud. Another furnace, from Phase X, was bowl-shaped and the base was deliberately stepped so that one part was higher than the other. It had a diameter of 0.35m and a depth of 0.14m. The fill was sterile but it is likely the furnace was deliberately and thoroughly cleaned so as not to waste any of the valuable residues.

After copper and tin was smelted, the raw material was generally cast into small ingots in stone moulds and was then melted down in crucibles for pouring into clay moulds. The archaeological evidence for copper and copper-alloy working, therefore, produces a range of artefacts in the form of crucibles, moulds, ingots and motif pieces. These appear most commonly on high status secular and ecclesiastical early medieval settlements such as Lagore crannog, Co. Meath (Hencken 1950), Moynagh Lough crannog (see above), Garranes ringfort, Co. Cork (Ó Ríordáin 1942) and Armagh (Gaskell Brown and Harper 1984) for example. Evidence for glass-working has also been demonstrated at Lagore, Garranes and Armagh and it appears that specialist smiths were commissioned by the lordly and ecclesiastical classes for the production of decorative iron, bronze and glass artefacts.

In conclusion, the presence for ironworking in the archaeological record is abundant in the form of furnaces, smithing hearths, charcoal producing kilns and residues most commonly of slag. Excavations along the M4 have produced distinctive rectangular smithing hearths which are differentiated in form from oval furnaces. Smithing hearths may also be bowl-shaped and there is evidence that smelting furnaces were reused as hearths. Therefore, it is extremely difficult to identify one from the other without specialist analysis of the residues. Iron slag is a common find on early medieval sites within furnaces, hearths and enclosing ditches and is a sure indicator of ferrous working.

The residues of non-ferrous and glass working are less readily identifiable because the furnaces and hearths were intensively cleaned due to the increased value and rarity of these resources. Until the seventeenth century, for example, glass was imported into Ireland (Bourke 1997) and was undoubtedly considered a luxury item prior to that. There is evidence, most commonly from high status secular and ecclesiastical settlements, of copper and copper-alloy working in the form of crucibles, moulds, ingots and motif pieces that can be readily associated with non ferrous metalworking. Much of the equipment used for glass and enamel working was the same as that of copper and copper-alloy working so the two were commonly carried out in the same area by specialist smiths. Non ferrous and glass working is therefore identifiable in the archaeological record by the presence of the equipment used by the smiths as we are much less likely to discover residues within furnaces or hearths.

Chronology

Excavations in advance of the M4 have added immensely to our knowledge of metallurgy in Ireland from late prehistory until the medieval period. There seems little doubt to refute the date of 810-420 BC which was obtained from a sub-rectangular pit at Kinnegad 2 which contained 100 sherds of late Bronze Age pottery and some iron slag (see Carlin, Ginn and Kinsella forthcoming). A bloom smithing hearth at Rossan 6, which contained much slag from its primary fill, was also radiocarbon dated to 820-780 BC (ibid.). The late Bronze Age dates from the metallurgical features on the M4 confirm the views of Raftery (1976; 1994) and Cooney and Grogan (1991) for early iron production in Ireland within a late Bronze Age context.

The M4 excavations uncovered multiple metallurgical sites dating between 400 BC and AD 600 where previously ironworking sites from this period had been lacking in the archaeological record (Carlin, Ginn and Kinsella forthcoming). More recent excavations on the M7/8, at Derrinsallgh 4, have produced radiocarbon dates of 240 BC – AD 50 and 10 BC – AD 240 from two bowl furnaces (Lennon 2007). It is becoming clear, therefore that there is growing evidence for ironworking production sites from the middle and late Iron Age and that this evidence will expand with increased publication.

The majority of the metallurgical features from the M4 excavations were dated to the early medieval period while evidence for late medieval metallurgy was minimal. What became apparent, however, was that the methods of production and morphology of the metallurgical features remained constant from the late Bronze Age until the seventeenth century. Therefore, it is only by radiocarbon dating and associated artefacts that metallurgical features can be ascribed to a certain period.

General Discussion

A total of eleven kilns and two possible metalworking features have been uncovered at Lismullin in proximity to a large late Iron Age ceremonial enclosure, a ring-ditch of probable Bronze Age/Iron Age date and an early medieval unenclosed souterrain (see Grogan & O'Connell *et al* 2007). Lismullin, therefore, represents a multi-period archaeological complex dating from prehistory until the early-middle ages. This brief discussion will focus on the cereal-drying kilns and the metallurgical features as excavations are ongoing and a final report will be produced thereafter by the site director Aidan O'Connell.

Before discussing the cereal-drying kilns, I will begin with an investigation into the function of the two possible metallurgical features at Lismullin. Both are figure-of-eight-shaped and are not dissimilar to the surrounding cereal-drying kilns. Indeed it can be argued that one of these features functioned as a kiln rather than a furnace or smithing-hearth. This was figure-of-eight-shaped and measured 2.69m in length, was 1.40m wide and had a depth 0.64m (Aidan O'Connell pers comm.). A late Iron Age projecting ring-headed pin was uncovered from its upper fill. Of particular interest, regarding its function, was the presence of a vertical stone placed deliberately within the flue that displayed evidence of burning. This was most probably a baffle stone that was used to protect the cereal grains, in the drying chamber, from the sparks which entered the flue via the fire. The dimensions of this feature are consistent with the general sizes of figure-of-eight kilns and no iron slag, or metallurgical residues, was recovered from its fill.

More enigmatic, however, was the figure-of-eight-shaped feature which displayed evidence for intensive burning and fire reddening. Fired material extracted from all three elements of this feature was from the clay lining and this was produced at high temperatures over more than one firing. This was not a pottery kiln as the bowl-shaped components are an unsuitable shape to stack pots and the temperature generated appears to have been far too high for ceramic production (Grogan and O'Connell *et al* 2007). Neither was this likely to have been a cereal-drying kiln because the evidence for intensive burning is more in line with the temperatures required for metallurgical activities. For parallels, we must, therefore, turn to the evidence for further figure-of-eight-shaped metallurgical features. The Killickaweeny feature was identified as a smithing hearth due to the high levels of iron located within its fill. At Derrinsallagh 4, three figure-of-eight metallurgical features were identified. Iron slag was located from the upper fills of one example and importantly the primary and secondary deposits included vitrified clay suggestive of a clay superstructure. This figure-of-eight feature was either a furnace or smithing hearth but its definitive function will not be known until specialist analysis of its residues has been undertaken. Both the Killickaweeny and Derrinsallgh smithing hearths/furnaces differ to the Lismullin type in that they produced direct evidence of ironworking, in the form of slag, from their fills. It is likely, therefore, that the Lismullin feature functioned as a non-ferrous metalworking or glass working furnace or hearth. It is not surprising that there is no evidence for copper, copper-alloy or glass residues due to its rarity and value (the furnace/hearth would have been well cleaned after use), when compared to iron, but it is unusual that the equipment associated with non-ferrous metalworking and glass working was not found in association with the furnace/hearth such as crucibles, moulds or specialist tools for example. The figure-of-eight metallurgical feature at Lismullin therefore remains something of an enigma and all can that be said at this stage is it did not function as a cereal-drying kiln and was probably utilised for non-ferrous metallurgical and/or glass working activities.

The remaining eleven features under discussion comprise of cereal-drying kilns. The majority were figure-of-eight-shaped although two were oval kilns. The shortest example was 2.15m in length and the longest was 3.40m. The widest kiln measured 1.60m while

the least wide was recorded at 0.68m (Aidan O'Connell pers comm.). The primary fills of the kilns consisted generally of carbonised and charcoal-rich layers and some lenses of ash were present. They were eventually covered with backfill. Cereal grains have been initially identified from one of the kilns, measuring 5.60m in length, 1.20m wide and 0.30m deep, which has been described as dumbbell-shaped (Aidan O'Connell pers comm.) and more are likely to be revealed once the soil samples have been sieved. The dimensions and morphology of the Lismullin kilns can be paralleled with the oval and figure-of-eight-shaped kilns described (see Appendices' I & II) and it is suggested therefore that they date between the middle Iron Age and the early medieval period (c. 100 BC – AD 700). The suggested date-range is based on evidence from previously excavated kilns which have produced radiocarbon dates from mostly primary contexts. Like Lismullin, the presence of oval and figure-of-eight-shaped kilns, in proximity to each other, was recorded at Colp West, Solsborough and Johnstown. All three sites produced archaeological features which spanned the Iron Age and early medieval periods. The ritual enclosure at Lismullin dates to the late Iron Age and the ringditch may be contemporary or slightly earlier. The souterrain probably represents a later feature, most likely dating to the second half of the first millennium. The oval kilns at Lismullin, it is suggested, will date to the Iron Age, or the transitional period encompassing the beginnings of the early middle-ages, and the figure-of-eight cereal-drying kilns may be contemporary or slightly later, spanning the centuries up to c. AD 700. The radiocarbon dates for the kilns at Lismullin are keenly awaited to determine if they are representative of the initial dating-sequence proposed by the author based on the, thus far, small sample of excavated kilns.

The discovery of cereal-drying kilns dating to the Iron Age in Ireland is an exciting one because previously they have been seen as an early medieval and later technological innovation (Monk and Kelleher 2005). The same authors (ibid., 106) have proposed a possible indigenous development for figure-of-eight kilns, dating to the early medieval period, but now it seems probable, and the archaeological evidence and radiocarbon dating is suggestive, that oval Iron Age kilns (Appendices' I & II) developed in Ireland without influence from Roman Britain. The majority of drying kilns that have been

archaeologically investigated in Britain are of Roman date and many are T-shaped where the stem of the T forms the flue and the cross forms the duct of the drying chamber (Monk 1994, 217). Many of the T-shaped kilns date to the late Roman period, c. AD 400 and later (ibid.), which chronologically places them three or four centuries later than some oval kilns from Ireland (see Appendix II). The awaited radiocarbon dates from Lismullin are essential because if the oval kilns produce middle to late Iron Age dates, it strengthen the claim for the indigenous development of cereal-drying kilns in Ireland. It is crucial, therefore, that cereals, from primary contexts *in situ*, if available, are dated and more than one sample is submitted for dating (Mick Monk pers comm.). Species identification is also crucial, if charcoal is sampled from primary fills, because it is then possible to factor-in the 'old wood effect' if long-lived tress such as oak or elm were burnt.

The recent discoveries of middle-to-late Iron Age cereal-drying kilns should not come as a surprise and more are sure to be identified through development-led archaeology and in succeeding publications. It has long been recognised that there was an increase in arable farming in the first centuries AD, most notably from the third century onwards, and that this led to large-scale deforestation (Edwards 1990, 52; Laing 2006, 65; Mitchell & Ryan 1998, 246; Raftery 1994, 122; Waddell 1998, 377). Pollen analysis has been crucial to this understanding (for example see Hall 2000; for a summary of pollen diagrams see Stout 1997, 39-47) and it has allowed for the reconstruction of cultural landscapes during the prehistoric and historic periods. Pollen records have been established in counties throughout Ireland and the majority identify land clearance in the early centuries AD. At Lough Doo, Co. Mayo, woodland clearance was extensive involving the almost complete removal of elm and yew whilst cereal pollens increased emphasising the expansion of crop husbandry c. AD 400 (O'Connell *et al* 1987). At Lough Sheeauns, Co. Galway, the pollen record demonstrated woodland clearance and the initiation of intensive farming prior to AD 500 (Molloy and O'Connell 1991). Other examples include the pollen record from Red Bog, Co. Louth, which shows a sharp decline in tree pollens between the first and sixth centuries and a corresponding increase in cereal pollens (Mitchell 1986) and from Loughnashade, Co. Antrim, and Whiterath Bog, Co. Louth, which similarly depict

widespread land clearance from the second century and a dramatic increase in arable agriculture (Waddell 1998, 377).

It has previously been argued that the adoption of new ploughing technology, which resulted from contacts with Roman Britain, hastened the growth of agriculture throughout the opening centuries of the first millennium (Mitchell & Ryan 1998, 248). However, more recent research by Brady (1993) and Kelly (1997) has shown that the coulter plough was not introduced until the tenth century. Irish ploughing, therefore, remained much the same during the Roman occupation in Britain and farmers ploughed with the ard or scratch plough throughout the late Iron Age and for most of the early medieval period in Ireland. Agriculture, however, was clearly expanding so what were the indigenous factors which influenced this? Ryan (2000, 32) has outlined a number of possibilities including the development of cooperative farming, the use of plough teams of four oxen, improved varieties of crops and extensive manuring which were all a culmination of better management. Is the initial archaeological evidence for oval cereal-drying kilns, dating to the middle and late Iron Ages, and the succeeding figure-of-eight-shaped kilns, to c. AD 700, another component of this indigenous farming enterprise? It may be too early to say at this point but it an interesting proposition nonetheless. It is also very interesting to note that the adoption of the coulter plough, *coltar* which is most likely a borrowing from Norse, in unkown before the tenth century (Ryan 2000, 32) and this is approximately the same time when keyhole-shaped kilns appear on the Irish landscape. Therefore, did the advent of new ploughing practices coincide with improved cereal-drying technology? Perhaps, keyhole-shaped kilns were also the result of Scandinavian agricultural influences but this is beyond the scope of this paper.

Conclusion

This paper has focused on the cereal-drying kilns and possible non-ferrous metalworking/glass working furnace or hearth that forms part of the archaeological complex at Lismullin. The kilns consist primarily of figure-of-eight types although two oval examples are also present. Based on the small sample of previously excavated kilns, which have produced radiocarbon dates, I have devised a preliminary chronological

framework for the development of kilns whereby oval type predominantly date to the middle and late Iron Age, figure-of-eight kilns were commonly in use between approximately the fourth and seventh centuries and keyhole-shaped kilns first appear in the ninth/tenth centuries. This paper has drawn heavily from the work of Monk and Kelleher (2005) and has largely followed their kiln chronology. It differs in that I have ascribed and included oval and sub-oval kilns, which date to the Iron Age, and I have suggested a tighter date-range for figure-of-eight-shaped kilns. This hypothesis remains to be tested and it is only with increased publication, greater dissemination of information and considered sampling strategies that this will be possible.

The radiocarbon results from the Lismullin cereal-drying kilns and other recently excavated kilns along the M3 and across the country are of significant importance. I have suggested that the Lismullin oval kilns will produce middle-to-late Iron Age dates while the figure-of-eight-shaped kilns will probably return dates between c. AD 300-700. There is also the possibility that some of the oval and figure-of-eight kilns will date to the late Iron Age/early medieval transitional period. If this turns out to be case, it raises important questions about the indigenous development of farming practices and technology in Ireland. The pollen record has been a constant reminder of the landscape changes that occurred in Ireland from approximately the third century and the emergence of cereal-drying kilns dating to the same period should therefore come as no great surprise.

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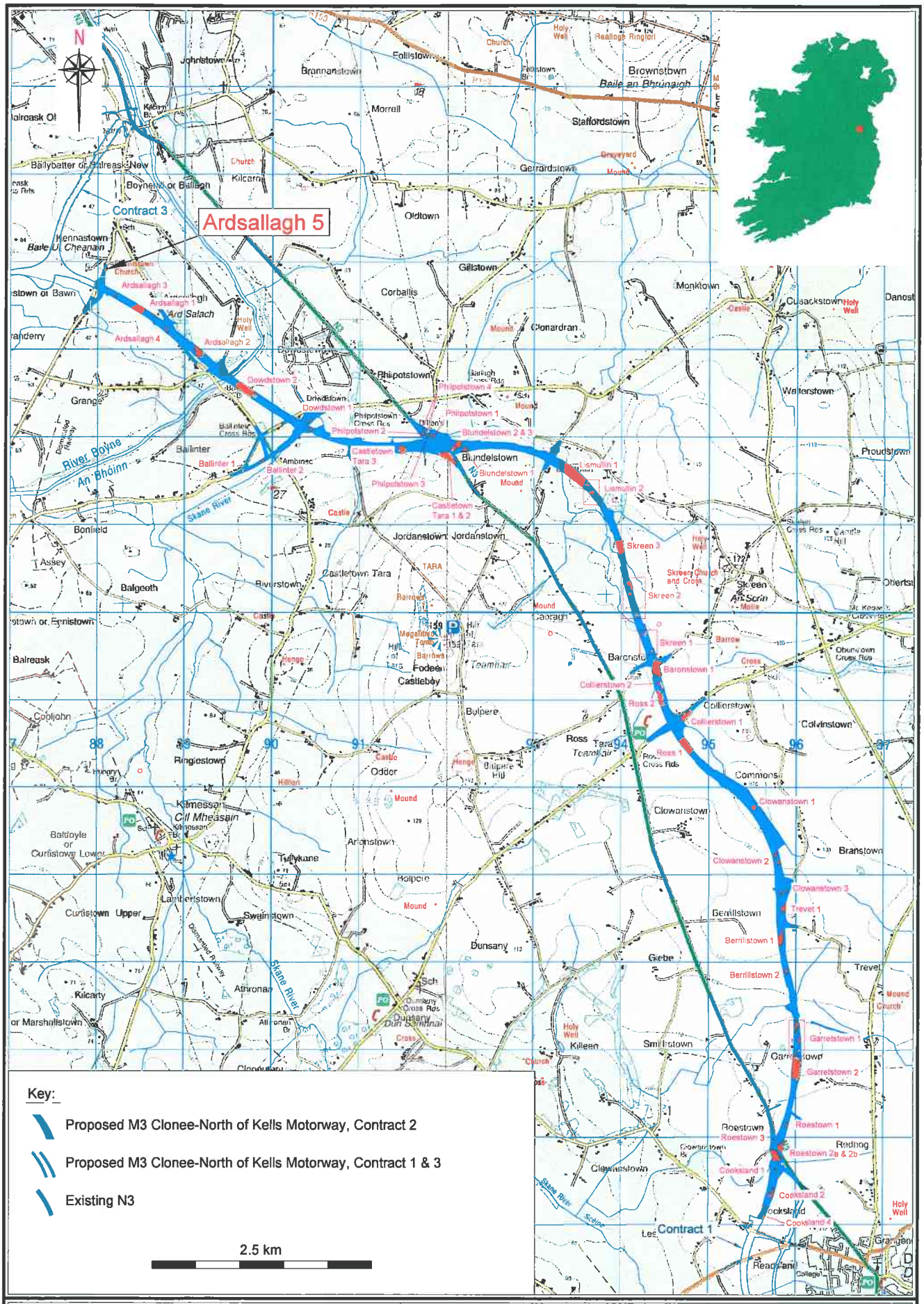

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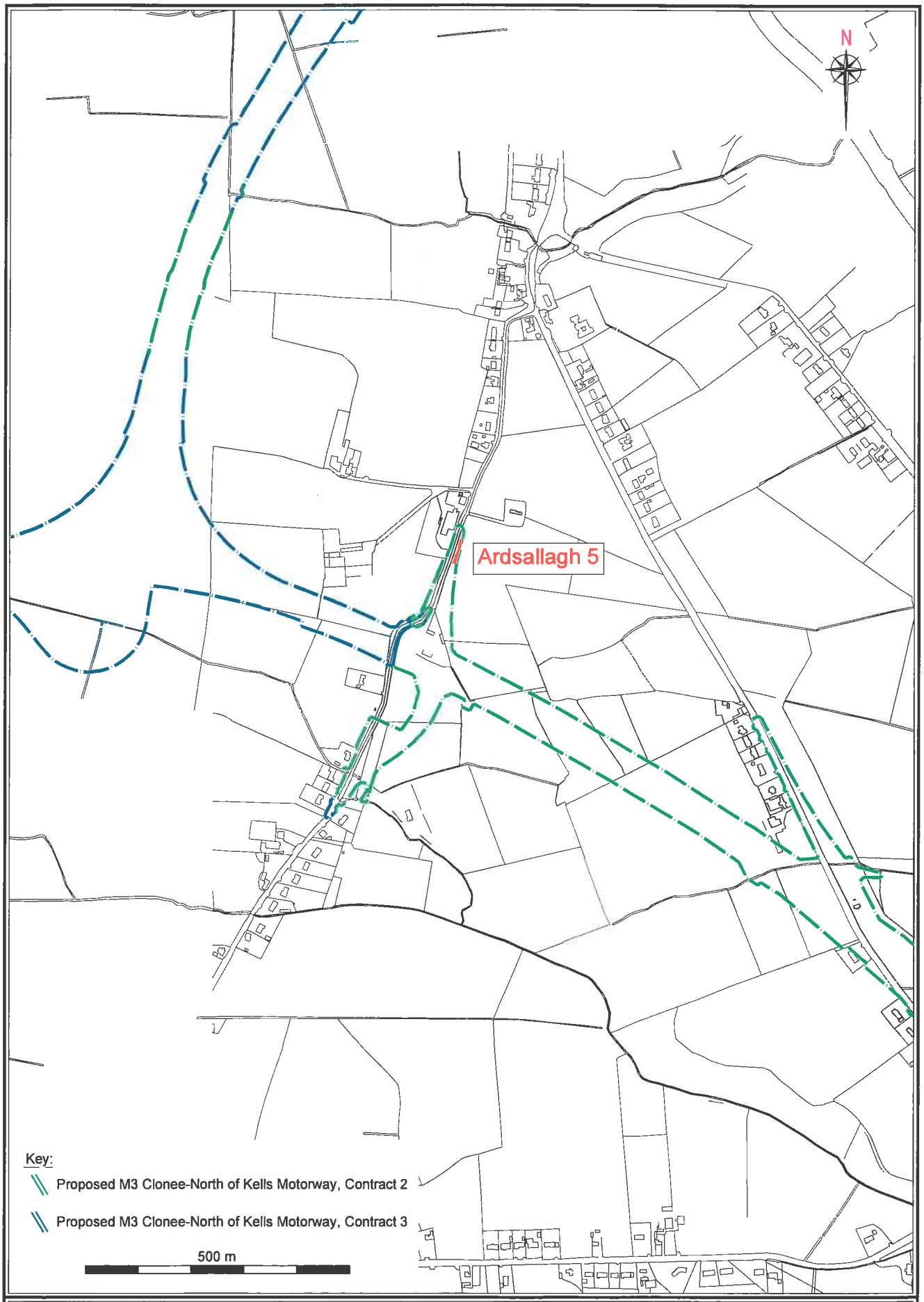
		Date: Jul '08
	Issued for: Excavation Report	Origin: OSi Discovery Series
	Client: Meath County Council	Drawing no.: 04_01_C3139

Figure 1: Location of Ardsallagh 5



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		Date: Jul '08
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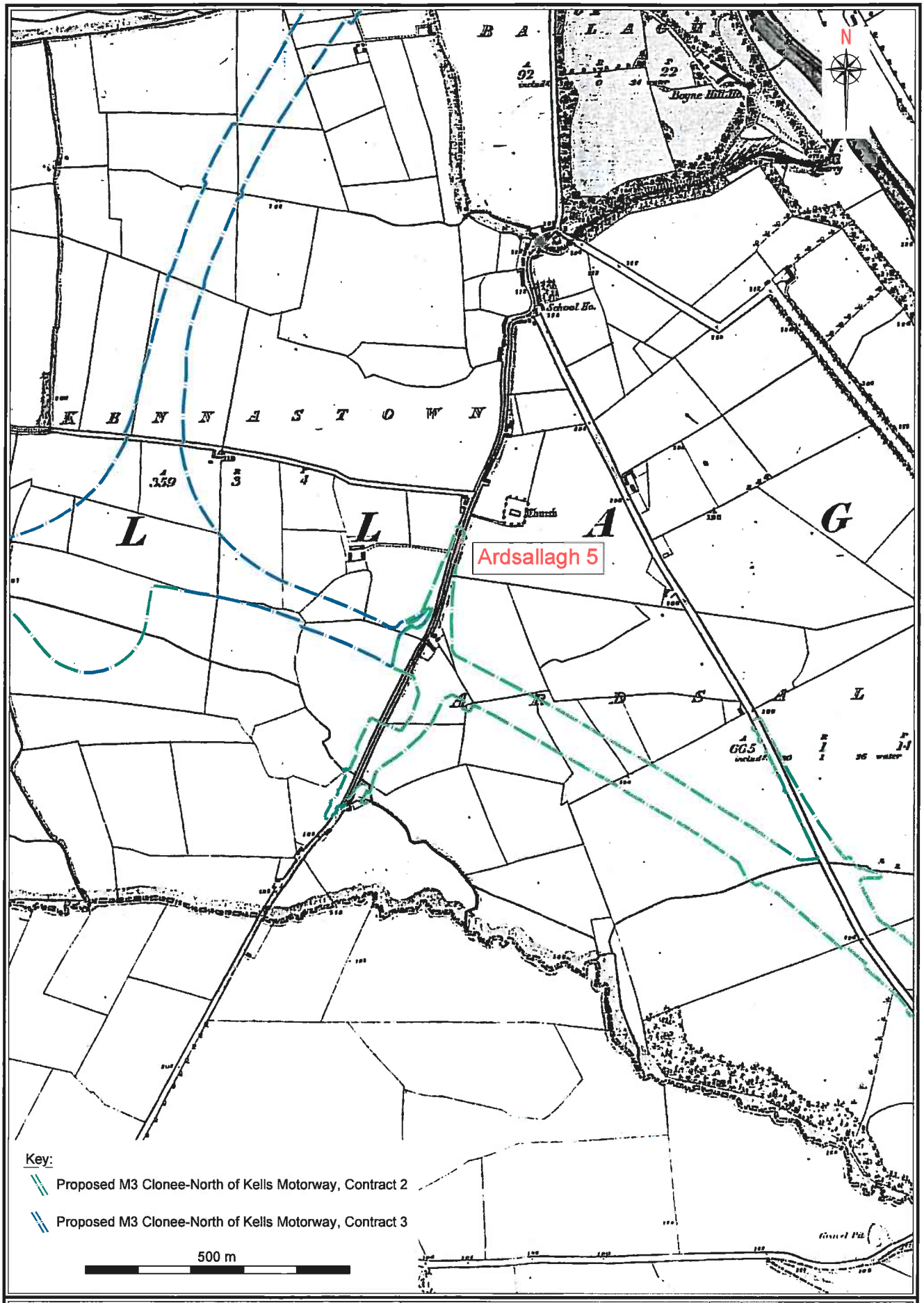
	Client: Meath County Council	Drawing no.: 04_01_C3140

Figure 2: Location of Ardsallagh 5 on current OS background



Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M3 Clonee-North of Kells PPP Scheme Contract 2, Ardsallagh 5	Scale: 1:10,000 A4
		Date: Jul '08
	Issued for: Excavation Report	Origin: OSi (1836)
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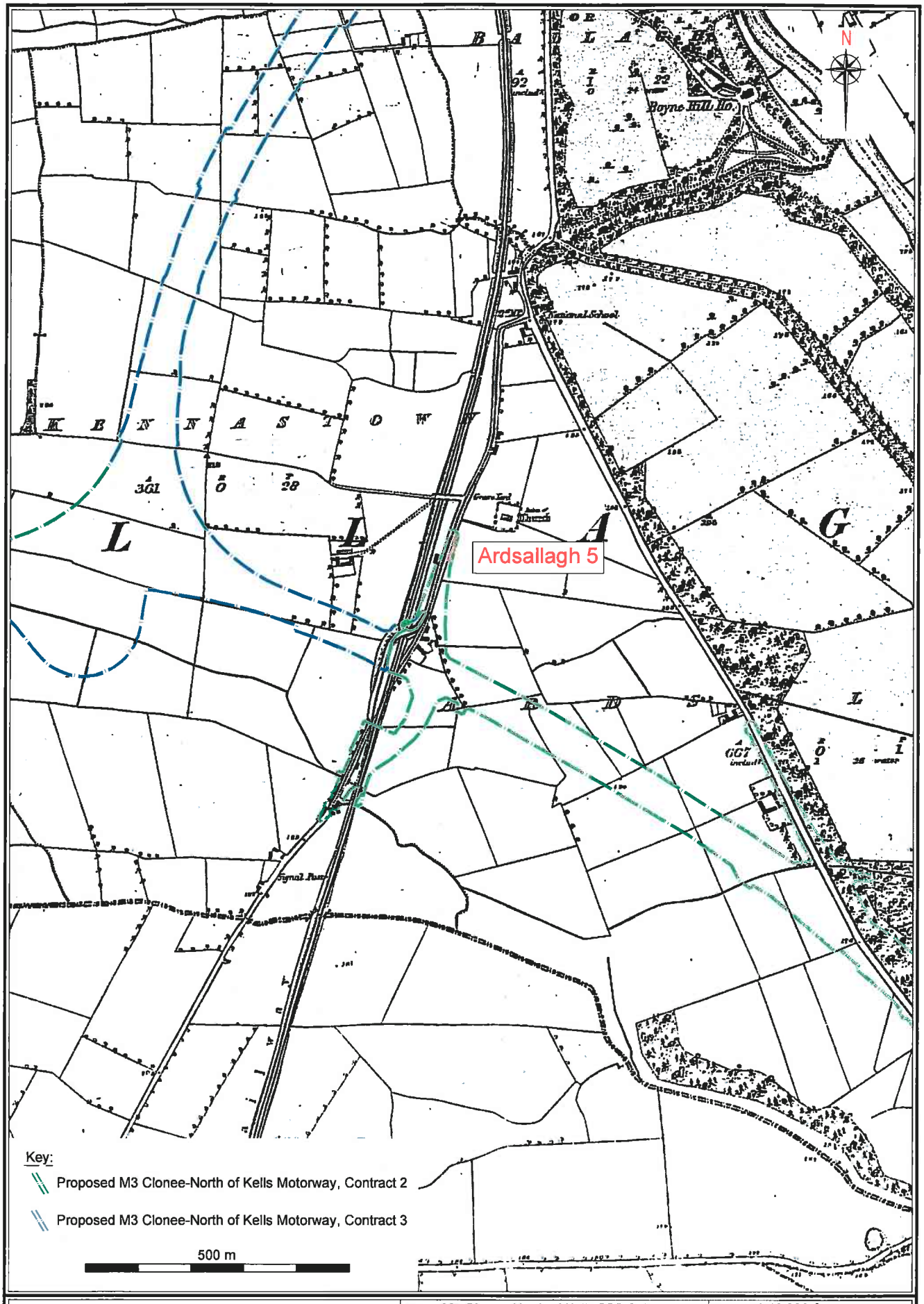
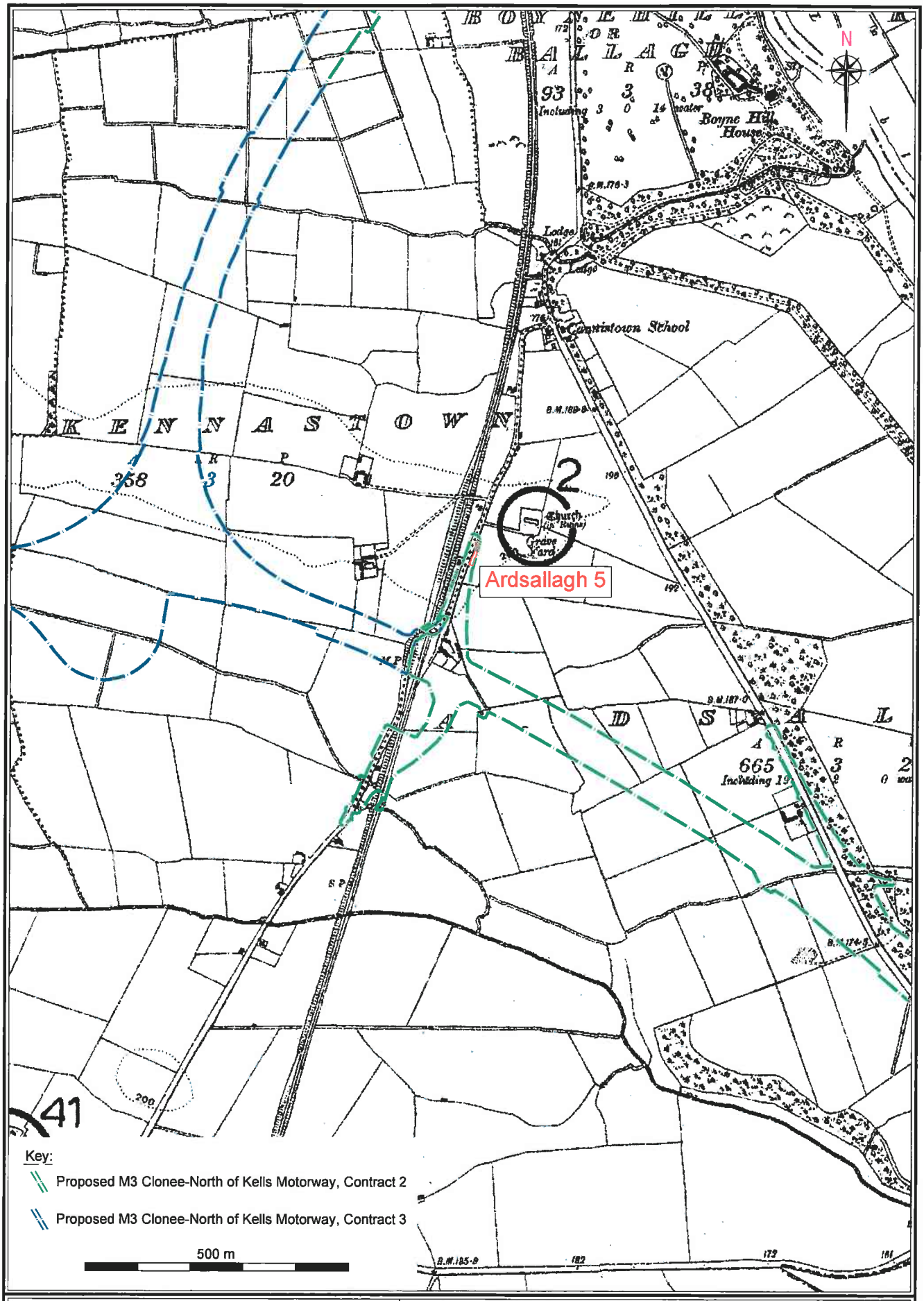
Figure 3: Ardsallagh 5, extract from 1st edition OS map, Meath sheet 31



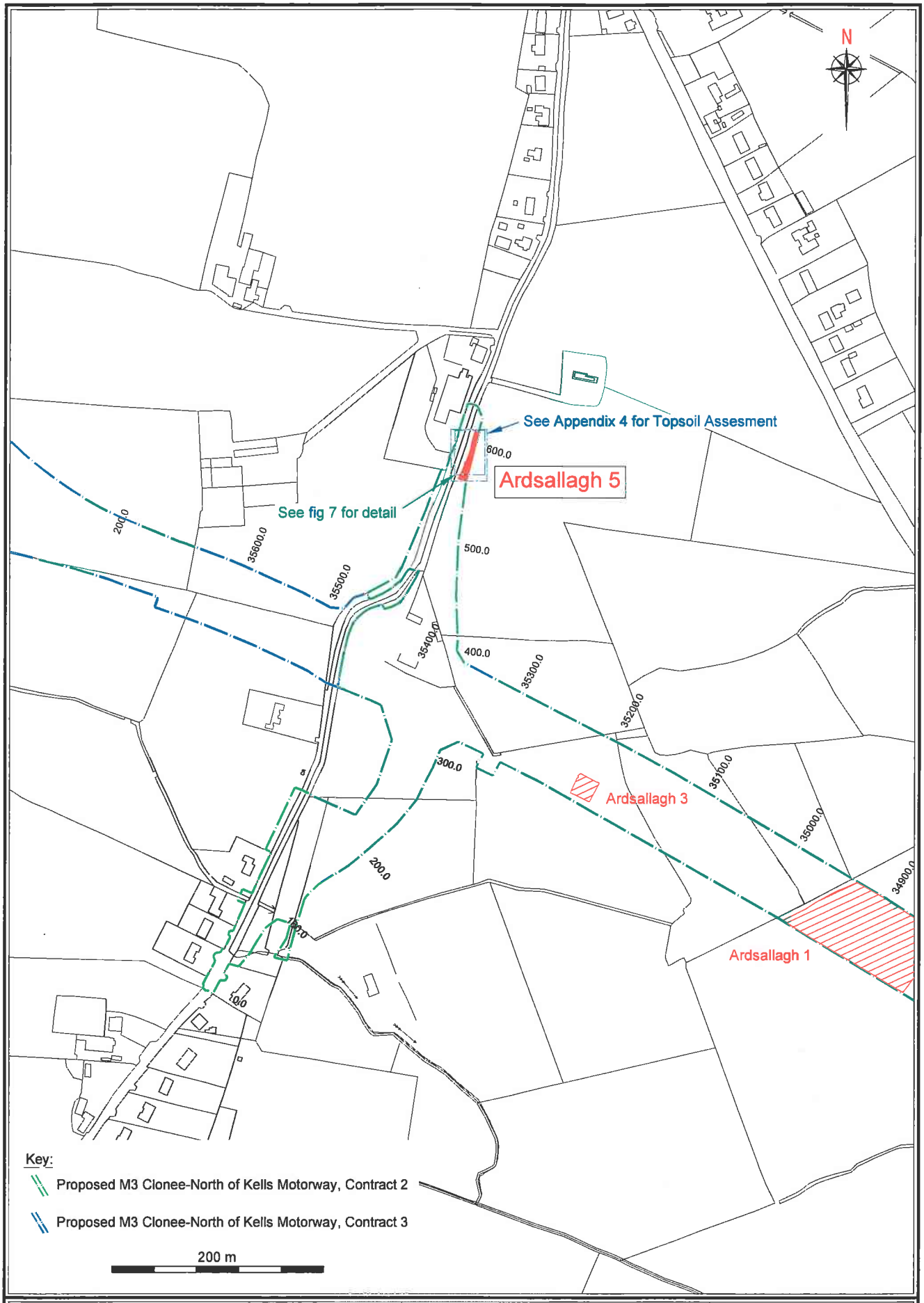
Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M3 Clonee-North of Kells PPP Scheme Contract 2, Ardsallagh 5	Scale: 1:10,000 A4
		Date: Jul '08
	Issued for: Excavation Report	Origin: OSi (1882)
	Client: Meath County Council	Drawing no.: 04_01_C3142

Figure 4: Ardsallagh 5, extract from 2nd edition OS map, Meath sheet 31



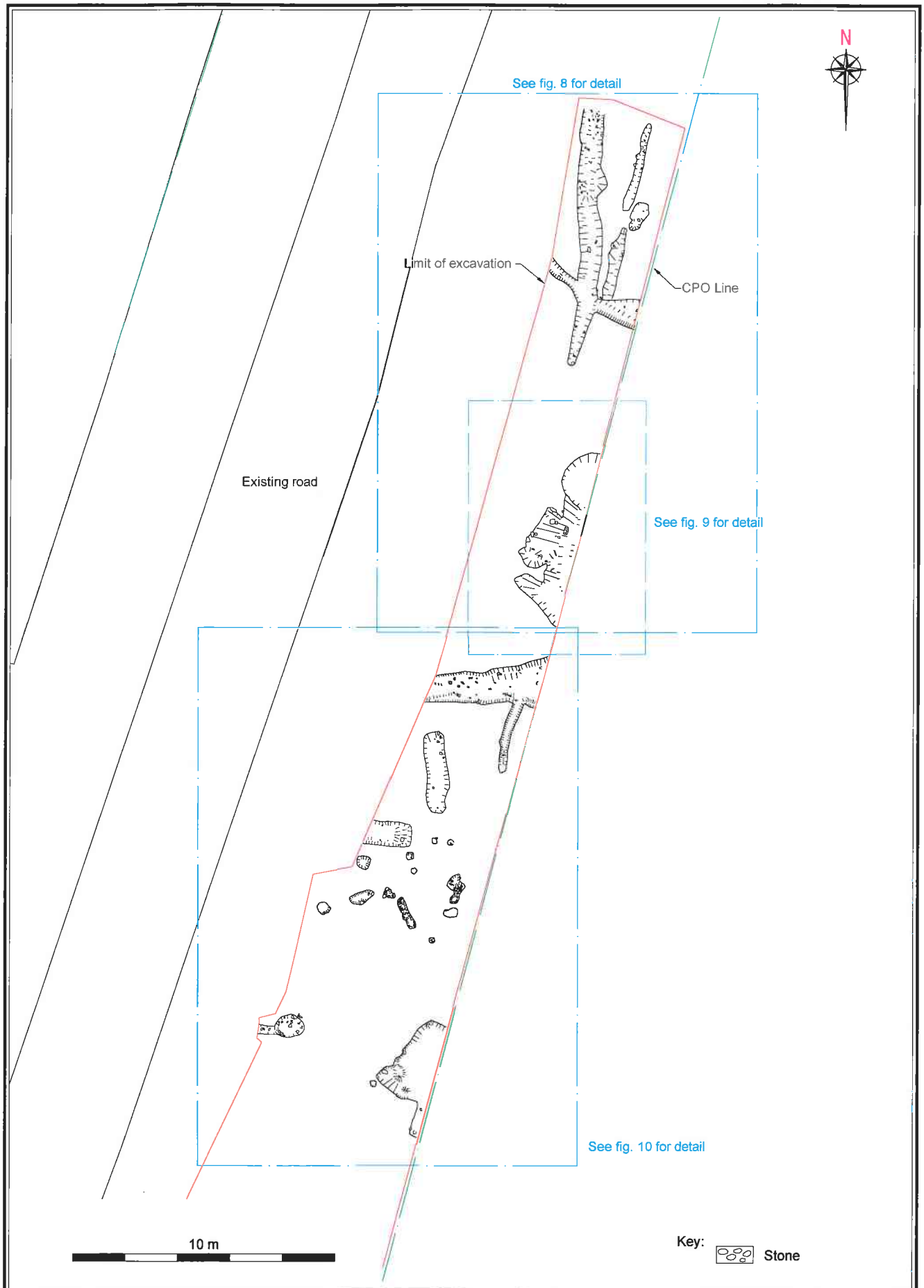
Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M3 Clonee-North of Kells PPP Scheme Contract 2, Ardsallagh 5	Scale: 1:10,000 A4
		Date: Jul '08
	Issued for: Excavation Report	Origin: OSi (1909)
	Client: Meath County Council	Drawing no.: 04_01_C3143

Figure 5: Ardsallagh 5, extract from 3rd edition OS map, Meath sheet 31



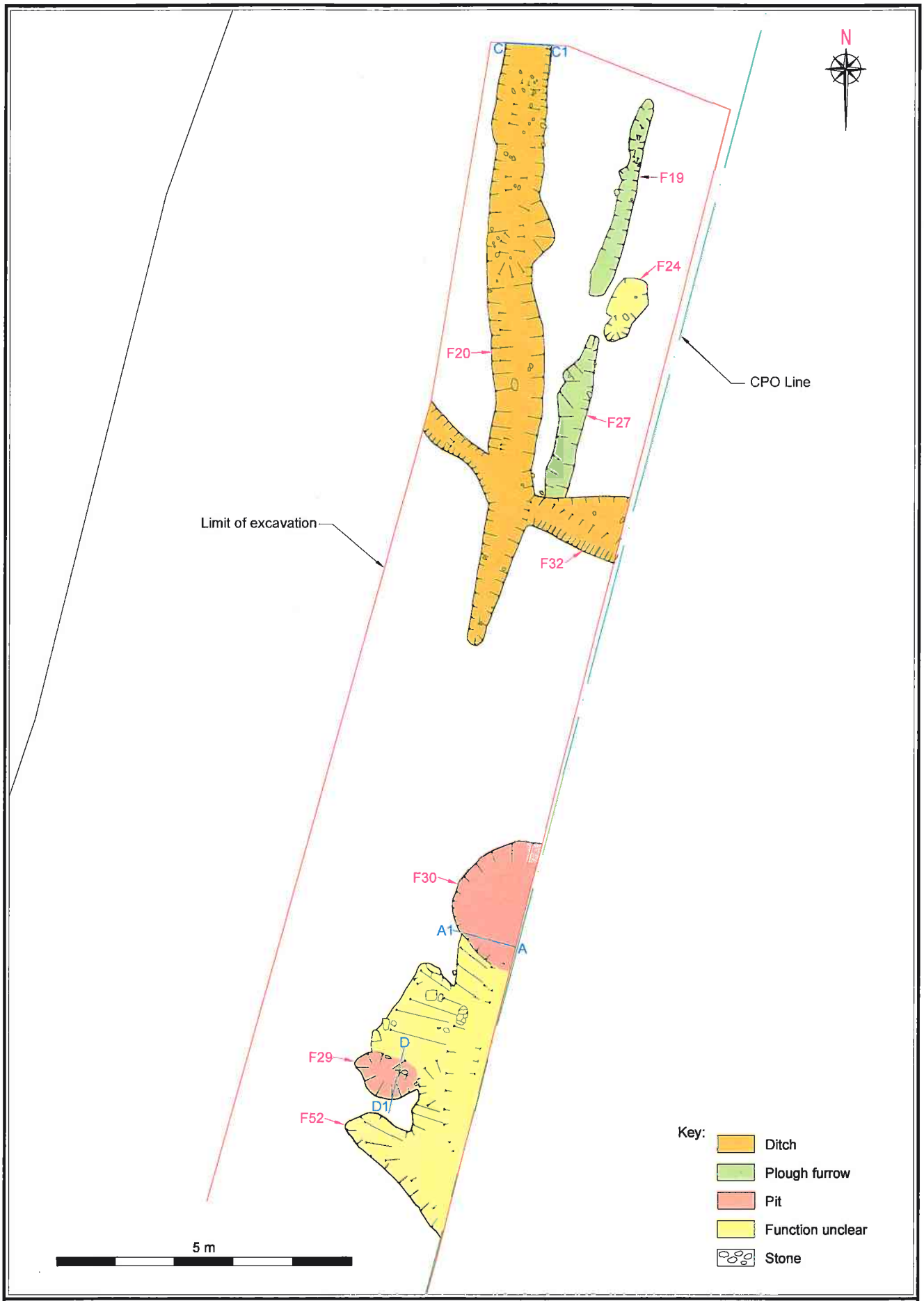
Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M3 Clonee-North of Kells PPP Scheme Contract 2, Ardsallagh 5	Scale: 1:5,000 A4
		Date: Jul '08
	Issued for: Excavation Report	Origin: Client/ACS Ltd.
	Client: Meath County Council	Drawing no.: 04_01_C3144

Figure 6: Detailed location of Ardsallagh 5



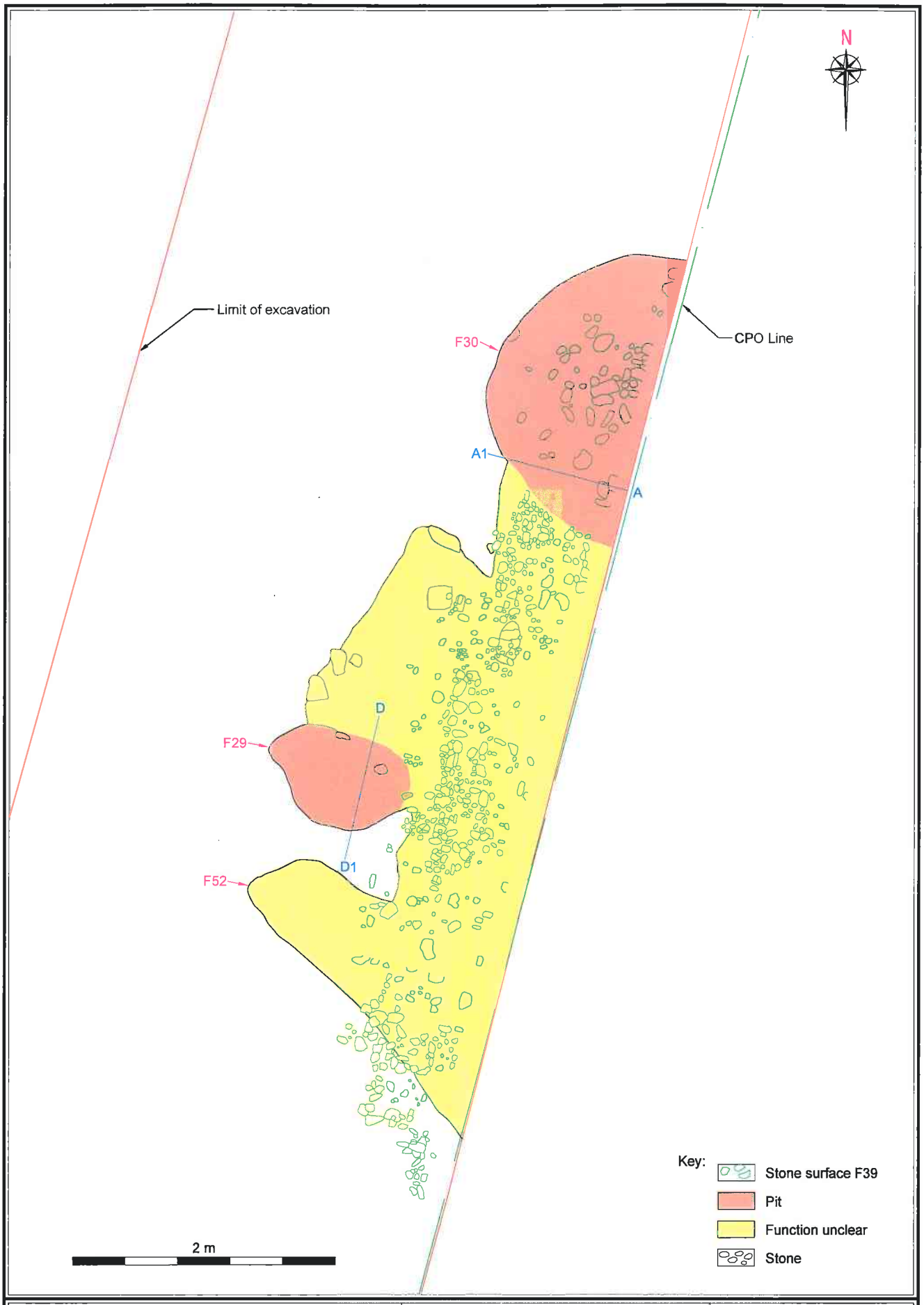
Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M3 Clonee-North of Kells PPP Scheme Contract 2, Ardsallagh 5	Scale: 1:200 A4
		Date: Jul '08
	Issued For: Excavation Report	Origin: Client/ACS Ltd.
	Client: Meath County Council	Drawing no.: 04_01_C3145

Figure 7: Post-excavation site plan



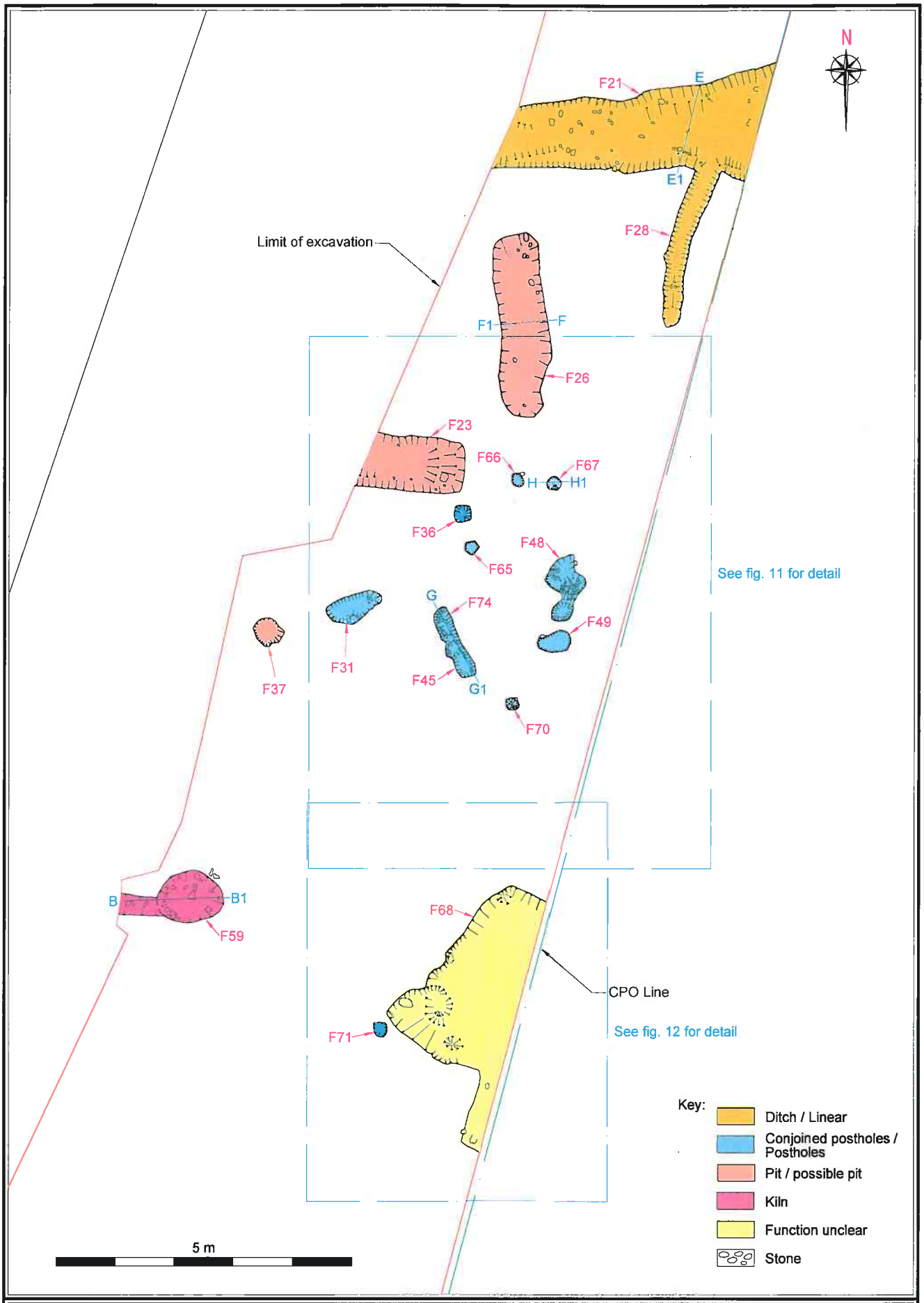
Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M3 Clonee-North of Kells PPP Scheme Contract 2, Ardsallagh 5	Scale: As scalebar
		Date: Jul '08
	Issued For: Excavation Report	Origin: Client/ACS Ltd.
	Client: Meath County Council	Drawing no.: 04_01_C3146

Figure 8: Post-excavation site plan, northern extent



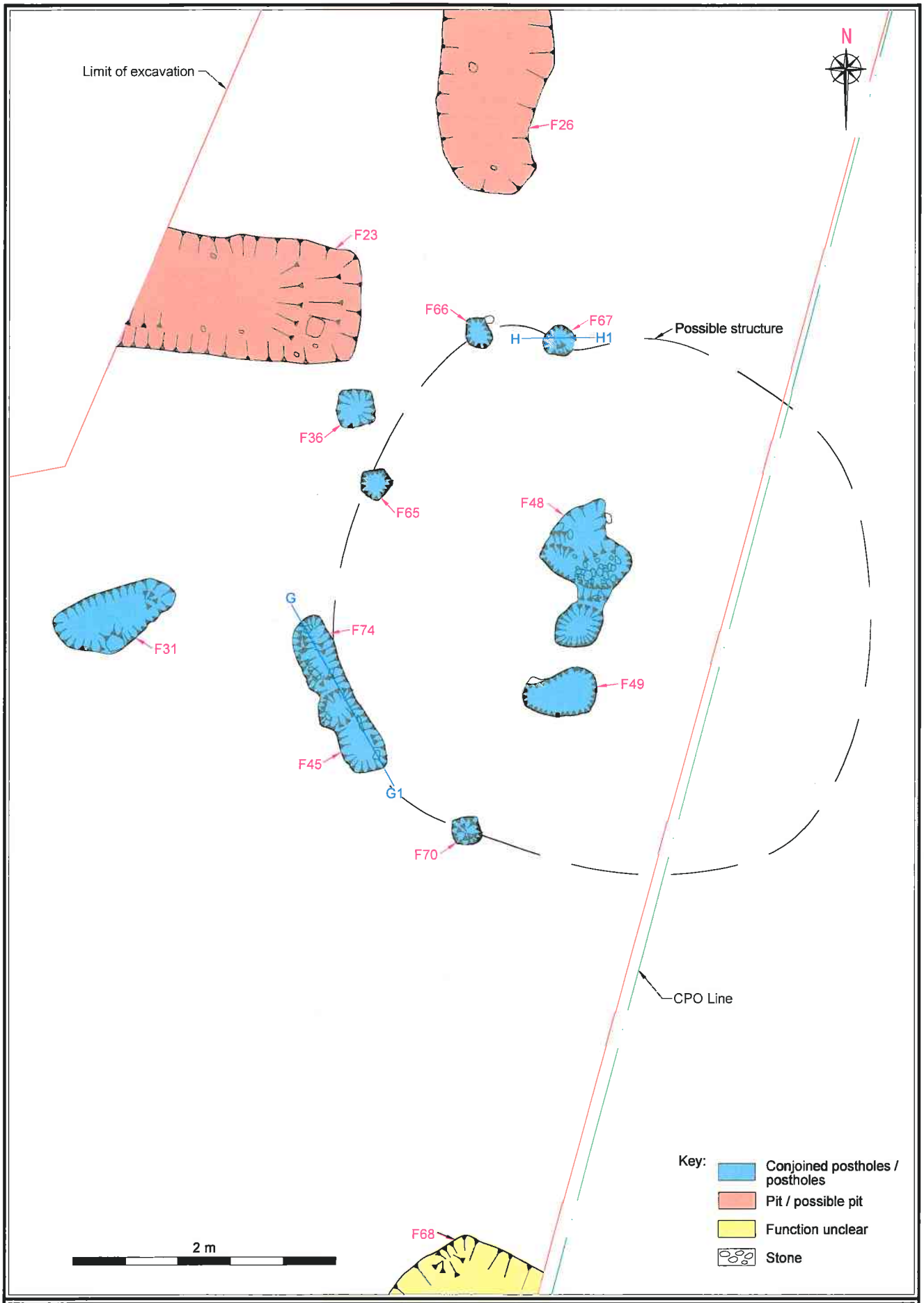
Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M3 Clonee-North of Kells PPP Scheme Contract 2, Ardsallagh 5	Scale: 1:40 A4
		Date: Jul '08
	Issued For: Excavation Report	Origin: Client/ACS Ltd.
	Client: Meath County Council	Drawing no.: 04_01_C7040

Figure 9: Detail of stone surface F39



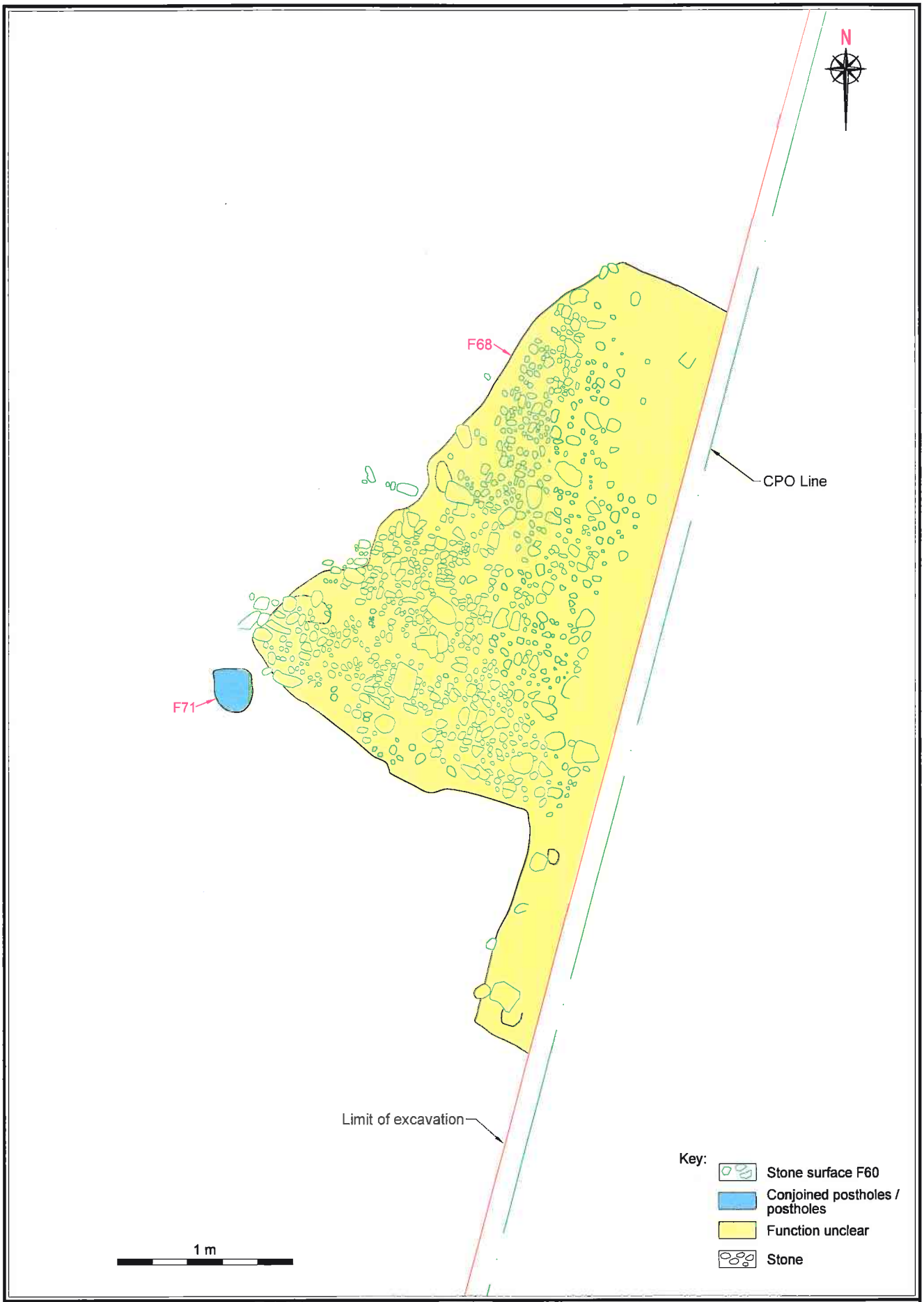
Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M3 Clonee-North of Kells PPP Scheme Contract 2, Ardsallagh 5	Scale: As scalebar
		Date: Jul '08
	Issued For: Excavation Report	Origin: Client/ACS Ltd.
	Client: Meath County Council	Drawing no.: 04_01_C7041

Figure 10: Post-excavation plan of Ardsallagh 5, southern extent



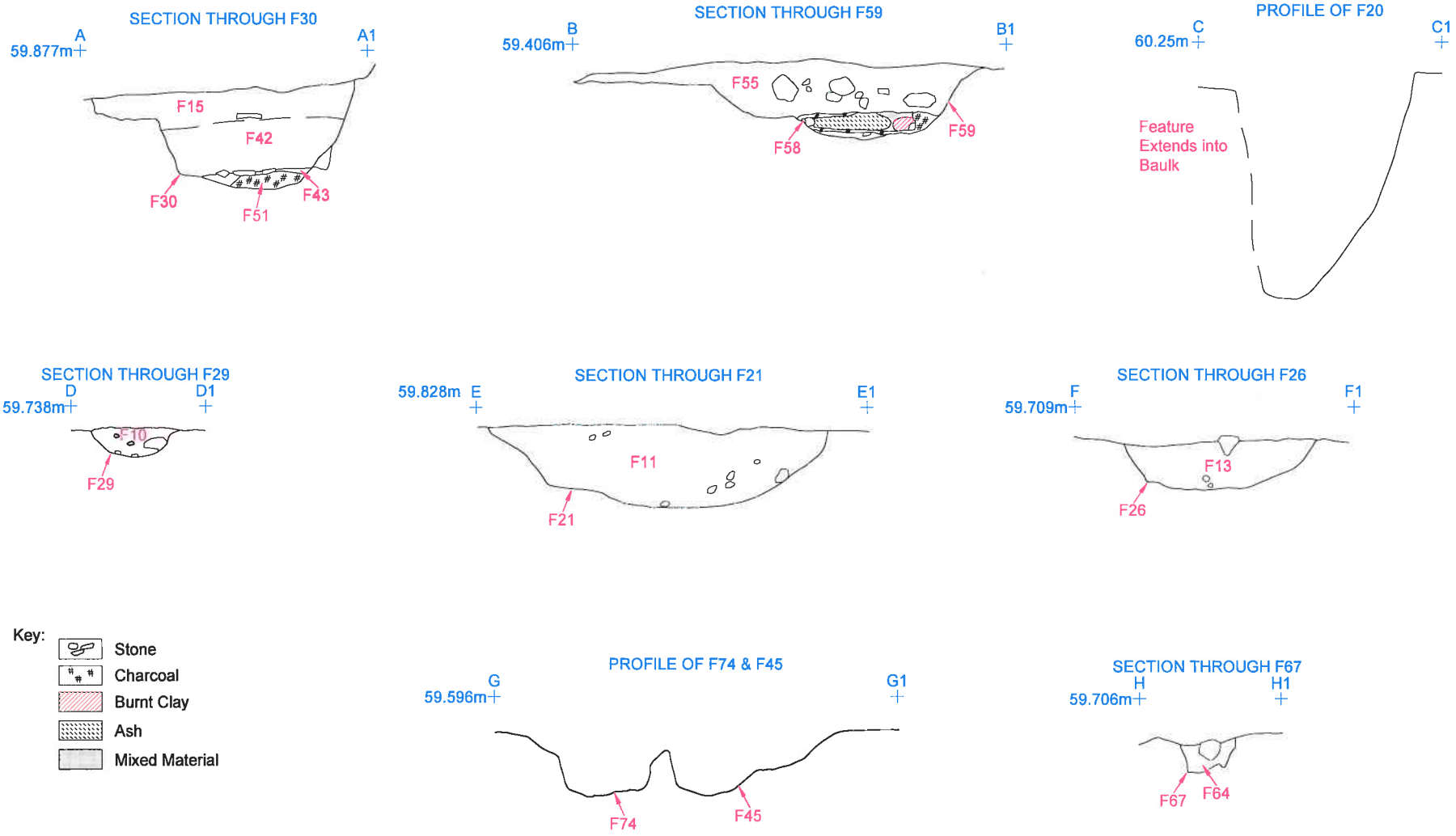
Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M3 Clonee-North of Kells PPP Scheme Contract 2, Ardsallagh 5	Scale: 1:40 A4
		Date: Jul '08
	Issued For: Excavation Report	Origin: Client/ACS Ltd.
	Client: Meath County Council	Drawing no.: 04_01_C7042

Figure 11: Detail of possible structure



Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M3 Clonee-North of Kells PPP Scheme Contract 2, Ardsallagh 5	Scale: 1:30 A4
	Issued For: Excavation Report	Date: Jul '08
	Client: Meath County Council	Origin: Client/ACS Ltd.
		Drawing no.: 04_01_C7043

Figure 12: Detail of stone surface F60



Archaeological Consultancy Services Ltd. Unit 21, Boyne Business Park, Greenhills, Drogheda, Co. Louth	Site: M3 Clonee-North of Kells PPP Scheme Contract 2, Ardsallagh 5	Scale: 1:25 A4
		Date: Jul '08
	Issued for: Excavation Report	Origin: ACS Ltd.
	Client: Meath County Council	Drawing no.: 04_01_C7044

Figure 13: Sections

Plate 1: Stones F39 in irregular cut F52 from the north (04_01_Ardsallagh 5_CP1014_9)

Plate 2: Pit F30 from the north (04_01_Ardsallagh 5_CP1015_27)

Plate 3: Pit F23 from the south (04_01_Ardsallagh 5_CP1012:5)

Plate 4: Aerial view of southern extent of the site from the south-east (04_01_Hawkeye_DSC2140)

Plate 5: Aerial view of northern extent of the site from the south-east (04_01_Hawkeye_DSC2150)

Plate 6: Aerial view of site with Cannistown church in the background from the south (04_01_Hawkeye_DSC2158)

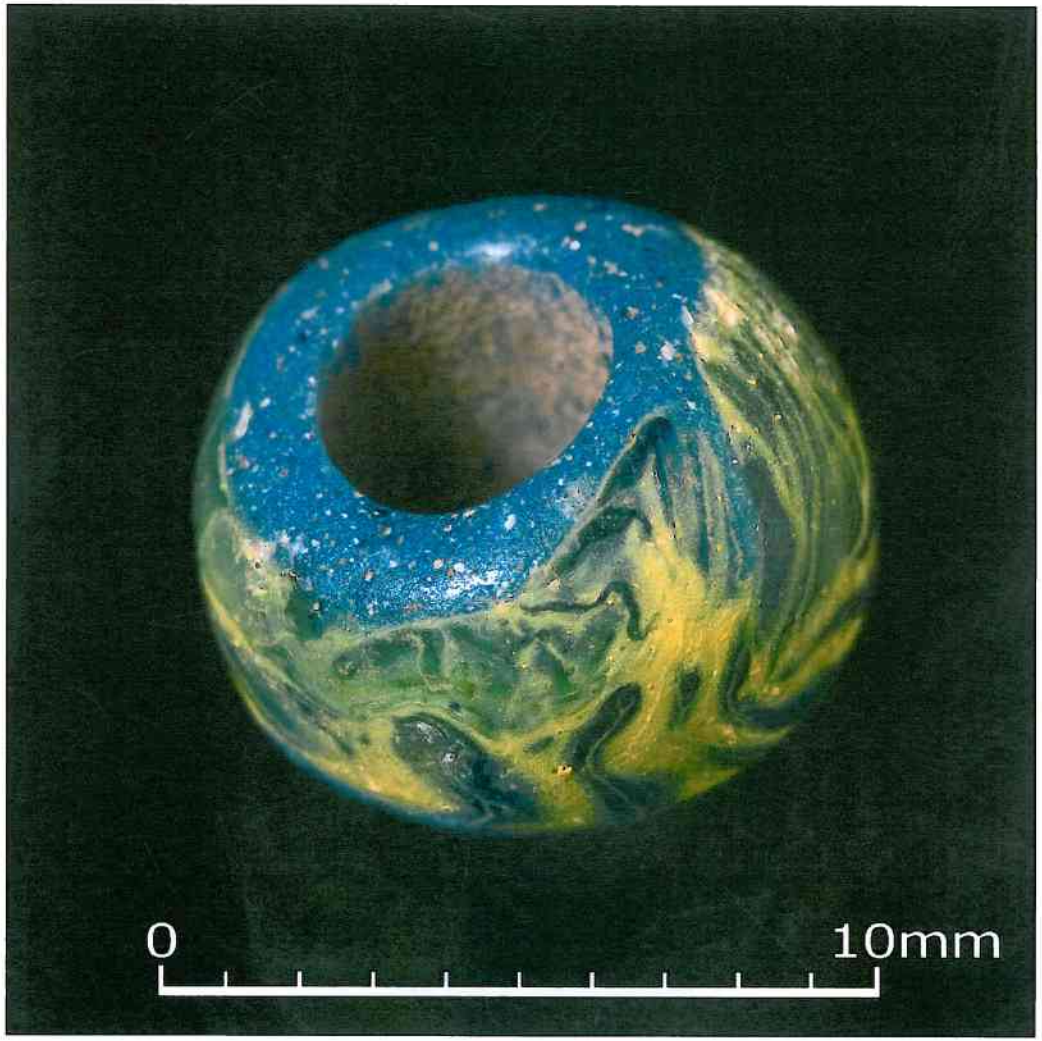


Plate 7: Glass bead recovered A008/038:38:1 (Photo John Sunderland)