Final Excavation Report, Knockaphunta, Castlebar, Co. Mayo

McGLADE 26/05/2020 LICENCE 16E445 PLANNING MAYO P14/691

archaeology plan
HERITAGE SOLUTIONS

SITE NAME

Knockaphunta, Humbert Way, Castlebar, Co. Mayo.

CLIENT

Cynthia Clampett (CEO), Mayo Roscommon Hospice Foundation, Knock, Co. Mayo

PLANNING

Mayo County Council P14/691

LICENCE

Excavation Licence No. 16E445

REPORT AUTHOR

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DATE

26th May 2020

ABBREVIATIONS USED

DoCHG	Department of Culture, Heritage and the Gealtacht
NMI	National Museum of Ireland
NMS	National Monuments Service
OS	Ordnance Survey
RMP	Record of Monuments and Places
NIAH	National Inventory of Architectural Heritage
LAP	Local Area Plan
GSI	Geological Survey of Ireland

Acknowledgements

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I would particularly like to thank Gerry Walsh, chief archaeologist with Mayo County Council, for his knowledge and interest while visiting the site. Thanks also to Lorna O'Donnell for information on the results of current environmental analysis on fulachtaí fia.

Thanks to Brendan Arrigan of Arrigan Surveys for conducting the survey of the site during the excavation.

I would like to acknowledge Lorna O'Donnell and Antoine Giacometti, the specialists on the project, for their analysis of the finds and samples retrieved during the excavation, and their input during the final report production. Thanks also to Siobhain Ruddy and Antoine Giacometti wor reviewing the final report and to Brandon Walsh for assistance with image production for the report.

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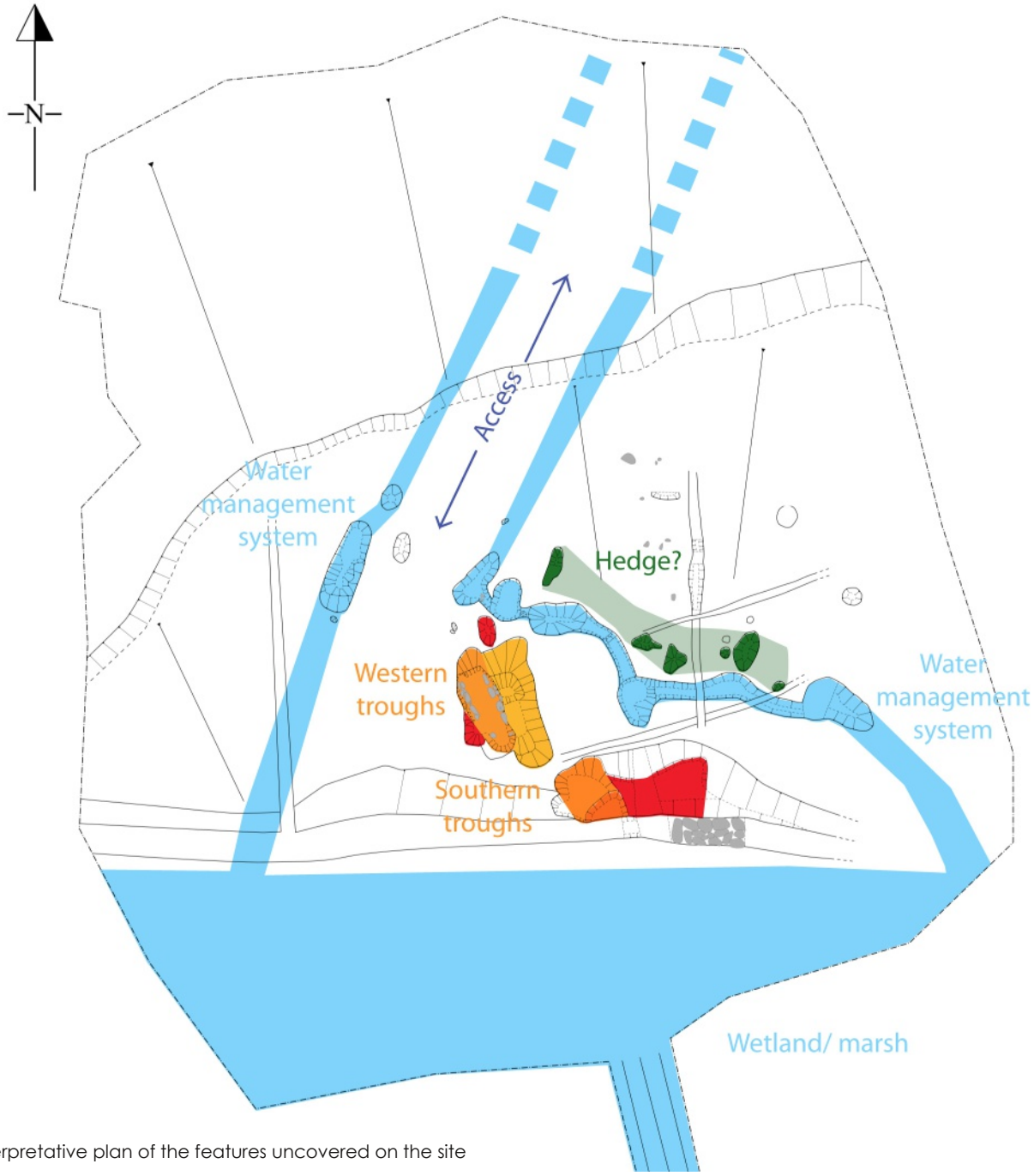
Section 1 Introduction

Report summary

Four fulacht fiadh troughs were uncovered on a site sloping from north to south on the side of a low drumlin with a wetland area just beyond them to the south. Two water management features were also uncovered, one channelling water away from the troughs and the other



Interpretative plan of the features uncovered on the site

channelling water though a number of pits, while also protecting a probable work area. Two pits along the second water management system may have been used as cisterns to supply of fresh water for use in the fulacht troughs, with the other pits serving other functions relating to the processing being carried out at the site. There was some indication that parts of the water management system were wood-lined.

One of the fulacht troughs was partially stone lined while two others may originally also have been lined with stone. The stone linings would not have been water-tight and an additional material would have been needed to seal the troughs.

The fulacht troughs were used sequentially from the Middle Bronze Age into the Late Bronze Age, with the water management system in use throughout. Other contemporary fulachtaí fia have been excavated in the vicinity, clustered in three areas. This may suggest that at least three kin-groups were present in the wider area during this period and that their occupation and use of the landscape was relatively consistent over this period.

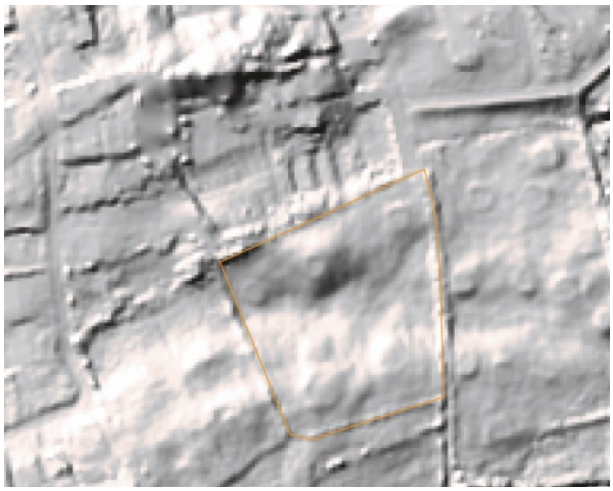
A large burnt spread overlay the troughs, which was severely disturbed during the 19th and 20th centuries.

Site location

The excavation site was situated in a small (1.75ha) field situated southwest of Castlebar, Co. Mayo, in the townland of Knockaphunta (NGR 513837/789214). It is situated on the western side of Humbert Way, off the Westport Road.

Development background

The owner of the land intends to develop it into a new Hospice Facility for the charity of the Mayo Roscommon Hospice Foundation. This will involve construction of a Palliative Care Centre building primarily of single story height, with some parts two-storeys high. Landscaped gardens, parking spaces (70),



Location of the development site with the excavation boundary highlighted in blue (top)

Lidar image of the site published 2018. A number of circular anomalies are visible on the site and within the field to the east, which relate to the use of the site as a pitch and putt course, courtesy of the GSI (centre)

Satellite view of the site, c. 2011-2013, courtesy of Bing Maps (bottom)

services areas and other associated works are also included.

Condition 1 of the Request for Further Information (Mayo CC P14/691) required an archaeological assessment, including a site visit and desktop study as well as possible survey, testing or monitoring. Based on the desktop assessment, and as discussed with the local authority archaeologist Gerry Walsh in Mayo County Council, a programme of archaeological testing was carried out on the site by Antoine Giacometti in May 2015 under Licence No. 15E0219.

The development was subsequently granted planning permission in September 2015. The Grant of Planning Permission had four conditions relating to archaeology (Conditions 6-9).

Condition 6 stated that 'the thick deposit of black soil containing a high quantity of stone, some of it burnt, and charcoal' may be the remains of a fulacht fiadh, ancient cooking site. This potential archaeological site must be archaeologically resolved under licence from the National Monuments Section, Department of Arts, Heritage and the Gaeltacht.

Condition 7 required that the developer employ a suitably qualified archaeologist to monitor all ground disturbance associated with the proposed development. The monitoring should be undertaken in agreement with the National Monuments Section of the Department of Arts, Heritage and the Gaeltacht.

Condition 8 stated that should archaeological material be uncovered during the course of monitoring, the archaeologist shall have work on the site stopped, pending a decision as to how best to deal with the archaeology. The developer shall be prepared to be advised by the National Monuments Section of the Department of Arts, Heritage and the Gaeltacht with regards to any necessary mitigating action (e.g. preservation in situ, or excavation) and should facilitate the archaeologist in recording any material found.

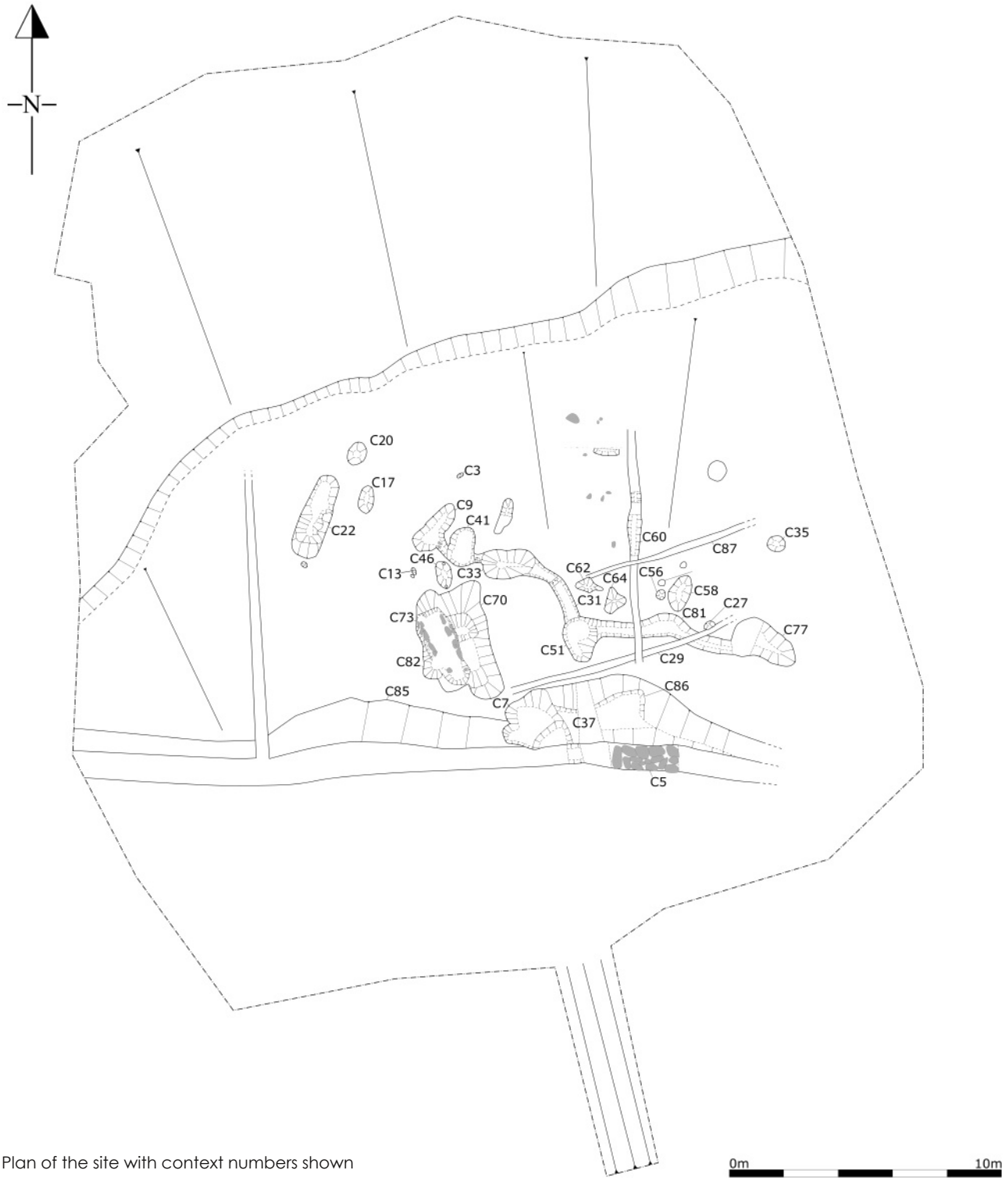
Condition 9 required that Mayo County Council, the National Monuments Section of the Department of Arts, Heritage and the Gaeltacht and the National Museum of Ireland be furnished with a report describing the results of the monitoring.

Location of archaeological site (green) within the overall development (top)

Satellite image dated 20-09-19 showing the completed hospice on the site (bottom)

In compliance with the archaeological conditions laid out in the Grant of Planning Permission the author carried out additional testing on the site in 2015 (McGlade 2015; Licence No. 15E0219 ext.), which confirmed the presence of a heavily disturbed burnt spread and identified the extent of the area that would require archaeological monitoring on the site. The monitoring was carried out under the same licence in 2016, which confirmed that archaeological features were present below the

disturbed burnt spread identified in the previous testing programmes. The excavation was carried out in September 2016 under Licence No. 16E0445 with the preliminary report submitted in October 2016 (McGlade 2016b). This report presents the final findings of the excavation.



Plan of the site with context numbers shown

Section 2 Final findings of the excavation

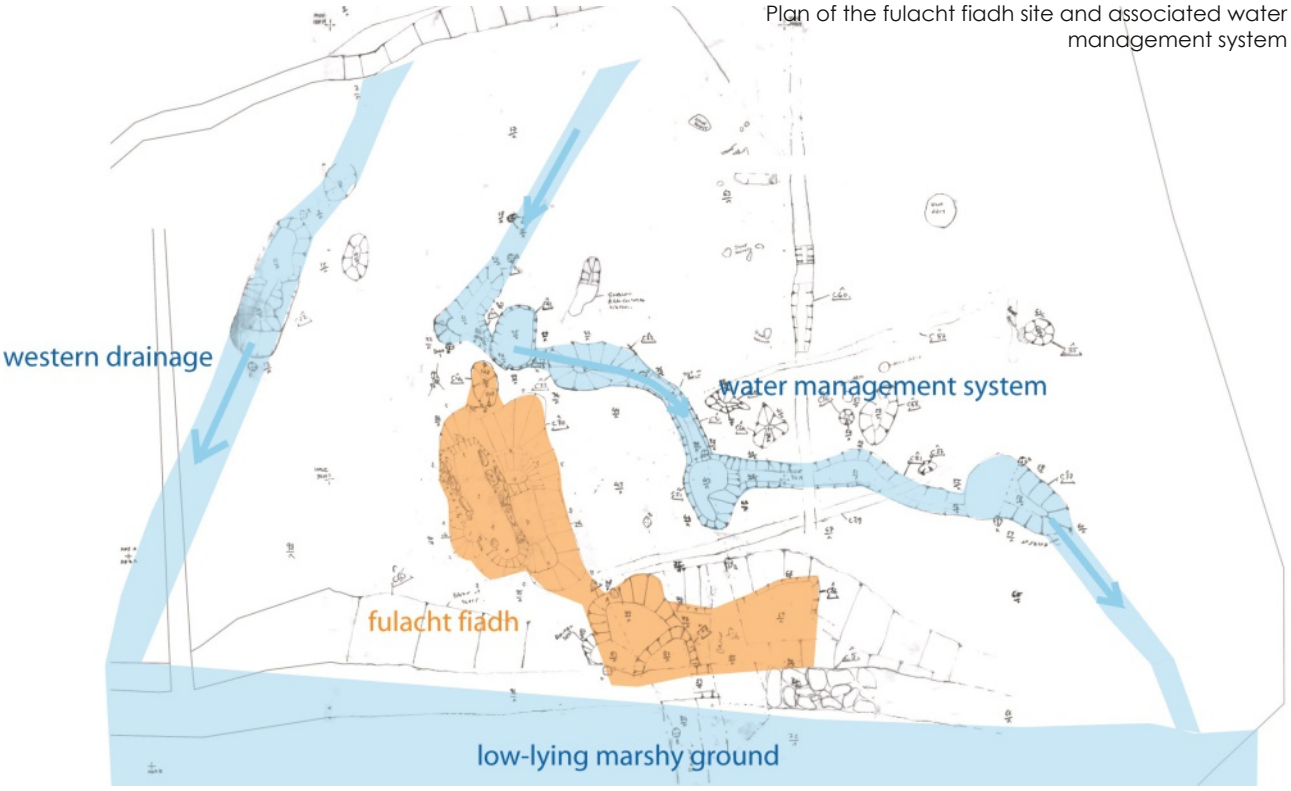
Introduction

The excavation revealed two phases of fulacht fiadh activity associated with a large spread of burnt mound material. The burnt mound material (C2) had previously been identified during the two testing programmes on the site (Giacometti 2015 and McGlade 2015) and had been heavily impacted upon since the post-medieval period, with post-medieval and early modern ceramics and glass present throughout the spread.

The spread sealed an evolved fulacht fiadh site that was returned to over at least 400 years. The original trough was a sub-rectangular cut, which was replaced by a more formalised sub-rectangular partially stone-lined trough set slightly to one side. A water management system, which channelled water away from the work area associated with the troughs was also uncovered. A pit along one of the channels may also have served as a source of fresh water for use in the troughs.

A third trough was created further to the south, downslope of the earlier two examples. This was not as elongated as the earlier two troughs. A stone was present along the side suggesting the trough may have been lined originally with the lining subsequently robbed out. This was in turn recut by the final trough at the site, which was deeper and shorter than the trough it replaced. Two stones were present in one corner of the trough, which may be the remains of a robbed-out lining. The two later troughs were also served by the same water management system as the earlier examples. Possible hearths and firing locations were also identified.

Plan of the fulacht fiadh site and associated water management system



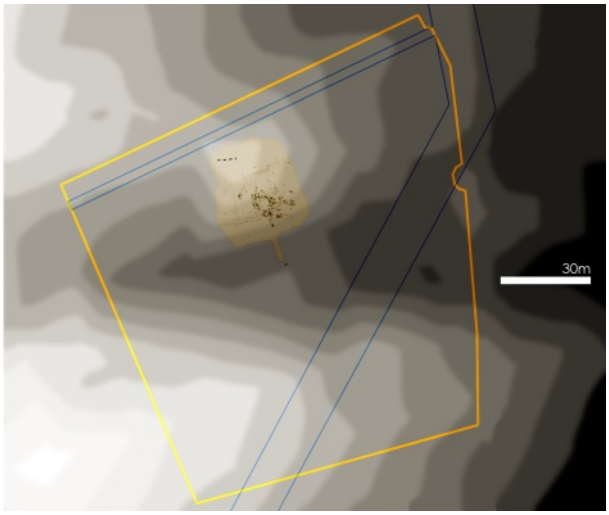
The fulacht was located on a relatively steep slope on the side of a low drumlin, with a low-lying area, occupied by a ditch that formed a field boundary in the post-medieval period, to the south. The field boundary ditch is likely to have replaced a marshy or boggy stretch of land lying between the small drumlin in the north of the development site and a second to the southwest. The large amount of burnt stone and charcoal present suggests the fulacht fiadh may have been used over an extended period.

Fulachtaí fia

A by-product of the recent building boom has seen a large number of fulachtaí fia being excavated and this has resulted not only in an increase in our knowledge of fulachtaí fia but has questioned the basic interpretation as to both their time-frame and function (Dennehy 2008, 5). The term fulacht fiadh has come to be used to refer to a monument type that was involved in pyrolithic technology – or the heating of stones.

The spelling varies in both the singular (Fulacht fiadh, fulacht fian) and the plural (fulachta fiadh, fulachtaí fia). "Fiadh" in Old Irish meant something like "wild", often relating to animals such as deer, while fian refers to the mythological band of hunters and warriors, the Fianna. There are historical references to the use of pits dug into the earth used for cooking and bathing, with one, For a Feasa ar Éirinn, noting that they are known among the peasantry as fulacht fian (O'Neill 2004, 80). Other historical references clearly use the term "fulacht" to describe a cooking spit, a close reading of these accounts suggests that the term actually derives from a word meaning support and probably carries a deliberate reference to the Irish words for blood and meat (ibid., 84). As such the term itself is probably incorrect when discussing sites involved in pyrolithic technology, however this has become the understood name for the monument type. This report uses the term fulacht fiadh for the singular and fulachtaí fia for the plural of the site type.

Fulachtaí fia are relatively common monuments in Mayo with 383 listed in the RMP files and an additional 145 sites recorded as burnt mounds. The excavations bulletins list 79 sites containing fulachtaí fia and an additional 45 sites containing burnt mounds or burnt spreads. Some of these sites have been added to the RMP files. Nine fulachtaí fia or burnt mound sites have been identified within 2km of the site at Knockaphunta, four at Aghadrinagh, three at Cloondeash, one at Lisnageetha or Antigua, and one within Knockaphunta townland itself to the west of the site.



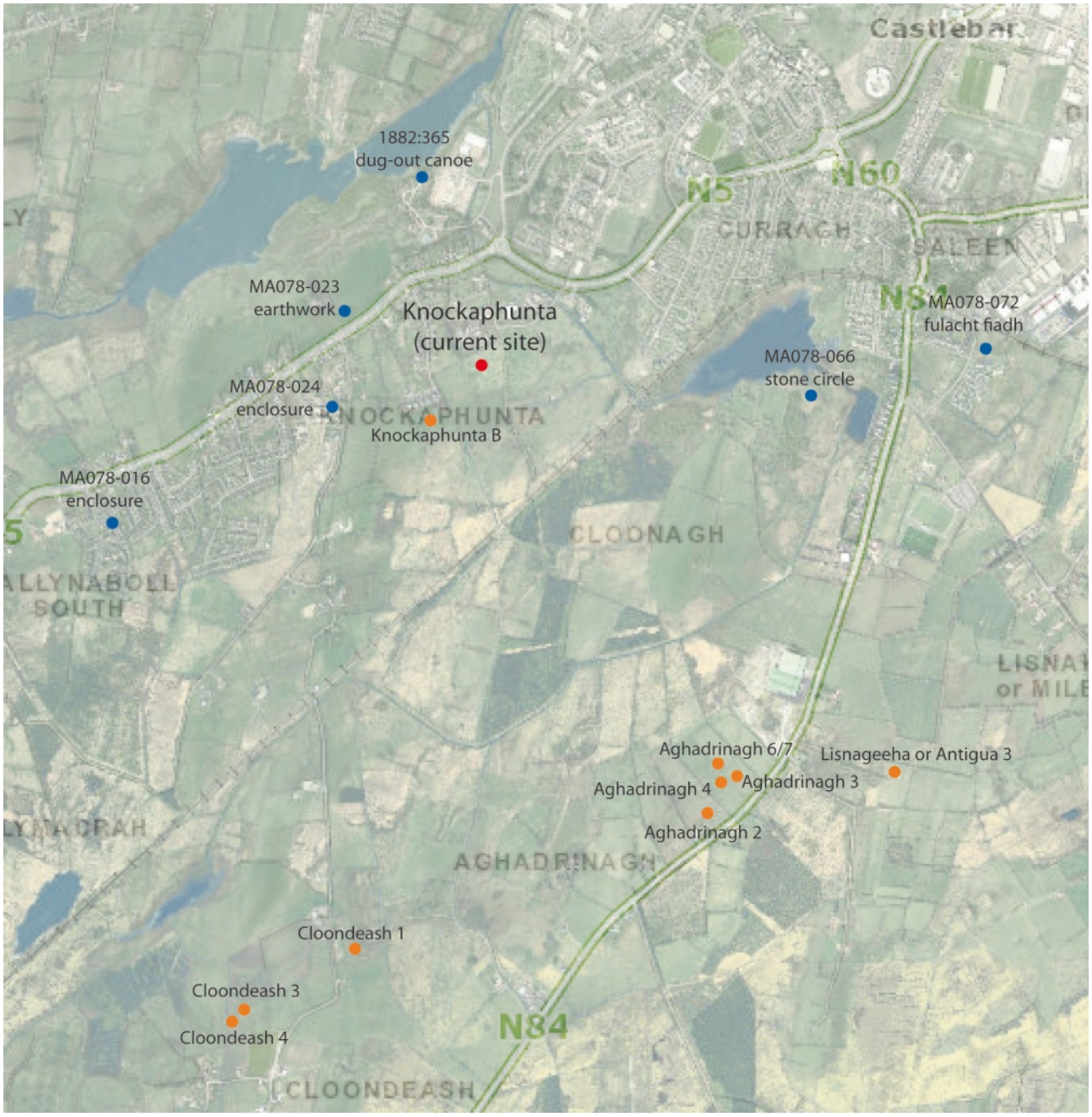
Contour map of the proposed development site showing the site of the excavation on the southern slope of the drumlin to the north just above the low-lying area between the two drumlins (top)

Mid-ex view of the removal of the burnt spread overlying the water management system and troughs (bottom)

Fulachtaí fia are found to be primarily of Bronze Age date, though literary sources suggest their continued use, in a limited and perhaps anachronistic and ritualistic way, into the early historic period (O'Neill 2004, 83), while some archaeologically dated examples have been dated as early as the Neolithic period. Mayo examples dating to the Neolithic period are known from Ballyglass West, Sonnagh and Tomboholla to the east of the county, Gortaroe to the south, Deerpark East to the west and centrally at Smuttannagh (Hawkes 2018, 122-3), indicating knowledge of the technology was widespread prior to the emergence of fulacht activity to the south of Castlebar in the Middle Bronze Age.

When excavated, fulacht fiadh sites usually consist of a hearth, a mound of fire-cracked stones and burnt material, and a trough

Location of the other fulachtaí fia sites identified through excavation in the vicinity (in orange), with additional possible also marked prehistoric sites (in blue)



(Waddell 1998, 174-5). Frequently the hearth is absent or does not survive, indicating this was a less formal feature of the site. Fulachtaí fia may also have had additional coverings of light structures, or associated structures and buildings. It is thought that hot stones were dropped into a water-filled trough to heat the water for cooking or other purposes. They are generally located in wet/marshy areas, with many being built into or near streambeds and water sources. Occasionally the waste material is discarded in a visible horseshoe-shaped mound surrounding the fulacht fiadh. More frequently fulachtaí fia have no visible above-ground component and take the appearance of a subsurface layer of burnt material, having been spread out through agricultural activity over time.

Although fulachtaí fia have a widespread distribution across the country they are generally found to be clustered in areas where there is other settlement evidence (Grogan 2005, 41-2). This was also noted during some of the recent road schemes, for example at Clonmore North, Co. Tipperary, where a fulacht fiadh was excavated on the same site as a contemporary habitation site, while at Brackbaun, Co. Limerick a Late Bronze Age/ Early Iron Age fulacht fiadh was situated close to an Iron Age settlement and burial site (McQuade et al 2009, 119). It was also noted at Caltragh, Co. Sligo, where three of the fulachtaí fia in closest proximity to the Bronze Age houses uncovered there appear to have been contemporary, suggesting they were components of a more permanent settlement pattern (Danaher 2007, 40). Although no Bronze Age settlement sites have been identified as yet in the vicinity of the site at Knockaphunta, the possibility for such should be considered, perhaps on the slightly higher ground to the west near where the enclosures and earthwork are recorded in the RMP files, or to the northeast in the vicinity of the town itself.

Traditionally, fulachtaí fia have been interpreted as temporary prehistoric cooking/feasting sites, with experiments proving that cooking could have been carried out at these sites. In his recent publication based on the analysis of burnt mound excavations up to 2010 Hawkes prefers an interpretation of fulachtaí fia sites as relating to the cooking of food (Hawkes 2018, 234).

Alternative suggestions for the use of fulachtaí fia have also been postulated, with some being replicated in experimental archaeology. An experiment carried out in 2009 demonstrated that a fulacht-type feature could be used in the brewing of beer (Quinn & Moore 2009). The general lack of animal bone from fulacht fiadh sites, including the one uncovered at Knockaphunta, is one of the reasons put forward for questioning the traditional cooking place interpretation for all fulachtaí fia. Semi-industrial uses, such as in the washing and dying of clothes and hides or in the preparation of leather, have been considered (Waddell 1998, 177). Recent studies on the environmental evidence from fulachtaí have indicated that in some cases, textile production was carried out at these sites (Brown et al., 2016, 285-6). Experiments carried out in 1999 demonstrated that fulachtaí fia could be used in the processing of textiles, such as washing, dyeing and fulling (Denvir 1999, cited in Dennehy 2008, 14).

Some have suggested they may have been used as saunas or sweathouses, such as that at Rathpatrick, Co. Waterford (Eogan & Shee Twohig 2012, 179) or the large hut encircling a trough found at Cloughjordan, Co. Tipperary (Dennehy 2006). A cluster of stake holes uncovered beside the trough at Aghadrinagh 2, c. 1.5km to the south of the Knockaphunta site, had been interpreted at the remains of a sweathouse (McNamara & Russell 2017a, 11). Additionally, they may have been used as bathing places, as suggested in the medieval tale of the Romance of Mis, (O'Drisceoil 1990), where Dubh Ruis bathes Mis in the trough water rich in melted deer fat following their meal. This would suggest a dual function for the feature in question, and this is likely to be the case with many fulachtaí fia, where they would have served more than one function.

It should be noted that the type of stone used in the fulacht may be an indicator as to their function. Sandstone is a better choice of stone for use in these features as it retains heat better (Dennehy 2008, 18). The use of limestone,

Site	Date	Description	Reference
Aghadrinagh 2	1612-1445 BC	Rectangular trough, burnt spread & poss. structure. Possible stone-lined trough	McNamara & Russell 2017a
Aghadrinagh 3	1297-1116 BC 1310-1157 BC	Sub-rectangular trough & burnt spread, water management system, possible stone-lined trough	McNamara & Russell 2017b
Aghadrinagh 4		1123-930 BC Burnt spread	McNamara & Russell 2017c
Aghadrinagh 6-7	1600-1420 BC	Sub-circular trough, burnt spread & water management system	McNamara & Russell 2019
Lisnageetha or Antigua 3	n/a	Sub-rectangular trough & burnt mound, trough partially stone lined	McNamara & Murphy 2017
Cloondeash 1	1612-1455 BC	Sub-circular trough, burnt spread, water management system, poss. wood-lined trough	Nunan 2019a
Cloondeash 3	1625-1451 BC	Burnt mound	Nunan 2019b
Cloondeash 4	1611-1434 BC	Burnt mound and later pit clusters	Nunan 2019c
Knockaphunta (B)	1412-1231 BC	Burnt mound	Quinn, Excavations Ref. 2016:091

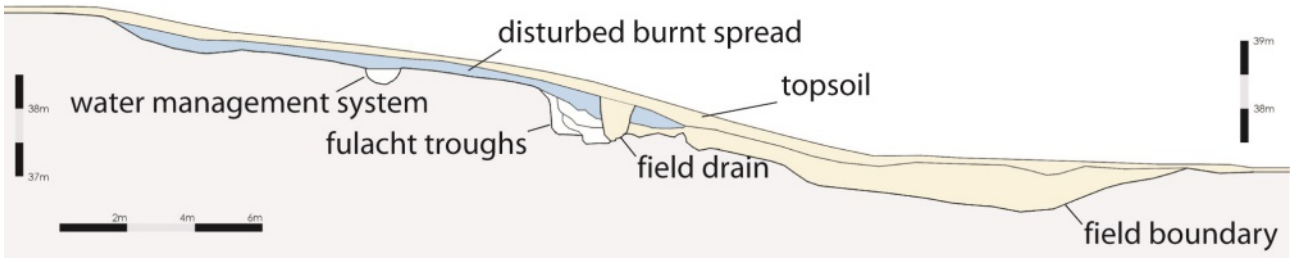
Table showing the dates of tother fulacht fiadh sites within 2 kilometres of the site (top)

while not retaining heat as well, would also have had a secondary issue caused by the repeated heating of the stone resulting in a chemical reaction turning it into slaked lime, making it highly unsuitable for cooking or bathing (ibid.). In cases where limestone is present therefore, other functions should be considered. While some burnt limestone was noted within the spread at Knockaphunta, the majority of the burnt stone recorded was sandstone, which would be suitable for a fulacht fiadh. The predominant use of sandstone at the site is both practical, as it was present within the boulder clay in the surrounding area, and efficient as the stone could be heated and cooled approximately five times before splitting into unusable fragments (Buckley 1990, 171).

At the same time, a better understanding of prehistoric settlement in Ireland from several decades of archaeological excavations have allowed for a more nuanced interpretation of fulachtaí fia sites and their role in a complex, settled society of Bronze Age Irish kingdoms (e.g., Hawkes 2015; Hawkes 2018, 166-176). While additional features associated with settlement have yet to be identified in the vicinity of the site at Knockaphunta, the presence of three separate clusters of fulachtaí fia in the vicinity would suggest at least three kin-groups were present within the area in the Middle Bronze Age.

The disturbed burnt spread

The large burnt spread overlying the troughs at Knockaphunta measured 22.8m by 17.7m, ranging in depth from 0.17 to 0.4m, with a minimum volume of 115m^3 and a maximum of 161m^3. This is above the average dimensions nationally (9.4m by 7.06m, Hawkes 2018, 55), and represents a substantial spread when compared to the other fulachtaí fia sites uncovered in the area. The majority of these (six examples) have recorded spreads ranging from c. 2m^3 to 22m^3. Two represent burnt mounds between 45m^3 and 80m^3, with only one at Cloondeash being larger than the burnt spread at Knockaphunta. The Cloondeash burnt spread had no associated trough with later activity identified at the site suggesting it was used or returned to over an extended period of time, into the Iron Age, which may explain the substantial burnt spread (Nunan 2019c). The burnt spread at Knockaphunta is also indicative of a site that was used repeatedly with four troughs identified, which were used sequentially



West-facing profile of the site showing the slope of the ground level from the north (left) to south (right), width the field boundary occupying the low ground to the south. The disturbed burnt spread can also be seen to overlie the fill of the field boundary. 2:1 height exaggeration (top)
Plan showing the extent of the burnt spread at Knocka-phunta (bottom left)
Pre-ex view of disturbed burnt spread C2, looking east (centre right)
Mid-ex view of the removal of the burnt spread C2, look-inh northwest (lower centre right)

Table of burnt mound dimensions in the vicinity ofn the site (bottom right)

Location of the excavation (in blue) and development site (orange) on the First Edition Ordnance Survey map (centre right), Third Edition OS map c. 1910s (lower centre right) and revised Third Edition OS map c. 1950s (bottom right). Limekilns in the vicinity marked on the maps are circled in green

Site	Mound dimensions	Approx. vol.
Aghadrinagh 2	10 x 6 x 0.2m	12m^3
Aghadrinagh 3	17 x 4.5 x 0.1-0.3m	15.3m^3
Aghadrinagh 4	13.5 x 11.51 x 0.3m	46.62m^3
Aghadrinagh 6-7	8.2 x 7.8 x 0.3m	19.19m^3
Lisnageetha/Antigua 3	3.3 x 2.2 x 0.28m	2.03m^3
Cloondeash 1	10.5 x 7 x 0.3m	22.05m^3
Cloondeash 3	11.5 x 10.8 x 0.62m	77m^3
Cloondeash 4	44 x 14 x 0.6m	369.6m^3
Knockaphunta	6 x 2-3 x 0.3m	4.5m^3

over a minimum of 162 years, and possibly up to 693 years.

The disturbed burnt spread was identified during the monitoring phase of works on the site (McGlade 2016a) with further features being uncovered beneath the spread during the excavation. The site was found to have been heavily disturbed during the 19th and 20th century. The burnt spread (C2) overlay the fill (C19) of the field boundary (C85) at the southern end of the site, which was filled in between the 1910s and the 1950s, as well as a buried topsoil (C30) to the west of the site, which contained early modern pottery. It can be assumed that the upper levels of all the features identified beneath the spread were truncated during the disturbance of the overlying spread. This is particularly apparent to the south of the stone-lined trough (C73), where the lining has been truncated away from the southern end. It is unclear where the burnt mound or mounds were originally located.

The analysis of the finds from the excavation indicated that the burnt mound was disturbed in the 19th and 20th centuries (Giacometti 2017). No finds were identified earlier than this period. A number of refits were identified from pottery within the burnt spread, the field drain and the field boundary (ibid.). This suggests that the disturbance of the burnt mound occurred when the field boundary and the later field drain were inserted in the 19th century. Later 20th century material was also present within the burnt mound material, which may corroborate the suggestion that the site had been used for the disposal of waste from St. Mary's Hospital. The site may also have been used as a dumping ground for waste material from the nearby limekilns during the late 19th and 20th century. There is anecdotal evidence that this waste material was subsequently used as road fill in the vicinity (Andy Neary pers. comm. 2016), with the removal of the material likely to have further disturbed and intermingled the modern waste with the prehistoric burnt mound material below.

Prehistoric fulachtaí fia with significant modern disturbance have been noted elsewhere in Mayo, with modern ceramics recorded within the

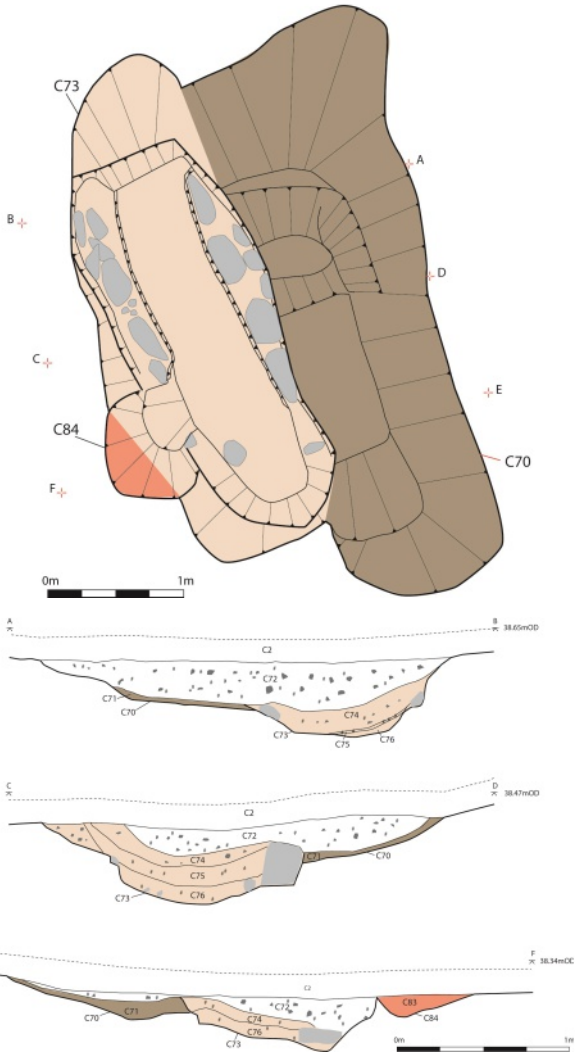
View of the limekiln depicted on the 1950s revision of the OS map in the field to the northeast of the site (top)

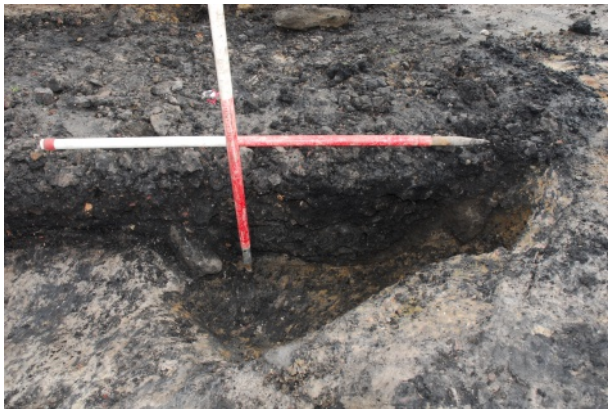
Location of the excavation (in blue) and development site (orange) on the First Edition Ordnance Survey map (upper centre), Third Edition OS map c. 1910s (lower centre) and revised Third Edition OS map c. 1950s (bottom). Limekilns in the vicinity marked on the maps are circled in green

disturbed burnt spreads of at least six sites including Deerpark East 1 (Excavation Licence No. 01E0562, Excavations Ref. 2001:906) and Gortaroe (Excavation Licence No. 01E650 ext., Excavations Ref. 2002:1393). The relatively mobile nature of the burnt stone and charcoal mound material allows for intrusive finds of comparatively recent date to occasionally be found within the material, particularly if the site has seen truncation in the past.

The fulacht troughs

Beneath the disturbed burnt spread a number of features were uncovered. Four of these were troughs (C7, C37, C70 and C73), with the earliest being relatively informal (C70), two consisting of steep-sided and flat bottomed pits (C7 and C37) suggesting better construction





Plan of troughs C70 and C73 with section points highlighted (top left)

Sections through troughs C70 and C73: north-facing section (A-B) at northern end (top section), south-facing section (C-D) through centre (central section) and north-facing section (E-F) at southern end (bottom section)

Mid-ex photo of north-facing section through troughs C70 and C73 (A-B), looking south (top right)

Mid-ex photo of south-facing section through troughs C70 and C73 (C-D), looking north (centre right)

Mid-ex photo of north-facing section through troughs C70 and C73 (E-F), looking south (bottom right)

General mid-ex photo of troughs C70 and C73, looking east (top right)

Post-ex photo of troughs C70 and C73, with lining of trough C73 apparent, looking north (middle right)

Post-ex photo of trough C73 with lining apparent, looking south (bottom right)

and the fourth (C73), which had a partial rough stone lining, being the best constructed. Stones were also present along the sides of the two steep-sided troughs to the south suggesting they may also have been partially stone-lined, with the lining robbed out prior to abandonment.

The earlier troughs to the west and south were recut by later troughs, located to the southwest of the earlier examples in both cases. The two later troughs were also slightly deeper than the trough they replaced. In both cases the position of the later trough is only slightly removed from the earlier example, with one side being cut through the fills of the earlier trough. The repositioning from trough C73 to trough C7 after a possible break in continuity on the site may have been in response to changing conditions in the local environment, with a more downhill position deemed necessary. Interestingly the troughs do not encroach on an area to the north and east of the troughs. This area is also protected by the water management system and is likely to have been a work area.

Hawkes, in his recent publication on prehistoric burnt mounds in Ireland has suggested a number of categories to help compare these site types (Hawkes 2018, 111-114). The fulacht fiadh site uncovered at Knockaphunta can be categorised as Type 2, complex burnt mounds (ibid.). Hawkes notes that these sites exhibit evidence of prolonged use with the identification of numerous troughs and pits, as is the case at Knockaphunta.

The western troughs were the earliest on the site. The earliest of these (C70) was radiocarbon dated to 1704-1607 BC, at the end of the Early

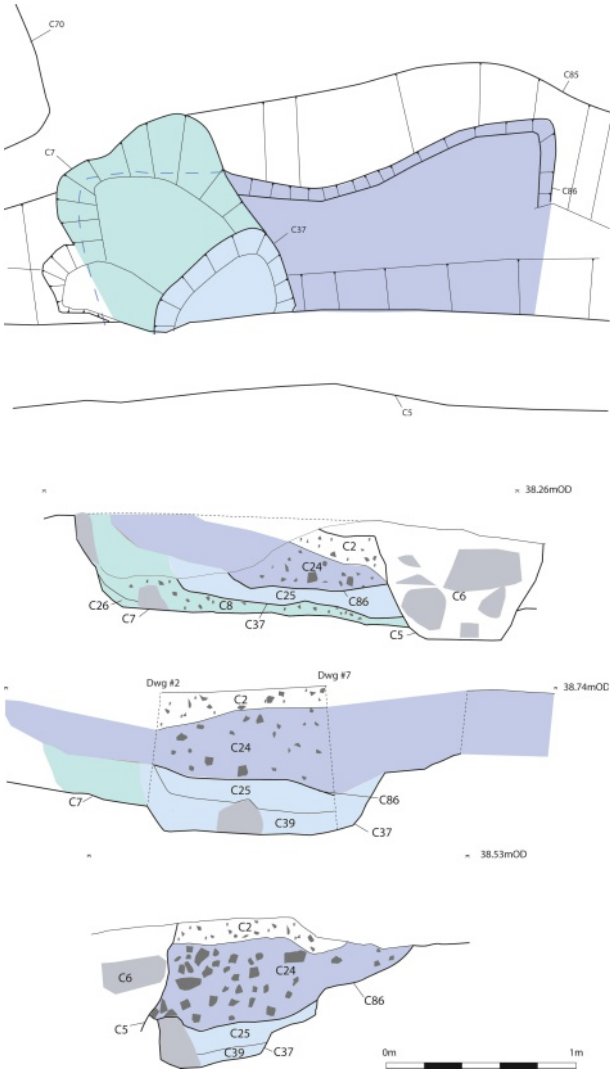
Post-ex view of trough C7 toleft and trough C37 in centre, with field drain C5 to right (top left)

Mid-ex view of trough C7 being cut by trough C37, looking east (centre left)

Mid-ex view of trough C37 with reddened fill C24 within cut C86 overlying it, looking west (bottom left)

Plan of southern troughs C7 and C37 with large shallow pit C86 also highlighted (top right)

Sections trough troughs C7 and C37, and pit C86:
Southwest-facing section (top section)
South-facing section (central section)
East-facing section (bottom section)



Bronze Age (c. 2500-1600 BC). It was replaced by a stone-lined trough (C73), which was cut into the earlier trough. A radiocarbon date of 1614-1454 BC was returned for the lowest fill of the stone-lined trough. The dates returned indicated that the highest probability (78.5%) for the earlier trough had a date range of 1704-1607 BC, while the highest probability (86.7%) for the second trough had a date range of 1614-1493 BC. Thus the second trough was last cleaned out or utilised between 7 and 211 years after the first. The second trough was slightly deeper and had a stone lining, so it may have been created with the intention of improving the existing fulacht at the end of the Early Bronze Age and into the Middle Bronze Age.

The radiocarbon date returned for the earliest of the southern troughs (C8) was 1387-1051 BC, with the highest probability (87.7%) that the trough dated to 1317-1051 BC. This is somewhat later than the previous two troughs, dating to the change from the Middle (c. 1600-1200 BC) to Late Bronze Age (c. 1200-500 BC), approximately 300 years later than the western troughs based on median dates. A later trough (C37) truncated the earliest southern trough, indicating that the fulacht activity continued into the Late Bronze Age. As with the western troughs, this may represent a process of improvement and continuity at the site over many generations. The burnt mound associated with the initial fulacht site and the associated water management system would still have been visible and recognisable within the landscape, even if it had become overgrown in the intervening years.

By the Middle Bronze Age functionally and spatially distinct domestic settlement sites had become a feature of the settled landscape and the widespread use of pyrolithic technology indicates fulacht sites were an integral part of the settlement pattern (Hawkes 2018, 218). It is interesting that five of the fulacht fiadh sites uncovered in the vicinity of the Knockaphunta date to the Middle Bronze Age and are broadly contemporary with the western troughs on the site. The earlier of the western troughs at Knockaphunta is the earliest identified in the vicinity to date, however the use of fulachtaí fia is known to date back into the Neolithic period in Mayo (Hawkes 2018). The use of fulachta[pic] fia appears to have been embraced by the people of this area from this time. It is also interesting that the southern troughs at Knockaphunta, dating to the end of the Middle Bronze Age and into the Late Bronze Age, are broadly contemporary with a second wave of fulacht usage in the area, with a further two sites in the vicinity dating to this period and one slightly later at the beginning of the Late Bronze Age. The lack of sites falling outside of these phases of activity is noteworthy and may be significant.

The four troughs identified on the site were all sub-rectangular in shape, though the western two were more elongated. The two western troughs (C70 and C73) measured 3.74-4.2m in length, 1.3-1.56m in width and 0.5-0.6m in depth and the two southern troughs (C7 and C37) 1.3-1.77m in length, 1.4-1.05m in width and 0.51-0.83m in depth. A comparison of the radiocarbon dates returned for the other fulachtaí fia excavated in the vicinity indicates that the sites uncovered at Aghadrinagh 2 and 6-7, and at Cloondeash 1, 3 and 4 are broadly contemporary with the western troughs at Knockaphunta, while those at Aghadrinagh 3 and 4 the spread at Knockaphunta B are broadly contemporary with the southern troughs on the site. The two western troughs at Knockaphunta, measure 3.74-4.2m by 1.3-1.56m by 0.5-6m, though the internal

Table showing dimensions of the troughs uncovered on the site and of those uncovered within 2km of the site (bottom)

Context	Trough dimensions	Shape	Lining
C70	4.2 x 1.56 min. x 0.5m	Sub-rectangular	n/a
C73	3.74 x 1.3 x 0.6m	Sub-rectangular	partial stone lining
C7	1.77 x 1.4 x 0.51m	Sub-rectangular	possible, stone
C37	1.3 x 1.05 x 0.83m	Sub-rectangular	possible, stone
Other nearby sites:			
Aghadrinagh 2	2.7 x 1.5 x 0.52m	Rectangular	possible, stone
Aghadrinagh 3	2.2 x 1.2 x 0.81m	Sub-rectangular	possible, stone
Aghadrinagh 4	n/a		
Aghadrinagh 6-7	1.8 x 1.54 x 0.4m	Sub-circular	n/a
Lisnageetha or Antigua 3	2.7 x 1.6 x 0.33m	Sub-rectangular	Partially stone-lined
Cloondeash 1	1.65 x 1.23 mx 0.23m	Sub-circular	Possible, wood
Cloondeash 3	n/a		
Cloondeash 4	n/a		
Knockaphunta B	n/a		

dimensions of the second stone-lined trough reduce to 3m by 0.7m by 0.6m when the lining is taken into consideration. This is somewhat longer than the examples found elsewhere in the vicinity, however falls within a the usual size and capacity range for sub-rectangular troughs from elsewhere in the country, which range in size from 0.63-6.62m by 0.38-4.43m and from 0.03-1.3m in depth (Hawkes 2018, 67). The average dimensions are 2.23m by 1.4m by 0.4m, with a capacity of 1.52m^3, indicating the western troughs at Knockaphunta are above average.

Fifty-seven stone-lined troughs were recorded at fulacht fiadh sites in Ireland from 1950-2010 (Hawkes 2018, 70). Usually these have evidence of the stones being selected or shaped to fit tightly together, which was not the case at Knockaphunta. The surviving stone lining at Knockaphunta was of rounded stones and gaps were evident. While some of the stone lining may have been robbed out after the abandonment of the trough, or truncated away during the later disturbances on the site, it seems that a tightly constructed lining was not the intention. Partially stone-lined troughs similar to Knockaphunta have been identified elsewhere. A partially stone-lined fulacht trough was excavated in Brackbaun, Co. Limerick with rounded stones recorded along the short side of the trough (McQuade et al 2009, 102). A fragment of timber on the base of the trough suggested it had also been lined with wood (ibid.). Another trough partially lined with stone was recorded at Clonmore North, Co. Tipperary (ibid., 107). An additional lining of clay, leather or grasses may have been used to seal the troughs at Knockaphunta, with the stone-lining providing support. The upper layer of the underlying subsoil was a sand-rich material and the lining may have been used to stop this collapsing. Both of the troughs to the south may also have been lined with large unburnt stones present along their sides, though only in parts suggesting the lining was removed, or was not required for the full circuit of the trough.

A single find was associated with the fulacht troughs: a fragment of unburnt animal skull found in the upper fill (C8) of the earlier of the southern troughs (C7). The bone was subsequently identified as rabbit (Paula Kehoe pers. comm. 2016). This suggests the fragment of bone was intrusive. An animal burrow was identified in the vicinity to the south of the trough, which must be the source of the bone. The lack of contemporary material is a common feature of fulachtaí fia, where food waste and other finds are notable in their relative absence (Waddell 1998, 177). The remainder of the finds uncovered during the excavation relate to later disturbance of the site.

The environmental analysis of samples from the site also provide some insight. Alder charcoal was present in both of the earlier western troughs, being the dominant wood selected for use in the later trough C73. Alder was only present in small quantities in the sample analysed from the southern trough C7 and was not present within either of the water management features analysed. As alder thrives in wetland environments this may be an indication of a slight change in the local environment from the Middle Bronze Age to the Late Bronze Age, with the latter period perhaps being drier.

Another change in the local environment suggested by the environmental analysis is a slight change in woodland cover, with both ash and fruitwood charcoal present in the later southern trough being indicators of a more open canopy (O'Donnell 2017).

The majority of the wood selected for use at fulacht site was young, which may indicate the surrounding woodland was secondary scrub generated through previous woodland clearance (O'Donnell 2017). It may also indicate a level of woodland management where the new young growth was managed.

Much of the wood used was from twigs and smaller branches, which would have been easy to collect, though a sizable quantity of charcoal from both the western and southern trough fill analysed came from a single tree-type relating to a trunk or large branch, over 70% of the earlier western trough relating to alder and c. 40% of the southern trough relating to ash (O'Donnell 2017). This may imply a tree was cut down for use in the fulacht, while the remainder of the

charcoal relates to kindling and easily collected tinder. There was no evidence of insect boreholes within the charcoal to suggest the wood had been stockpiled.

The reuse of fulacht troughs after a short interval has been seen elsewhere in the country, sometimes suggested to be a deliberate attempt to redefine the earlier example (McQuade et al. 2009, 112). Examples of this are known from Athronan 1, Co. Meath, Lissava, Co. Tipperary, Lisdornan 3, Co. Meath, Gortroe 1, Co. Mayo and Kilbegly, Co. Roscommon (Hawkes 2018, 147). The later southern troughs at Knockaphunta do not interact with the earlier two troughs, however they are located within the area protected by the water management system, which appears to have been in use during both phases of fulacht activity at the site. The southern troughs at Knockaphunta were in use perhaps over 300 years later, suggesting a short interval in activity at the site. The wood species present within the later trough suggests a slight change in the local environment. Less alder was present possibly suggesting a retraction of the wetlands to the south, which may have necessitated the shifting of the fulacht trough further down the slope to the south. The latest trough to the south was also deeper than the earlier examples to the west. While the later fulacht troughs were repositioned, the reuse of the water management system for the two phases of fulacht activity implies continuity at the site.

Intensity of use

The internal dimensions of the lined trough (C73) were significantly smaller at 2.6m in length, 0.6m in width and 0.6m in depth, which indicates that if there previously was a lining in the other troughs, their capacity would have been significantly reduced. When the lining of trough C73 is taken into account, the Knockaphunta troughs have an average capacity of 1.65m^3. Enough fire-cracked stones were excavated in the spread (c. 161m^3) to fill one of the troughs over 97 times. A water-filled trough would have required at most to be half-filled with stones in order to boil water (Fahy 1960, cited in Sheehan 1990, 35; Dennehy 2008, 14), but almost certainly far less hot stones were used per trough heating (Hawkes 2015). Experiments carried out by M.J. O'Kelly in 1952 relating to a site at Ballyvourney I, Co. Cork demonstrated that cooking, both with the trough filled and empty of water, could be carried out in fulacht troughs and in his experiments produced c. 0.5m^3 of waste broken stone in the process (Waddell 1998, 175). Numerous other experiments relating the use of fulachtaí fia have been carried out since then, for example Denvir's experiments in 1999, which demonstrated that fulachtaí fia could be used in textile processing for washing, dying and fulling (Denvir 1999, cited in Dennehy 2008, 14). She found that only twelve heated stones were required to bring the trough to boil and one stone every ten minutes added to keep a constant temperature (ibid.). As Dennehy has pointed out, (Dennehy 2008, 14) there are issues with using the size of the burnt mound material to exactly identify the number of uses of the site, however it can be used to infer the intensity of use. Based on the volume of waste produced as suggested in O'Kelly's experiments there could have been up to 322 separate heating episodes on the site at Knockaphunta, assuming the stones were heated only once. Using Fahy's figure of a half-filled trough this would suggest c. 195 heating events. Buckley has demonstrated that sandstone, which formed the bulk of the burnt stone spread from the site, could be heated and cooled around five times before breaking into unusable fragments (Buckley 1990, 171). This may suggest that the site could have been used between 976 and 1,610 times, however even taking the lowest possible projection of 195 events, this implies an extended presence in the area. The site was used intensively and suggests repeated use.

Linings

One point that should be made relates to the ability of the various troughs to hold water. Two distinct natural layers were identified on the site: a white and yellow sand to the north; and a yellow boulder clay with large degrading grey sandstone boulders to the south. All the features identified on the site were initially cut through the upper sand layer. As well as making the job of the archaeologist very easy, with the dark fills of the various features standing out clearly from the pale natural sand, this material was also easy to dig. It was also easily eroded, as

Post-ex photo of partial stone lining in trough C73, looking north (top)

Post-ex photo of trough C37 with stones present in corner that may be the remains of a stone lining (centre)

Mid-ex photo of section through trough C7 with upright stone at northern edge of trough, possibly representing the remains of a stone lining, visible to the left (bottom)

seen in a number of the features where the edges were difficult to identify clearly as they had collapsed and been undercut in the past. This natural sand would not have efficiently held water, however, as the water would not stand in the pits for long. Interestingly the two troughs to the south (C7 and C37) were dug down through the upper sand layer and into the boulder clay below, suggesting they would have been more water-tight. The two eastern pits of the water management system (C51 and C77) were also dug into the underlying boulder clay. The question must be posed as to how water was held within these troughs and pits for any amount of time. Indeed, with the two later troughs, which were partially cut into earlier partially backfilled troughs, the ability to hold water would have been reduced even further. It is highly likely that the troughs previously had linings that have not survived, such as clay or natural materials such as wicker or leather. It is unlikely that they were wood-lined as the cuts were not formalised enough with straight edges to have housed a wooden lining. In the case of the trough that was partially stone lined, the lining was clearly not intended to create a water-tight container, as the stones were rounded and uneven with gaps and holes. This lining appears to relate to a formalising of the sides of the trough, possibly in an attempt to avoid collapse, rather than providing a water tight layer.

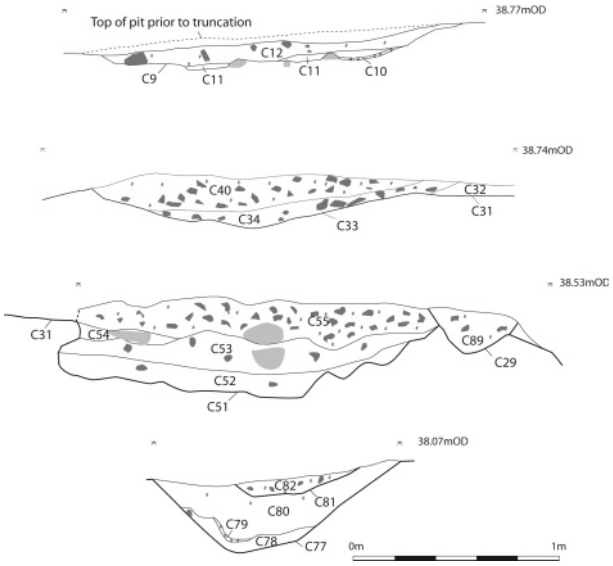
It is interesting to note that only eight of the fulacht fiadh sites in Mayo are recorded as having been dug into a sandy natural. A further seven note the presence of sand, possibly derived from crushed or broken down burnt sandstone, at the base of fulacht troughs. While this could also be due to a lack of sandy subsoils in the county, it would seem that it was not ideal to locate a fulacht on sandy natural in Mayo, with only 8.3% of excavated examples recorded as being cut into this material. The majority were cut into natural boulder clay or peat, with boulder clay offering better impermeability and peat, being water-logged, not causing the troughs to drain easily. Whether the site was located in sandy subsoil intentionally is unknown, however the ability of the troughs to self-drain after use might have been seen as a benefit for cleaning for example. Theoretically, if a temporary lining such as

leather was used this could be removed after the processing or cooking was completed allowing the water to seep into the natural sand surrounding the trough and making the removal of the fractured stone from the trough easier.

The water management system

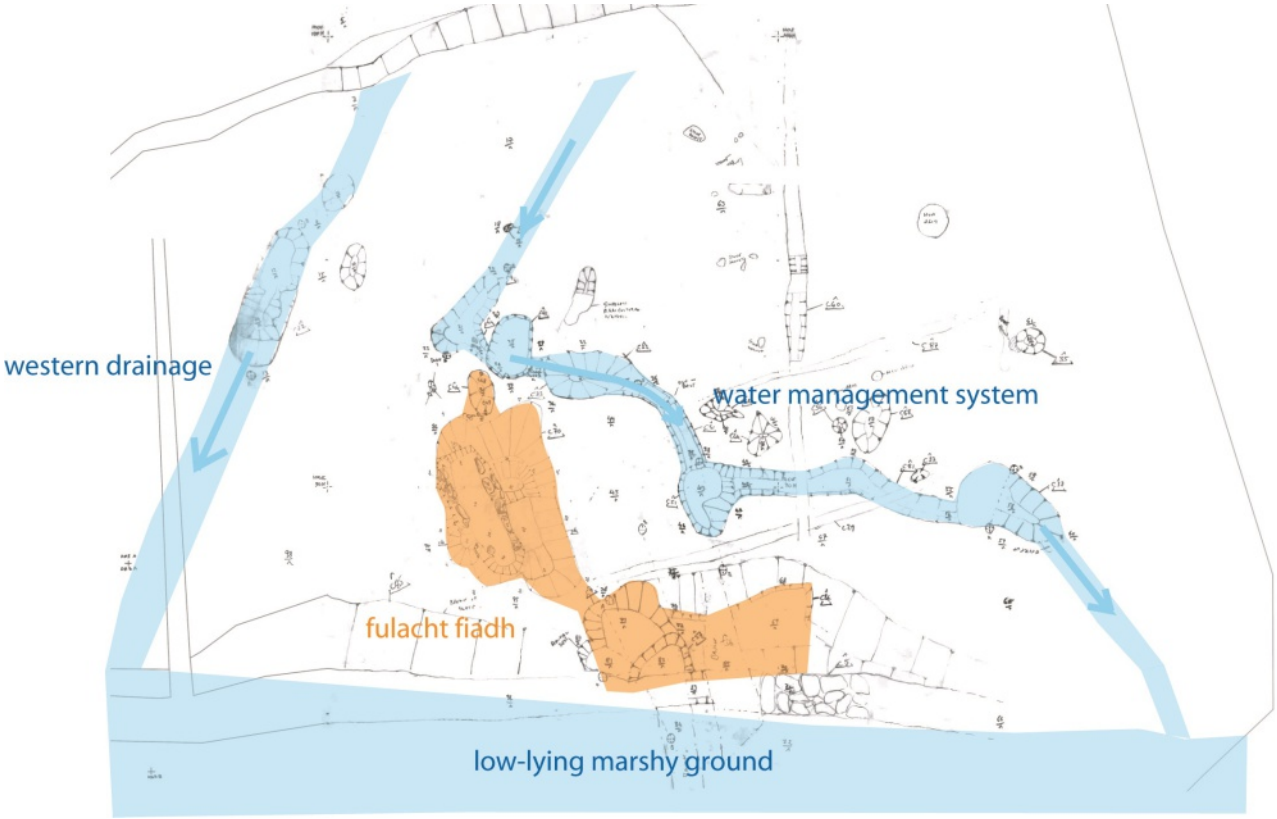
Two sections of water management were identified associated with the fulacht fiadh site. To the north of the fulacht troughs a series of pits and channels appear to have managed a small stream or watercourse from the top of the drumlin, directing it through five pits (C9, C41, C33, C51 and C77) via a number of small channels (C44, C94, C31 and C81) from northwest to southeast. The system skirts around to the north of the area the fulacht troughs are located in, diverting any uncontrolled water away from the area and off towards the low-lying, probably marshy ground, to the southeast.

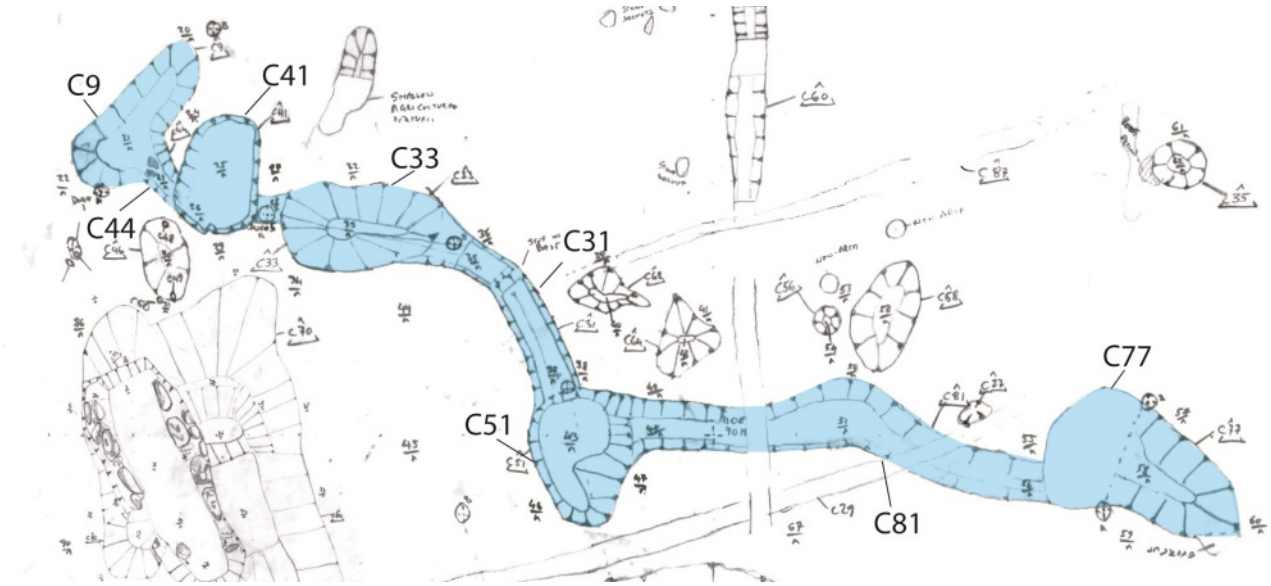
Two of the pits along the system were deeper and more pronounced than the others. Interestingly these also happen to be the pits closest to the fulacht troughs with the second pit of the water management system (C41) lying



Sections of pits along the water management system:
Southeast-facing section of pit C9 (top)
South-facing section of pit C33 (upper centre)
West-facing section of pit C51 (lower centre)
Southeast-facing section of pit C77 (lower section)

Plan of the water management system and its proposed continuationcreating drained spaces around the fulacht fiadh site (bottom)





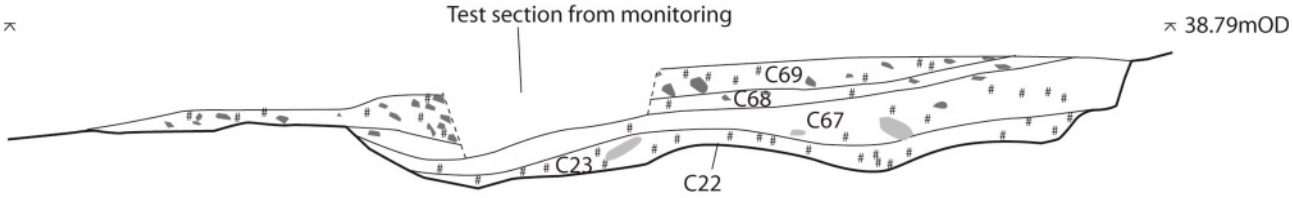
Close-up plan showing the pits and channells along the eastern side of the water management system (top)

Post-ex photo of pit C41, looking east. The location of the pit and its regular form led to the suggestion it may have served as a cistern for the western troughs (upper centre)

Mid-ex photo of pit C51 overlaid by burnt spread C2, looking east. This may had served as a cistern for the southern troughs and have been lined with oak though only the charred remains survived (lower centre)

Mid-ex overview of the water management system curving around the fulacht troughs to the left, looking northwest (bottom)

to the north of the two western troughs and the fourth pit (C51) lying to the northeast of the southern two troughs. These pits could have been used to provide water to the fulacht troughs in a controlled manner. The pit closest to the western troughs (C41), which had vertical sides and a flat base, had been intentionally backfilled while the remainder of the water management system stayed in use, suggesting the purpose for the pit expired prior to the abandonment of the system. This may relate to the abandonment of the western troughs, which went out of use prior to the creation of the southern troughs. The second possible cistern (C51) was located to the north of the southern troughs and was steep-sided and deeper. There was significant erosion of the pit, suggesting it remained open and unmanaged, possibly after



Southeast-facing section through pit C22 showing oak charcoal layer C23 along the base (top)

Mid-ex view of pit C22 along the western side of the water management system, looking northwest. The dense layer of oak charcoal along the base is clearly visible (bottom)

the abandonment of the site. The environmental analysis of the secondary deposit within this pit also contained a high quantity of oak, which may indicate a wooden vessel or lining was present within the pit, defining the cistern. The lining or vessel was burnt prior to the abandonment of the site with the pit remaining open, with water subsequently flowing through the system and further eroding it. A small amount of hazel and ash charcoal was also present within the fill, possibly relating to the nearby fulacht activity, with hazel and ash both present in the later southern fulacht trough.

There was some evidence for the control of water flowing through the system with steps in the base apparent in two of the channels (C44 and C31). This may have allowed some of the pits to be filled and emptied at various times. There was also some suggestion that not all the pits were in use at the same time.

Was this series of pits and channels created simply to provide a water source for the fulacht troughs, or could they have served an additional purpose? Perhaps they represent another stage in the processing being carried out at the site. In contrast to the hot water being produced in the fulacht troughs, the water managed from this series of channels and pits would have been cold, and simultaneous access to varies temperatures (boiling, tepid, cold) of water may have been an important aspect for the prehistoric activities carried out on the site.

The eastern side of the water management system curved around the north and east side of the fulacht area, channelling water flowing down from the higher ground away from the troughs and creating a drained work area. The eastern side was formed by a number of pits and interconnecting channels. There was evidence for undercutting and collapse along the line of the pits and channels suggesting erosion by the water flowing through the system over time.

A second water management system was recorded to the west with two features (C20 and C22) arranged along a similar northeast-southwest alignment. Previously a third feature was identified to the southwest of the larger pit (C22), however this was very shallow and did not survive well enough to record during the excavation. This appears to have been the base of a channel designed to protect the western side of the working area around the fulacht fiadh from inundation, directing water away from the area to the southwest.

Oak was not present within either of the trough fills analysed indicating it was not selected as fuel for the fulacht activity. This is contrasted strongly with the results from the associated water management features, which were dominated by oak charcoal. The charcoal within

the western linear pit (C22) formed a dense layer along the base and sides of the cut. This pit appeared to represent the remains of a cut that channelled water away from the fulacht troughs, avoiding the ingress of water from the higher ground to the north and funnelling it towards the lower-lying ground to the south, which is likely to have been wet land. As only oak charcoal was present within the sample taken from this feature it is possible that it represents something structural (O'Donnell 2017). This may indicate the channel was wood-lined at some point, with the lining subsequently being burnt.

Hawkes (2018, 82-3) notes the presence of water management systems at a number of Irish sites, frequently involved with the provision of water to and removing water overflow from the troughs themselves. He also noted that pits along these water management systems may have served a number of separate functions similar to a production line (ibid.). Hawkes encourages caution in the presumption of contemporaneity of these pits, and indeed at Knockaphunta there was evidence that at least one of the pits along the eastern side of the water management system was filled in prior to the abandonment of the system.

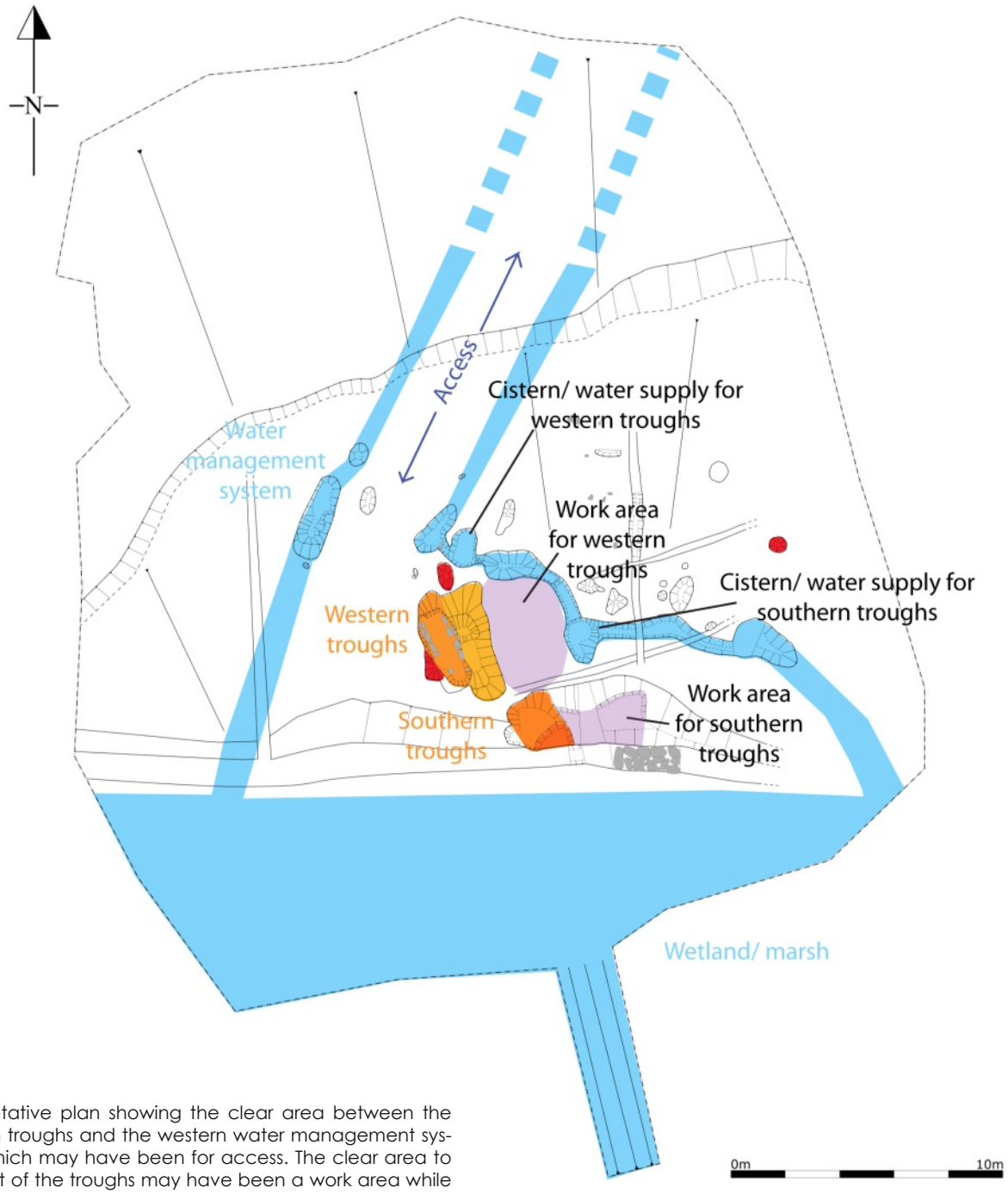
The water management system associated with the fulacht fiadh appears more elaborate than those seen at many other fulacht fiadh sites. The fulacht fiadh was located towards the base of the low drumlin with a low-lying and presumably marshy, wet and boggy area immediately to the south, in the vicinity of the post-medieval field boundary. This could have served to provide water for the fulacht troughs, however a somewhat elaborate water management system was created instead, probably fed by a small streamlet running from the top of the drumlin to the north into the lowland area to the south of the fulacht fiadh. The water in the boggy and marshy area between the two drumlins appears to have been rejected. It is possible that the water in the marshy area was dirty or stagnant and a source of clean fresh water was more desirable.

The clear areas

The archaeological features on the site were defined by channels and pits cut into the subsoil. However, areas without these would still have been utilised. Limited archaeology was noted to the north of the site, but given the shallow depth of topsoil in this part of the site it is very likely that agricultural activity and other post-medieval and modern disturbance would have impacted on features in this part of the site.

Mid-ex view of the site withe the clear area associated with access to the fulacht fiadh in the centre-ground and the work area associated with the western troughs in the background surrounded by the torughs and water management system, looking southeast (top)

Mid-ex view of the clear areas with the clear area associated with access to the right and the work area associated with the western troughs in the centre, looking south (bottom)

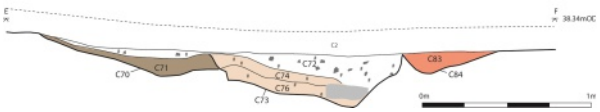


Interpretative plan showing the clear area between the western troughs and the western water management system, which may have been for access. The clear area to the east of the troughs may have been a work area while the shallow pit to the east of the southern troughs may have served a similar function. The possible fire-pits are highlighted in red

During the excavation it became clear that two areas of the site had conspicuous absences of cut features. The first of these was located to the west between the north-northeast to south-southwest trend of pits (C20 and C22) and northern end of the northwest-southeast running water management system and western troughs. This strip may have been the access route down the slope towards the fulacht troughs. The trend of pits to the west were possibly channelling a second small water course, protecting the western side of the path. This would have allowed for access down to the western troughs along their western side.

The second area where there was a conspicuous absence of features was in the centre of the site between the water management system and the fulacht troughs to the west and south. This area

measured 4.2m by 2.6-3m and was roughly parallel to and of similar proportions to the combined area of the two western troughs (C70 and C73). This blank space at the heart of the site was intriguing and was immediately apparent during the excavation. There are two possible suggestions for it being left untouched. The first is that this was the original location of the burnt mound, and the reason no cut features exist in this area was because it was occupied by the pile of burnt stone and charcoal waste created during the use of the fulacht fiadh. This interpretation is supported by the sequence of construction of the fulacht troughs, as later troughs were recut slightly further away from this open area. It could be suggested that there was a need to move the troughs away from the ever increasing and spreading burnt mound. An alternate interpretation is that this open area was kept free as the work area of the site allowing the various pits and troughs to be accessed from a central location. This suggestion is also plausible, as from this central area three of the pits along the water management system (C33, C41 and C51) are readily accessible, as well as the troughs to the south (C7 and C37) and the west (C70 and C73).



Post-ex view of fire-pit C35, looking north. Note the heavy scorching on the stone along the west side of the pit (top)

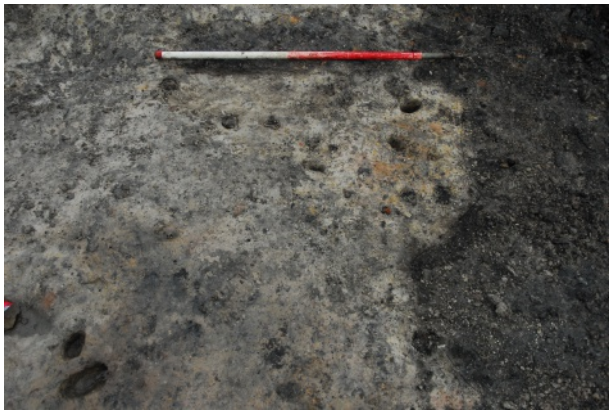
North-facing section through fire-pit C84 and troughs C70 and C73 (centre)

Mid-ex view of section through troughs C70 and C73 with fire-pit C84 to right, looking south (bottom)

Possible hearths & firing locations

Four possible hearths or firing locations were identified on the site. The first is to the east of the site beyond the eastern limit of the burnt spread and consisted of a small sub-circular pit (C35). This pit was found to have a natural stone along one side of the base that exhibited signs of in situ burning, suggesting the pit may have been used as a hearth. The location of the pit is quite far removed from the fulacht activity however and it seems unlikely that this pit was used to heat the stones for the fulacht as they would then have to be transported while hot to the troughs. The feature may still have been a hearth, but serving a different function.

The second possible hearth is suggested more by its location. This is a pit (C84) to the west of and cut by the stone-lined fulacht trough (C73). The proximity of this pit to the earlier trough (C70), also cut by the later stone-lined trough, suggests it was associated with the earlier trough, with use as a hearth being a possibility. The location of the pit would have been ideal as there would not have been a need to move the hot stones any great distance. The grey silt fill (C83) of the pit may derive from a concentration of ash within the hearth, and the fill was different from the fills of the other features in the vicinity.



Plan showing the location of possible hearths and firing spots (top left)

Mid-ex view of shallow pit C46, looking east. A number of stake-holes were uncovered in the vicinty with other circular anomalies noted but too shallow to identify as cut features (bottom left)

Mid-ex view of the site with section through shallow pit C86 remaining to centre left. This pit may have functioned as a work area for the southern troughs, or as a firing spot (top right)

Mid-ex view of section through trough C37 with reddened fill C24 overlying the backfilled trough, looking northeast. Fill 24 was the sole fill within shallow pit C86 and may have backfilled the pit and work area after the troughs had gone out of use (bottom right)

A shallow pit (C46) was identified to the north of the western troughs. The location of this pit, in close proximity to the troughs, and the presence of stake holes at either end of the base of the pit may suggest the feature represents a hearth, with the stake-holes possibly the remains of a light spit or associated structure. The stakes would have been very lightweight however, and there was no in situ burning noted within the pit. The location of this pit between the presumed water supply for the fulacht and the troughs was also somewhat problematic as the presence of a hearth here would likely have been an obstacle while the fulacht was in use.

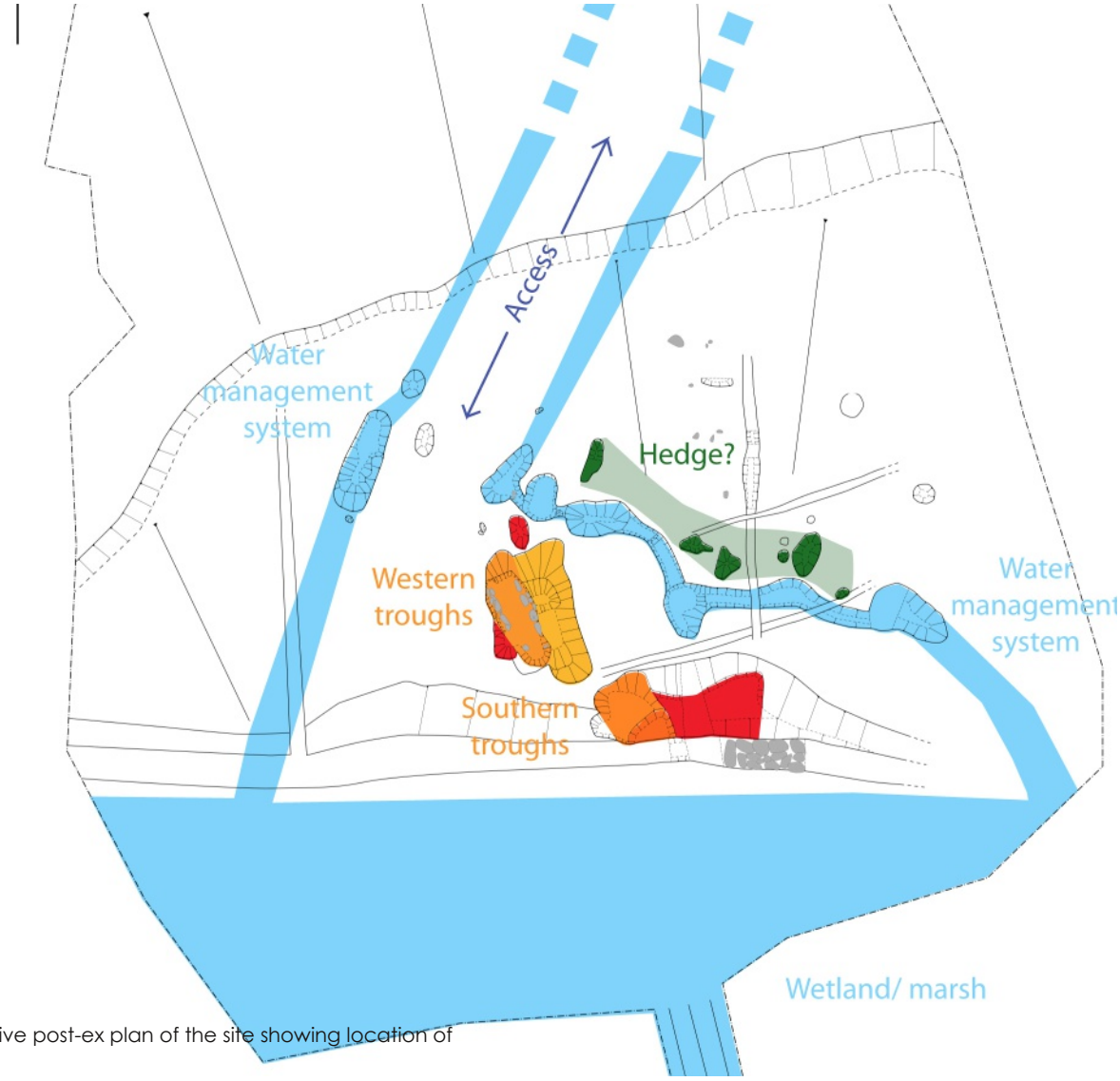
The final possible firing location is over and on top of the burnt stone refuse itself. This is suggested by a concentration of fire reddened burnt stone (C24) within the large shallow pit (C86) to the south of the site. The fill of the pit (C24) overlay the two troughs to the south (C7 and C37). The size and the shallow nature of this pit was somewhat unusual and it was initially interpreted as truncating the troughs, possibly representing later activity on the site. However, it is equally possible that it was open at the same time as them, being backfilled after the troughs had filled in. The pit contained noticeably fire-reddened burnt stone in higher concentrations than elsewhere on the site indicating these stones had been directly fired. Dennehy has suggested (2008, 11) that concentrations of reddened stone within the burnt mound material may indicate the location

of hearths located within the burnt mound rather than on the natural subsoil nearby. It is possible that this feature represents a sunken work area associated with the later troughs with firing taking place in and around this location.

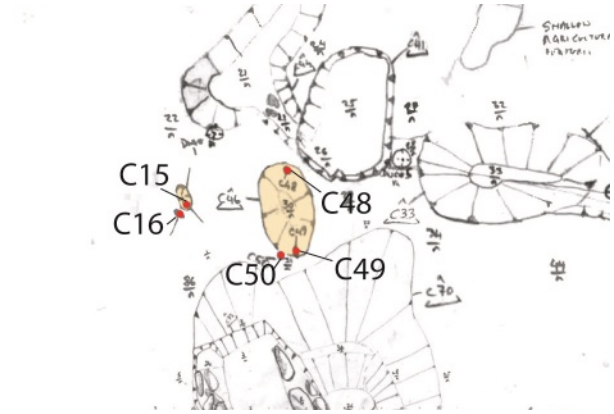
Additional features on the site

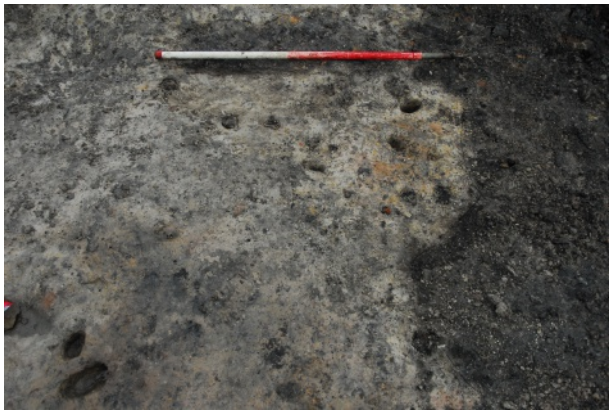
A number of other features were identified on the site during the excavation. To the east a series of five features (C28, C56, C58, C62 and C64) were identified to the north of the water management system. It is possible that these features may represent a line of root boles relating to a hedgerow previously running along the northern side of the water management system. This would explain their poor definition and lack of regularity, while also making sense practically. A hedgerow along the higher ground to the north of the water management system would have given some protection to the pits and channels to the south limiting the flow of water into the system from the sides and firming up the ground above the area of activity associated with the fulacht fiadh. If a hedgerow was allowed, or encouraged, to grow along the side of the water management system, this suggests a long term use of the site, and perhaps a certain level of planning.

Five stake-holes (C15, C16, C48, C49 and C50) were recorded during the excavation in the area between the western fulacht troughs (C70 and C73) and the northern end of the water management system (C9 and C41). It is unclear



Interpretative post-ex plan of the site showing location of hedge





Plan showing the location of the five stake-holes identified (top)

Mid-ex photo of pit C46 with stake-holes C48, C49 and C50 visible. Stake-holes C15 and C16 can be seen in the left foreground. Other potential stake-holes were investigated and found to be under 20mm in depth, possibly relating to stones pressed into the natural from the overlying burnt spread (bottom left)

whether these stake-holes were related to one another, however they were clustered together to the north of the western troughs. Two of the stake-holes were identified beside one another at one end of a pit with a third identified at the opposing end of the pit at a distance of c. 0.9m. While no in situ burning was noted, this pit may represent a fire-pit for the troughs to the south, with the stakes representing a lightweight spit. The remaining two stake-holes were located beside one another approximately 1.25m away forming a triangular shape. It is possible the stake-holes relate to a light-weight frame or tripod associated with activity being carried out within the troughs.

Bronze Age sites in the vicinity

Another fulacht fiadh was recently identified (Crumlish, 15E0384, 2015:145) and subsequently excavated in Knockaphunta 282m southwest of the site (Quinn, 16E0056; Excavations Ref. 2016:091). A kidney-shaped burnt mound measuring 6m by 2-3m by 0.3m with no associated trough was excavated, which was radiocarbon dated to 1412-1231 BC in the Middle Bronze Age.

At Aghadrinagh, c. 1.5m to the south of the site, a number of fulachtaí fia and burnt mounds were recently uncovered and excavated in advance of the construction of a new section of the N5 road.

At Aghadrinagh 2 a rectangular trough measuring 2.7m by 1.5m by 0.52m was uncovered associated with a burnt spread measuring 10m by 6m by 0.2m (McNamara & Russell 2017a, 5-6). A single flat stone was found along the side of the trough suggesting it may originally have been stone lined (ibid.). A radiocarbon date of 1612-1445 BC was returned from the basal fill of the trough, which is contemporary with the second trough of the western fulacht fiadh at Knockaphunta, which was also stone lined. A short section of slot trench and cluster of post and stake-holes were also uncovered beneath the burnt spread and were suggested to be the remains of a temporary structure associated with the fulacht, possibly a sweat house (ibid., 11).

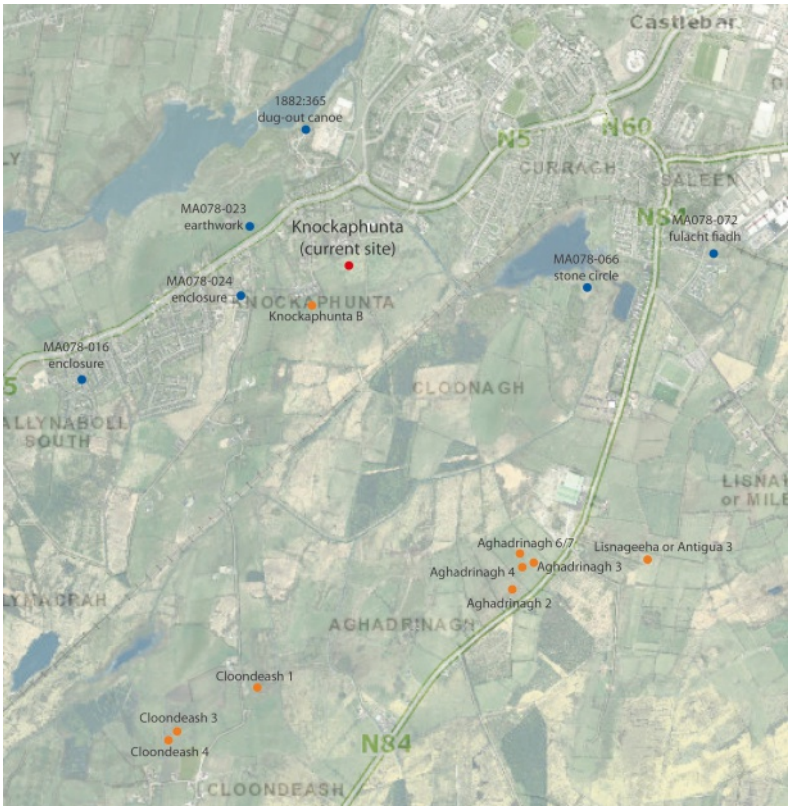
At Aghadrinagh 3 a sub-rectangular trough measuring 2.2m by 1.2m by 0.81m was uncovered associated with a truncated burnt spread covering an area of c. 17m by 4.5m and ranging in depth from 0.1-0.3m (McNamara & Russell 2017b, 5). A number of stones are depicted around one end of the trough, but were not recorded as a lining. A radiocarbon date of 1297-1116 BC was returned from a fill of the trough, with a similar date of 1310-1157 BC being returned for the burnt spread (ibid., 9). This is broadly contemporary with the southern trough at Knockaphunta. An overflow channel was also identified leading away from the trough.

At Aghadrinagh 4 a burnt spread was uncovered measuring 13.5m by 11.51m by 0.3m, which did not have an associated trough (McNamara & Russell 2017c, 5). A radiocarbon date of 1123-930 BC was returned for the burnt spread, which is slightly later than the activity at Knockaphunta.

At Aghadringh 6-7 a sub-circular trough measuring 1.8m by 1.54m by 0.4m was uncovered associated with a burnt spread measuring 8.2m by 7.8m by 0.3m (McNamara & Russell 2019, 6). No lining was identified. A radiocarbon date of 1600-1420 BC was returned for the burnt spread overlying the trough, while a date of 3640-3381 BC was returned for a peat layer underlying the burnt spread (ibid.). An irregular channel upslope of the trough was part of a water management system, possibly supplying water to the trough.

At Lisnageetha or Antigua 3, c. 1.6km southeast of the site, a sub-rectangular trough measuring 2.7m by 1.6m by 0.33m was uncovered associated with a small truncated burnt spread measuring 3.3m by 2.2m by 0.28m (McNamara & Murphy 2017, 5). The top of the trough cut was lined with angular stones (ibid.), which is comparable with the later of the western troughs at Knockaphunta. No charcoal survived within the samples taken and it was not possible to radiocarbon date the site (ibid., 7).

A further three fulachtaí fia sites were identified along the same road scheme in Cloondeash townland c. 2km to the southwest of the site. At Cloondeash 1 a sub-circular trough measuring 1.65m by 1.23m by 0.23m was uncovered associated with a burnt spread measuring 10.5m by 7m by 0.3m (Nunan 2019a, 5-6). A radiocarbon date of 1612-1455 BC was returned for the burnt mound overlying the trough, broadly contemporary with the western fulacht fiadh at Knockaphunta. A piece of timber was retrieved from within the trough just above the base, which had no obvious surviving tool markings. It may be the remains of a wood lining within the trough, or a discarded piece of wood. A pit and associated channel was identified to one side of the trough, with a spring present in the base of the pit (ibid.). Water flowed from the pit into the trough, with excess water flowing along the channel away from it.



Location of other sites in the vicinity. The sites in orange have been radiocarbon dated to the Bronze Age and are all fulacht fiadh sites. The sites in blue are derived from the RMP fils and the NMI topographical files and are potentially contemporary, though this has not been confirmed

At Cloondeash 3 a burnt mound measuring 11.5 by 10.8m by 0.62m was uncovered, which did not have an associated trough (Nunan 2019b, 5-6). A radiocarbon date of 1625-1451 BC was returned for the burnt mound, broadly contemporary with the western troughs at Knockaphunta (ibid.).

A substantial burnt mound was uncovered at Cloondeash 4 measuring 44m by 14m by 0.6m along the edge of a prehistoric stream course with no associated trough identified (Nunan 2019c, 6). A radiocarbon date of 1611-1434 BC was returned for the burnt mound, contemporary with the two other burnt mounds within the townland and with the western fulacht troughs at Knockaphunta. Two pit clusters were also identified at the site underlying the disturbed burnt mound, one dating to 1214-1006 BC and the second cluster dating to 768-430 BC (ibid., 14). These may indicate the fulacht fiadh site was reused at separate times in the Late Bronze Age and Early Iron Age, or be indicative of later unrelated activity on the site, with the burnt mound subsequently being disturbed to overlie the pits.

In the wider vicinity of the site the catalogue of radiocarbon dates compiled by Chapple (2019) indicates activity contemporary with the use of the western troughs at Knockaphunta at Cloongalloon to the northwest of Castlebar, where a log boat was uncovered and dated to 1618-1456 BC. A burnt mound uncovered at Cashel Upper, Turlough to the northeast of Castlebar was radiocarbon dated to 1618-1456 BC (ibid.).

In the later 19th century a 26-foot long canoe made of oak (suggesting a dugout canoe), was recovered during drainage works at a lake near Castlebar (NMI Files; Ref 1882:365). The lake is not specified but it may well be Lough Lannagh, which lies just outside the northwestern limits of the town. The boat is recorded as containing some 'stone implements' and some bones, and was presented to the museum by the Governor of Castlebar Prison. A second record for a dugout canoe, identified as having been recovered from Lough Lannagh, refers to a sample from the boat taken for the purposes of radiocarbon dating. It is noted in the files that the boat itself was not in the possession of the museum, and it must be assumed it is a separate boat to that of the 1882 acquisition. The files held no results of the carbon 14 dating, and it is unknown if this was carried out (NMI files).

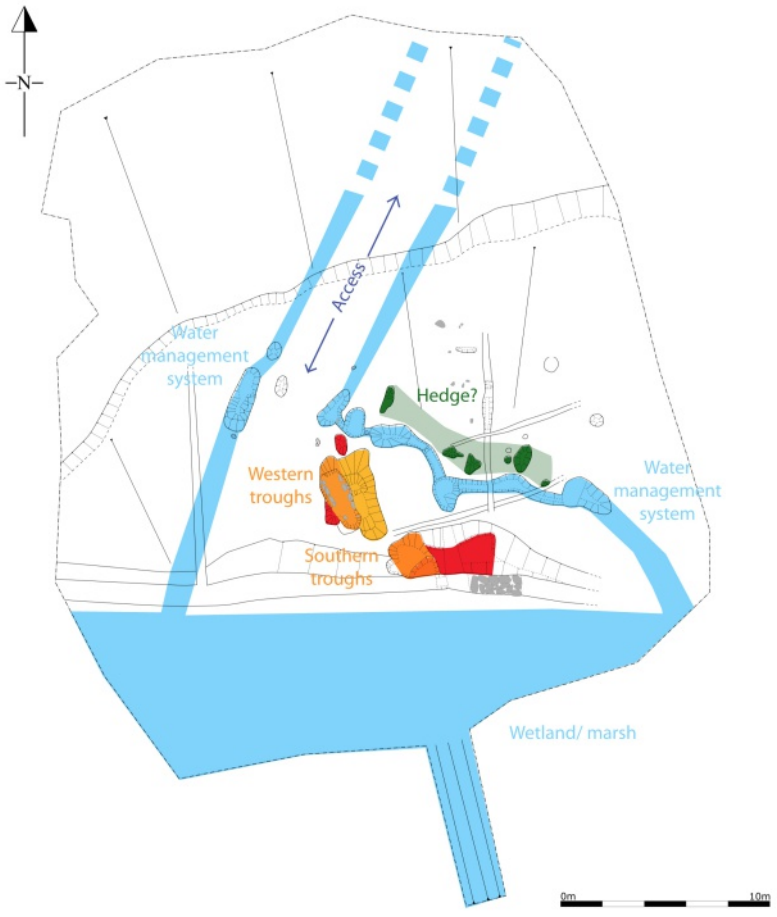
The RMP files also record the presence of an additional burnt mound, as well as a cairn, a mound and a stone circle in the vicinity of the site at Knockaphunta, all of which may date to the prehistoric period. The stone circle, located to the east of the site and south of Saleen Lough, is one of 24 known from Mayo, and lies 1km from the site. These are largely dated to the Bronze Age and are believed to have served a ritual function, further indicating an occupation of the lands in the vicinity of the site during the Bronze Age. A number of undated enclosures in the vicinity are also recorded, though these may relate to later periods.

The discovery of Bronze Age dugout canoes at Lough Lannagh and Cloongalloon indicate that Bronze Age communities were travelling through this region. The Topographical files of the National Museum record a number of probable Bronze Age artefacts from the vicinity of Castlebar including a bronze axehead, bronze cake and gold bracelets, which further attest to prehistoric activity in the area. The Castlebar provides an area of fertile ground to the south of the poorer mountainous lands, and close to the shores of Lough Lannagh and other smaller lakes, and thus would have been an attractive settling point in prehistory. Combined with the physical remains of the Bronze Age fulachtaí fia, it is highly likely that Bronze Age settlement sites existed in the Castlebar area and either have not survived, are not yet confirmed, or have yet to be identified.

Section 3 Conclusion

The site uncovered at Knockaphunta is an example of a fulacht fiadh that was used repeatedly over an extended period of time. It had an evolved water management system both directing water away from the working area around the troughs and providing a number of pits that may have served as a water supply and had additional functions as part of the processing being carried out at the site. It is possible the water management system was at least partially wood-lined, with the lining being burnt at some point. While one of the troughs was partially stone lined and two others may have been, an additional (and no longer surviving lining) must have been used on each of the troughs to make them water-tight.

The site at Knockaphunta shows a level of continuity in the local population from the Middle Bronze Age extending into the Late Bronze Age. This continuity is reflected in the other fulachtaí fia uncovered in the vicinity, which are clustered in three separate areas. Given the clustering of fulachtaí fia sites within 2km of the site, with activity in each cluster extending over significant amounts of time, these sites are likely to have been used by specific and separate kin groups and suggests at least three different communities were living in this area to the south of Castlebar during the Middle Bronze Age and into the Late Bronze Age.



Interpretative plan of the site

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Appendix A

Charcoal report

Client: Archaeology Plan

Townland: Knockaphunta

Excavation number: 16E445

County: Mayo

Author: Dr. Lorna O'Donnell

Date:17/2/17

Amended 7/5/20

Contents

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1 Introduction

At Knockaphunta, Co. Mayo, excavation uncovered a *fulacht fiadh*. The site consisted primarily of four troughs, troughs, one of which was partially stone-lined. A series of interconnecting pits and channels related to a water management system, while a number of possible hearths, a former hedgerow and an associated heavily disturbed spread of burnt stone and charcoal were also located (Mc Glade 2016). Radiocarbon dating indicates the site was in use during the Middle and Late Bronze Age. Charcoal is frequently found on Irish archaeological sites, in general in greater quantities than plant remains. Its uses in environmental archaeology range from being a suitable material for radiocarbon dating, to an environmental indicator. The aims of the charcoal work from Knockaphunta are as follows:

- To select suitable short lived charcoal for radiocarbon dating
- To reconstruct local prehistoric woodlands in Knockaphunta area
- To examine evidence for context related variation within the samples

2 Sampling strategy

Soil samples were taken on site as bulk soil. These concentrated on areas of charring.

3 Methodology

3.1 Processing

Soil samples were processed by means of flotation.

3.2 Charcoal identification details

Each piece of charcoal was examined and orientated first under low magnification (10x-40x). They were then broken to reveal their transverse, tangential and longitudinal surfaces. Pieces were mounted in plasticine, and examined under a binocular microscope with dark ground light and magnifications generally of 200x and 400x. Each taxon 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 a reference collection supplied by the National Botanical Gardens of Ireland, Glasnevin. It was aimed to identify 50 fragments per sample. If 50 fragments are not present in the sample, then all fragments possible are identified (O'Donnell 2011a).

The general age group of each taxon per sample was recorded, and the growth rates were classified as slow, medium, fast or mixed. Ring curvature of the pieces was also noted – for example weakly curved annual rings suggest the use of trunks or larger branches, while strongly curved annual rings indicate the burning of smaller branches

or trees (Figure 1). Tyloses in vessels in species such as oak can denote the presence of heartwood. These occur when adjacent parenchyma cells penetrate the vessel walls (via the pitting) effectively blocking the vessels (Gale 2003, 37). Insect infestation is usually denoted by round holes, and is considered to be caused by burrowing insects. Their presence normally suggests the use of decayed degraded wood, which may have been gathered from the woodland floor or may have been stockpiled.

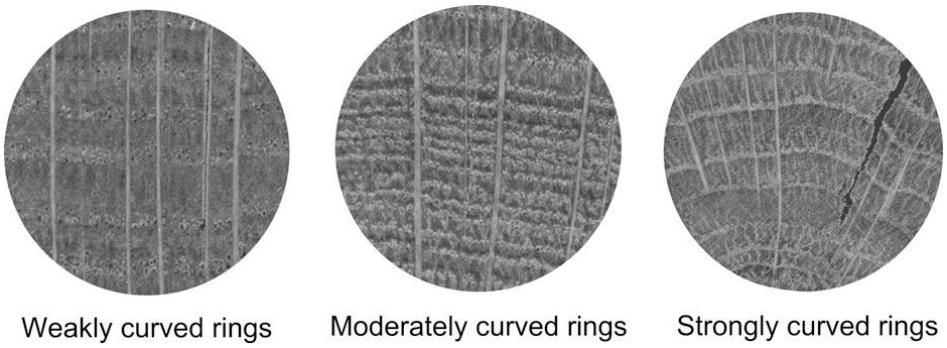

Figure 1 Ring curvature. Weakly curved rings indicate the use of trunks or large branches (Marguerie and Hunot 2007, 1421).

4 Results

4.1 Overall results

Charcoal was fully analysed from four contexts from Knockaphunta. This includes two pit fill contexts; S10, C23, basal fill of C22 and S12, C53, secondary fill of C51. Two trough fill contexts were also examined; S8, C8, fill of trough C7 and S16, C75, fill of trough C73. In addition, a fragment from S14, C71 and S15, C76 were identified for radiocarbon dating purposes only. This report presents the results of the four fully analysed samples. Radiocarbon dates have been received from C8 (1387-1051 cal BC UBA-33373), C71 (1744-1549 BC cal BC UBA-33374) and from C76 (1614-1454 BC UBA-33375), All dates are presented at two sigma. Seven native Irish wood taxa were identified, including alder (*Alnus* sp.), ash (*Fraxinus excelsior*), elm (*Ulmus* sp.), hazel (*Corylus avellana*), holly (*Ilex aquifolium*), oak (*Quercus* sp.) and pomaceous fruitwood (Maloideae). As regards fragment counts, oak, followed by alder, hazel and ash were the most commonly identified (Figure 2; Plate 1). Hazel was identified in the highest number of contexts however (three), while alder, oak and ash were all identified in two samples respectively (Figure 3). Elm, holly and pomaceous fruitwood were identified in relatively low quantities (Figure 2).

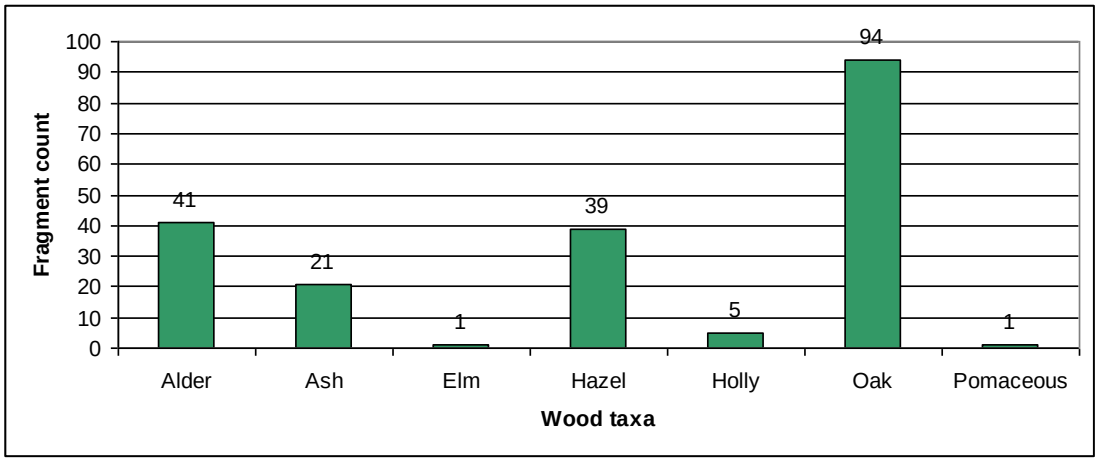

Figure 2 Total charcoal results (fragment counts)

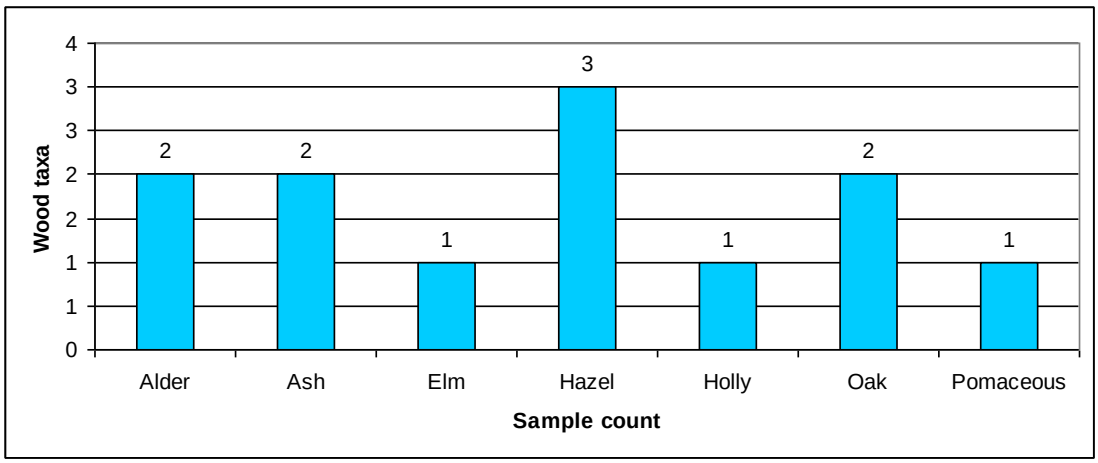

Figure 3 Charcoal results (sample counts)

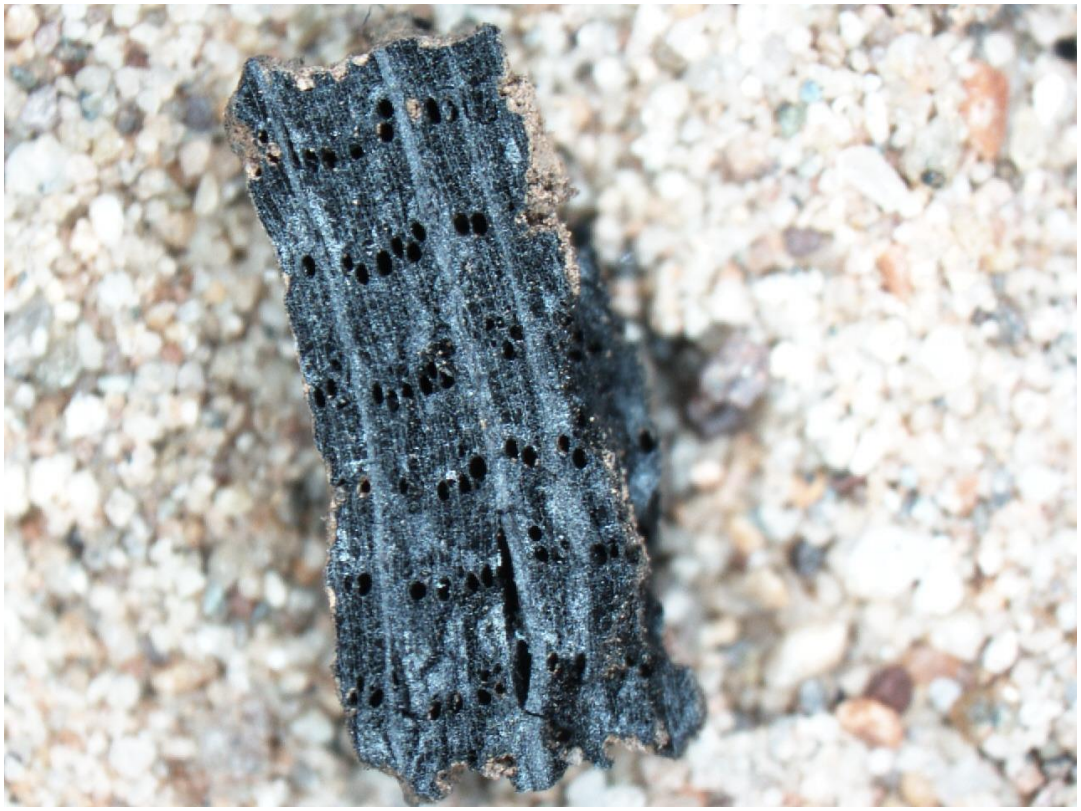

Plate 1 Oak charcoal (x0.8)

4.2 Ring growth and form of the main taxa identified

Alder fragments range in size from 4-22mm, with ring counts from 2-24. The annual rings are primarily strongly curved, with weakly curved rings being noted from C7. Hazel fragments range from 3-15mm and have between 3-15 annual rings remaining. All fragments are strongly curved. The ash pieces are a mixture of weakly and strongly curved annual rings, with counts ranging from 2-20. Size ranges from 4-8mm. The oak fragments are mainly weakly curved, some with tyloses, indicating the burning of heartwood. Size ranges from 2-12mm, while ring counts range from 5-14. The presence of weakly curved annual rings such as in the oak indicates that larger branches or trunk wood was burnt. In contrast, it is likely that smaller branches or twigs of hazel were burnt, as denoted by the strongly curved annual rings. Growth is quite mixed within all the taxa. Fast growth, as noted in the holly from C75 and the hazel from C53 indicates optimum growth conditions. No insect holes or bark were noted in the samples.

4.3 Contextual results

When the charcoal results are examined contextually, some clear differences are evident between the trough and pit fills. Trough fill C8, S8 contains four taxa. It is dominated by hazel and ash, with a small amount of pomaceous fruitwood and alder. Similarly, four wood taxa were identified from trough fill C75, S16. Results are

dominated by alder, followed by hazel and holly. One fragment of elm was identified. In contrast, the two pit fills are dominated by oak. Oak only was identified from C23, S10 while oak is the main component of C53, S12 where low levels of hazel and ash were also noted (Figure 4).

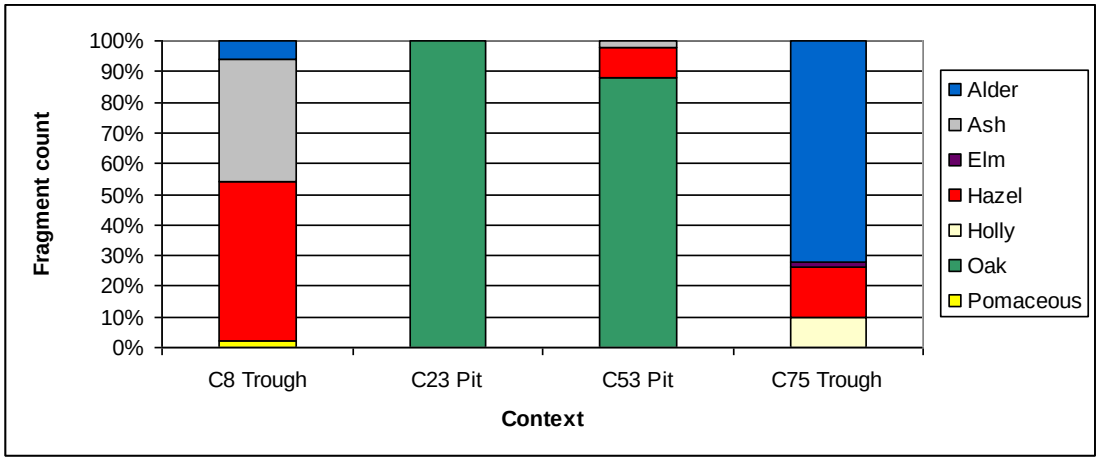

Figure 4 Charcoal results examining contextual variation

4.4 Chronological results

Radiocarbon dating demonstrates that C8 dates to the Middle/Late Bronze Age while C75 dates the Middle Bronze Age. The level of alder is significantly higher in the Middle Bronze Age C75, while ash and hazel are more important in the Middle/Late Bronze Age C8 (Figure 5). Ash in particular is very light dependent (see Section 5.2) and may indicate an opening of the woodland landscape during this time period. The higher levels of alder, a wetland indicator, may suggest that wetter conditions prevailed during the Middle Bronze Age than during the Middle/Later Bronze Age.

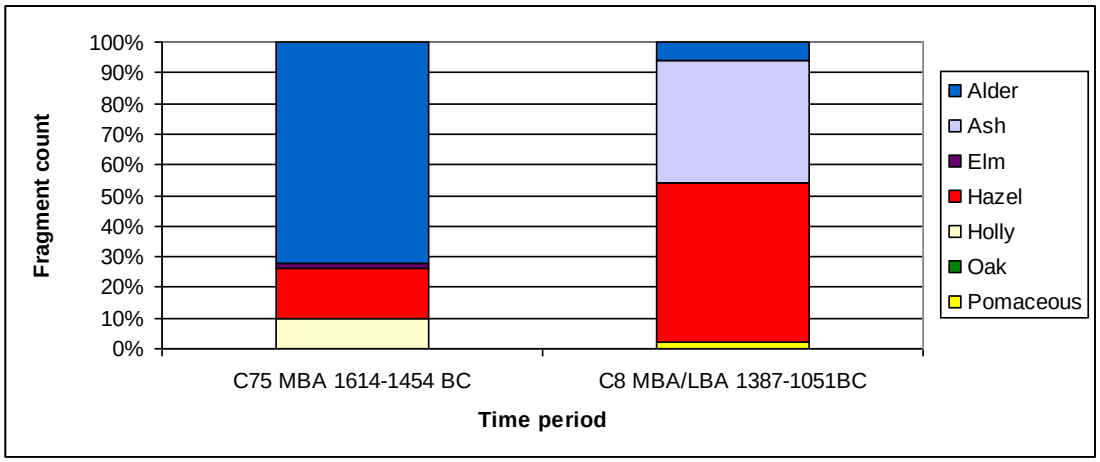

Figure 5 Chronological results

5 Discussion

5.1 Contextual variation

Variation in the charcoal results is very evident within the two pits, C23 and C53. The presence of oak only in C23 may indicate a structural use for that context or a charcoal deposit from a structural use, such as a burnt post or a metal working context. In contrast, the variety of wood taxa identified from the trough fills suggests that wood was gathered randomly to fuel the hearths at the site.

5.2 Nature of local woodlands

It is generally assumed that fuel and wood will be gathered from as close to the site as possible (Shackleton and Prins 1992) and therefore archaeological charcoal can reflect the surrounding environment. There are of course problems with this principle, such as particular trees may have been selected over others and there are issues with charcoal fragmentation. Yet, for the purposes of environmental reconstruction, charcoal can be used to provide a floristic background to archaeological sites, particularly when integrated with other environmental data. It is impossible to know, however, how close to or far away from a site wood was gathered.

Archaeological charcoal is generally derived from two types of context with different implications for their interpretation. Samples from short term events such as structural remains, cremation pyres, metal working contexts are reflective of selection of trees for a particular purpose. Thus for woodland reconstruction, this type of context is biased as it may not be representative of local woodland cover. The ideal type of deposit to use for woodland reconstruction is a long term one which is composed of domestic fuel from the site. This should give the most accurate picture of local woodlands over a long period of time. Charcoal data from the trough fills at Knockaphunta should be very suitable for environmental reconstruction, alder, hazel and ash form the main components of the trough fills. Alder is a wetland tree and is very commonly identified from *fulachta fiadh*, given the wetland nature of their site location. Ireland's native tree is the black or grey alder (*Alnus glutinosa*). It can often be seen growing alongside rivers, lakes, in marshes or in fens. A consistent and abundant supply of moisture is essential for its germination and early growth (Stuijts 2005, 139). Knockaphunta was located towards the base of a drumlin with low-lying and presumably marshy, wet and boggy area immediately to the south (Mc Glade 2016). This is the perfect type of an area to foster alder growth. It is likely that hazel also grew in the Knockaphunta vicinity during the Bronze Age. It will grow on a wide range of soils, including limestone, mildly acid soils and clays (Lipscombe and Stokes 2008, 102). Ash is quite indicative of open local conditions. Most likely this represents Ireland's native ash, *Fraxinus excelsior*. Ash trees prefer moist, well drained and fertile soils. It is very intolerant of shade (Lipscombe and Stokes 2008,

188); its presence in the Knockaphunta samples indicate that closed canopy woodlands did not prevail around the site.

Some other wood taxa that were identified from the trough fills are pomaceous fruitwood, holly and elm. The Maloideae group (pomaceous fruitwood), a sub family of the Rosaceae includes crab apple, wild pear, rowan/whitebeam and hawthorn. Crab apple (*Malus sylvestris*) is a tree of hedges, copses and oak woodland, thriving in fertile and heavy soils. It often grows singly, with large distances between individual trees (Lipscombe and Stokes 200, 78). Wild pear (*Pyrus pyraster*) can grow on woodland edges and also can be found growing in a solitary situation (Lipscombe and Stokes 2008, 114 ; Stuijts 2005, 142). 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). It is a tree of mountains, woodlands and valleys, growing on a wide range of soils, including chalks, acid soils and even peat (Lipscombe and Stokes 2008, 120). 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 Maloideae group. Holly tolerates shade well and often grows in the understorey in woodlands, but also likes open situations (Lipscombe and Stokes 2008, 110). Elm trees will grow well on rich, alluvial soils and do prefer riverine habitats (Gale and Cutler 2000, 264).

Oak was not identified in either of the two *fulacht fiadh* trough samples, yet was present in both pit samples. There are two native Irish oaks, and they cannot be separated by wood anatomy. The two species will grow in quite different habitats. The pedunculate oak (*Quercus robur*) will usually grow on heavy, lowland soils, where it will also tolerate flooding. In contrast, the sessile oak (*Quercus petraea*) will grow on less fertile, acidic soils (Hickie 2002, 60). The impression gained from the charcoal identifications at Knockaphunta indicate a local mixed woodland environment, with larger trees including oak, elm and ash. The presence of pomaceous fruitwood and ash suggests that these woodlands were not closed canopy in nature (Plate 2). Alder charcoal indicates the presence of a nearby river or wet area (Plate 3), which corresponds well with the site description. The use of relatively immature wood (the longest ring counts are 24) may suggest that this woodland was not mature, perhaps secondary scrub generated through previous woodland clearance. The fragmentation process of charcoal, however, must be taken into account when analysing annual rings, the fragments may simply be too small to preserve longer ring counts. The variety of growth patterns (slow to medium and fast) indicates that both optimum and non-optimum conditions for tree growth were present for the different taxa at

Knockaphunta. Different parts of trees were also utilised, for example small hazel rods/branches in contrast to larger oak trunks or branches, with heartwood present.

Plate 1 Oak with hazel and holly understorey

Plate 2 Alder tree

5.3 Comparative material

A large volume of *fulachta fiadh* have been excavated in Ireland over the last twenty years, primarily due to the high levels of large infrastructural developments in the country. Charcoal results from Knockaphunta are dominated by oak, alder, hazel and ash. The variety of wood taxa within the trough fills compares well to many other sites, indicating that fuel was probably randomly gathered for *fulachta fiadh* hearths. The main wood taxa identified are also very comparable to regional trends (for example Brown *et al* 2016; O'Donnell 2007; O'Donnell *et al* 2009; O'Donnell and Mc Keon forthcoming). The N5 Charlestown bypass stretches from Gortanure in east Co. Roscommon to Cloona in Co. Mayo (Gillespie and Kerrigan 2010). Charcoal from this road scheme was analysed from seven burnt mounds, dating from the Neolithic period to the Middle Bronze Age. The most common are alder, hazel, oak and ash, very comparable to Knockaphunta. Charcoal was also analysed from 22 trough fills from 16 *fulachta fiadh* sites. The most common wood taxa are alder, oak, ash and hazel (OCarroll 2010). A recent programme of post excavation work at the Céide fields complex in Mayo has placed a number of sites as dating to the Bronze Age. Of comparable date to Knockaphunta is the Middle Bronze Age settlement site of Belderg Beg, E109. Charcoal from this site is dominated by alder, hazel and oak (O'Donnell 2011b). Pollen data is available from Brackloon wood, in Westport (Little *et al* 2001). This demonstrates the importance of birch, oak, hazel and willow in the Mayo area during the Middle Bronze Age period Episodes of woodland clearance, as evidenced by the level of herbs versus trees fluctuates throughout the Bronze Age (Little *et al* 2001). .

6 Conclusions and recommendations

Charcoal was fully analysed from four samples from Knockaphunta. Short lived material for radiocarbon dating was identified from three contexts. Seven native Irish wood taxa were identified, results are dominated by oak, alder, hazel and ash. Context related variation is evident, charcoal results from the two *fulacht fiadh* trough are varied, while oak dominated two pits. The results compare well to other Bronze Age sites in Mayo and also to regional *fulacht fiadh* charcoal identifications.

It is recommended that the identified charcoal from Knockaphunta be permanently retained by the National Museum of Ireland. This is in accordance with the National Monuments Act 1930 (Section 2) and the National Monuments Act 1994 (Section 9). This allows for future research to be undertaken on the material.

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Table 1 Charcoal details from Knockaphunta

Sample	Fill	Cut	Context type	Identification	Common name	Fragment count	Weight (g)	Ring curvature	Ring count	Size (mm)	Growth	Comment
8	8	7	Fulacht trough	*Alnus*	Alder	3	0.37	Strongly curved	5	4-6	Medium	
8	8	7	Fulacht trough	*Corylus avellana*	Hazel	26	1.17	Strongly curved	5-15	3-8	Medium	
8	8	7	Fulacht trough	*Fraxinus excelsior*	Ash	20	1.05	Weakly curved	3-20	5-8	Mixed	Slow followed by fast in some cases
8	8	7	Fulacht trough	Maloideae	Pomaceous fruitwood	1	0.06	Strongly curved	4	5	Medium	
10	23	22	Basal fill of pit	*Quercus*	Oak	50	8.19	Weakly curved	5-14	2-12	Medium/fast	
12	53	51	Seondary pit fill	*Corylus avellana*	Hazel	5	1.17	Strongly curved	3-5	5-15	Fast	
12	53	51	Seondary pit fill	*Fraxinus excelsior*	Ash	1	0.06	Strongly curved	2	4	Medium	
12	53	51	Seondary pit fill	*Quercus*	Oak	44	2.74	Weakly curved	5-10	5-10	Medium	Strongly curved also. Tyloses present.
14	71			*Alnus*	Alder	1	0.03	Strongly curved	3	4	Medium	Identified for radiocarbon dating only
15	76	73	Basal fill of fulacht trough	*Alnus*	Alder	1	0.13	Strongly curved	2	5	Medium	Identified for radiocarbon dating only
16	75	73	Secondary fill of fulacht trough	*Alnus*	Alder	36	2.98	Weakly curved	8-24	5-22	Slow	

Sample	Fill	Cut	Context type	Identification	Common name	Fragment count	Weight (g)	Ring curvature	Ring count	Size (mm)	Growth	Comment
16	75	73	Secondary fill of fulacht trough	*Corylus avellana*	Hazel	8	0.61	Strongly curved	5-10	5-12	Medium	
16	75	73	Secondary fill of fulacht trough	*Ilex aquifolium*	Holly	5	0.13	Strongly curved	4-20	3-6	Fast	
16	75	73	Secondary fill of fulacht trough	*Ulmus*	Elm	1	0.11	Strongly curved	3	3	Medium	

Appendix B

Knockaphunta, Castlebar, Co. Mayo

The artefacts

Antoine Giacometti 19/06/2017

Clay pipe

4 fragments of clay pipe were identified, but these were too fragmented to provide much information. The two dateable fragments (2:1 & 6:1) are of 19th century date with large bowls almost parallel to the stem.

1:1 bowl fragment, long and straight-sided bowl of c. 19th century type, illegible faded stamp fragment
2:1 plain stem fragment
6:1 stem fragment with rouletted band decoration (milling; encircled dots) with slight error; fragment of bowl attached shows almost vertical bowl.
61:1 plain stem fragment, slightly tapering and probably near mouthpiece

Stone

6 fragments of slate were identified. Slate was frequently used for roofing during the post-medieval period, and two of the fragments (2:89 & possibly 6:18) have perforations which are likely to indicate nail holes. No refits were noted.

2:89 Fragment of dark grey rooflslate with perforation.
2:90 Fragment of greenish-grey slate, thick.
2:91 Fragment of silvery slate
2:92 Small fragment of silvery slate
6:18 Small fragment of dark grey slate. Possible small perforation visible.
19:6 Small fragment of dark grey slate

Pottery

The pottery from the site comprises predominately of fragments of broken refined white tablewares (bowls, cups and plates) dating from the 19th or 20th century. The most complete vessel is a plain white English stoneware 'marmalade'-type jar with rim groove to hold paper seal, refitting fragments of which are distributed in contexts 2, 6 and 19. A second similar jar (2:3) in refined whiteware had a probable commercial stamp (illegible). 1 fragment of English porcelain was also identified. These all date to the same period as the overall assemblage (1800+).

Other than refined whitewares and stonewares, small amounts of glazed earthenware storage jars were noted. These are post-medieval or modern in date (1650+) and difficult to date accurately.

The fragmentary nature of the pottery makes detailed analysis. Distinctly 18th century ceramic wares are absent in the site assemblage, including types such as creamwares which carry on well into the early 19th century, suggesting the assemblage as a whole dates anytime from the mid-19th century onwards.

1:2 1 complete fluted stand, possibly from an ornament or the separate leg of an ornate vessel. Fabric is refined whiteware.
1:3-5 13 fragments of refined white tableware. 2 are transfer-printed, 1 is moulded, 2 have a ring-base. MNV 4, of which 3 are hollow-wares.
2:2 1 fragment of unidentified refined whiteware.

2:3 Refined white stoneware commercial jar base with blue stamped mark (illegible). Possible jam or marmalade jar.
2:4 Glazed red earthenware storage vessel. Crude plain lead internal glaze, possibly Irish.
2:5 Black-glazed earthenware storage vessel with ribbing.
2:6 Base of fine black-glazed earthenware vessel.
2:7 Unglazed eroded earthenware
2:8-13 6 fragments plain white English stoneware 'marmalade'-type jar, non-refitting. Refit with 6:15-16 & 19: 7) MNV 1.
2:14-30 17 frags of refined white tableware. 2 transfer-printed, 1 hand-painted, 1 fluted ring base with a heavy red glaze inside and outside which may be a jar (rather than a tableware). MNV 5, of which 2 are hollow-ware and 1 is plate.
6:15-16 3 fragments from 1 plain white English stoneware 'marmalade'-type jar with rim groove to hold paper seal (1 refits with vessel 19:7)
6:17 1 fragment of white English stoneware, some slat-glazing evident, probably a jam or marmalade jar, different vessel from 6:15.
6:18 1 transfer-printed English porcelain fragment.
6:19-23 5 fragments of refined white tableware. Two have pink and green fruit and flower painted decoration. MNV 2.
19:1-2 2 small fragments of refined white tableware. MNV 1.
19:7 Plain white English stoneware 'marmalade'-type jar with rim groove to hold paper seal. In three pieces (incls. 19:10 & 19:11).
19:8 Black-glazed earthenware hollow vessel base with ribbing on ring base.
19:9 unidentified brown-glazed fabric with groove. Fabric completely burnt or vitrified.
30:1-5 5 fragments of refined white tableware. 2 have banded rims. MNV 3, of which 1 is hollow-wares and 2 are plates.

Glass

The glass predominantly comprises utility bottles. This broad term includes a wide range of functions (lamps, jars, breast bottles, water bottles, tea canisters, preserving bottles, chemical bottles, gardening bottles, sauce, beer, cider, pint and milk bottles, etc., all of which were produced in clear and coloured glass from the 18th century. At Knockaphunta, the bottles can be loosely described as a 'wine' bottle (2:31-43, 6:8-9 & 19:4), a 'beer' bottle (2:44 & 1:1b), two 'mineral water' bottles (2:52-88, 19:3) and a 'pharmaceutical' bottle (2:51). One of the 'mineral water'-type utility bottles has vertical side seams and embossed text indicating a hinged mould, and its blob-top lip (developed to seal the carbonated water, soda or beer within) was subsequently applied to the perforated bottle neck. These factors indicates a post c. 1820 date for manufacture.

Smaller fragments of table glass include a stemmed dessert glass (6:10) and two jars or jugs (1:6c & 2:50). A small amount of window glass is also present, most of it from a single 20th century pane (2:47-48 & 6:8-9).

The overall assemblage dates to the 19th and 20th centuries, and contains no obviously pre-19th century fragments judging from bottle and vessel forms and fabric.

1:6 fragment of pale blue opaque glass; fragment of brown bottle glass (beer?), fragment of clear vessel glass with thick rim (not a drinking vessel or bottle – may be a jar or jug).
2:31-43 13 fragments of olive-green wine bottle glass, refits not checked but probably 1 vessel same as 6:1-7
2:44 1 fragment of brown bottle glass (beer?)
2:45-46 2 fragments of two different windows, clear glass
2:47-48 2 fragments of the same window-glass with striations on one face. Same as 6:8-9.
2:49 1 fragment dark blue opaque glass
2:50 1 fragment of clear vessel glass with thick rim (not a drinking vessel or bottle – may be a jar or jug). Not same as 1:6
2:51 1 base of small oval clear glass utility or medical bottle.
2:52-88 37 fragments of semi-complete clear glass utility bottle (sauce, mineral water, etc) with oval profile, embossed 'R' on base and illegible embossed mark on body, mould-poured, blob-top lip.
6:1-7 7 fragments of olive-green wine bottle glass, no refits but probably 1 vessel.
6:8-9 2 fragments of the same window-glass with striations on one face
6:10-14 5 fragments of clear glass vessels, 1 of which is a stemmed dessert glass. MNV 3.

19: 3	1 utility bottle glass, probably a mineral water bottle, 'N' engraved in side.
19:4	olive-green wine bottle glass

Slag

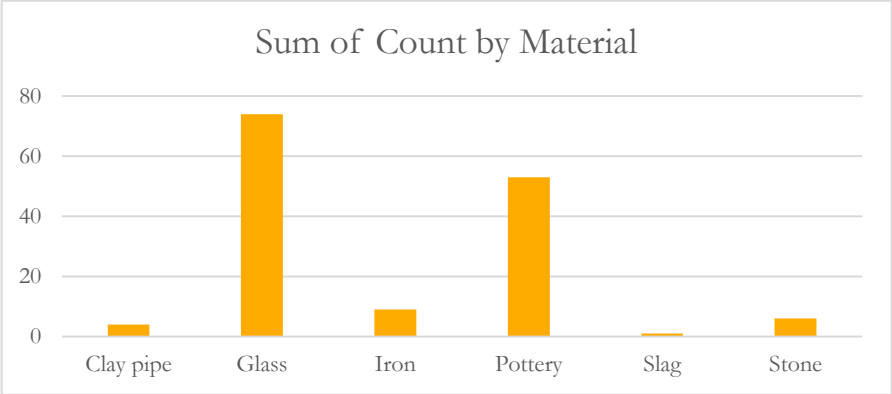
19:5	tiny fragment of vitrified industrial residue

Iron

2:93	iron fragment (nail?)
6:24-31	1 horseshoe, 2 large nails, 2 large nail fragments, 1 fragment of possible farm machinery, 1 fragment of curved metal (vessel?), and 1 unidentified fragment.

Discussion of finds

The overall finds assemblage is dominated by glass (50%) and pottery (36%), followed by smaller amounts of iron (9%), slate (6%), clay pipe (4%) and slag (1%). The high proportion of glass is due to the way it shatters, and a comparison of material type by individual object (MNV count) would significantly reduce the proportion of glass within the assemblage. Nevertheless, these artefact proportions are comparable to the proportional weight of the materials, and the proportion of glass is higher than the typical post-medieval assemblage.

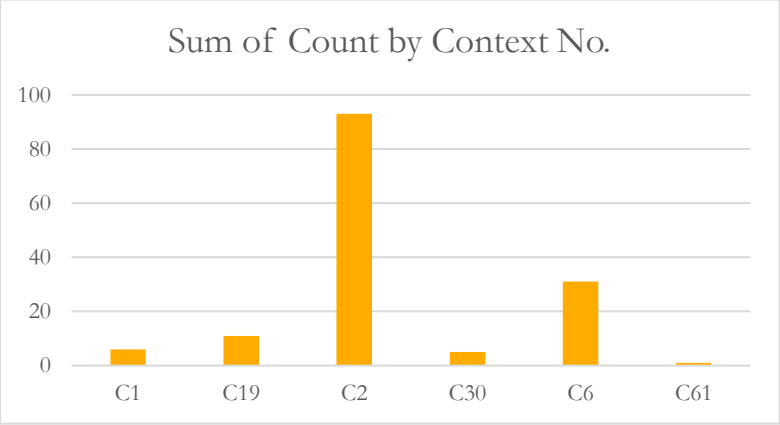


All artefacts from the site derived from six contexts. More than half derived from C2 (63%), and a large proportion (21%) also came from C6. The remaining artefacts came from C19 (7%), C1 (4%), C30 (5%) and C61 (1%).

List of Contexts (after McGlade 2016)	
C1	Topsoil
C2	Disturbed burnt spread
C6	Fill of field drain (C5)
C19	Fill of field boundary (C85)
C30	Buried topsoil (with red brick)
C61	Agricultural gully (with red brick and post-medieval pottery)

The proportion of materials within each context was broadly equivalent to the overall proportional breakdown of the assemblage, as discussed above.

There is no distinction between individual contexts in terms of artefacts. In a number of cases refits were identified between contexts. This was most obvious with the plain white English stoneware 'marmalade'-type jar, refitting fragments of which are distributed in contexts 2, 6 and 19. It was also the case with the modern window in contexts 2 and 6, which while not refitting, both belong to the same very distinctive pane.



In terms of date, the assemblage as a whole can be dated to the 1820s or later, certainly extending into the 20th century. This is based on the absence of late 18th glass and ceramic types which remained in use into the early 19th century, and the presence of 20th century glass fragments.

The assemblage could represent material that has gradually accumulated from c. 1820 to the 20th century or be a mixture of material which has been discarded at various dates from 1820 onwards. However, it is just as likely that it represents a single dumping episode from a relatively short space of time, probably in the early 20th century.

The assemblage itself is rubbish, comprising broken and discarded tablewares, utility/commercial vessels, clay pipe and small broken architectural fittings. This is typical 19th or 20th century household waste.

Conclusions

McGlade (2016, 2) writes that the prehistoric remains were 'heavily disturbed during the 19th and 20th centuries, with early modern ceramics and glass apparent throughout. The field boundary to the south was depicted on the 1830s Ordnance Survey map, and later agricultural and drainage features were identified during the excavation and testing programmes. There is anecdotal evidence that the site was used as a dump during the 20th century, with waste material from St. Mary's Hospital being dumped on the site and subsequently used in local road surface works (Andy Neary pers. comm. 2016). Towards the end of the 20th century the site was part of a pitch and putt course.'

This description correlates with the artefact analysis.

Appendix C Radiocarbon dates

UBANo	Sample ID	Material Type	^{14}C Age	±	F14C	±
UBA-33373	16E445:8 SS#8	Hazel	2984	49	0.6897	0.0042
UBA-33374	16E445:71 SS#14	Alder	3364	31	0.6579	0.0025
UBA-33375	16E445:76 SS#15	Alder	3257	29	0.6667	0.0024

Information about radiocarbon calibration

RADIOCARBON CALIBRATION PROGRAM*
CALIB REV7.0.0
Copyright 1986-2013 M Stuiver and PJ Reimer
*To be used in conjunction with:
Stuiver, M., and Reimer, P.J., 1993, Radiocarbon, 35, 215-230.
Annotated results (text) - -
Export file - c14res.csv

16E445:8 S
UBA-33373
Radiocarbon Age BP 2984 +/- 49
Calibration data set: intcal13.14c # Reimer et al. 2013

% area enclosed	cal AD age ranges	relative area under probability distribution
68.3 (1 sigma)	cal BC 1277- 1125	1.000
95.4 (2 sigma)	cal BC 1387- 1339	0.080
	1317- 1051	0.920

16E445:71
UBA-33374
Radiocarbon Age BP 3364 +/- 31
Calibration data set: intcal13.14c # Reimer et al. 2013

% area enclosed	cal AD age ranges	relative area under probability distribution
68.3 (1 sigma)	cal BC 1689- 1623	1.000
95.4 (2 sigma)	cal BC 1744- 1707	0.135
	1704- 1607	0.823
	1582- 1559	0.039
	1552- 1549	0.002

16E445:76
UBA-33375
Radiocarbon Age BP 3257 +/- 29
Calibration data set: intcal13.14c # Reimer et al. 2013

% area enclosed	cal AD age ranges	relative area under probability distribution
68.3 (1 sigma)	cal BC 1607- 1583	0.276
	1559- 1552	0.064
	1547- 1499	0.660
95.4 (2 sigma)	cal BC 1614- 1493	0.909
	1481- 1454	0.091

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42 Fitzwilliam Street
Belfast BT9 6AX
Northern Ireland

Radiocarbon Date Certificate

Laboratory Identification:	UBA-33373
Date of Measurement:	2016-12-15
Site:	Knockaphunta, Castlebar, Co. Mayo; 16E445
Sample ID:	16E445:8 SS#8
Material Dated:	charcoal
Pretreatment:	AAA
Submitted by:	Steven McGlade

Conventional ^{14}C Age:	2984±49 BP
Fraction corrected	using AMS $\delta^{13}C$

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Belfast BT9 6AX
Northern Ireland

Radiocarbon Date Certificate

Laboratory Identification:	UBA-33374
Date of Measurement:	2016-12-12
Site:	Knockaphunta, Castlebar, Co. Mayo; 16E445
Sample ID:	16E445:71 SS#14
Material Dated:	charcoal
Pretreatment:	AAA
Submitted by:	Steven McGlade

Conventional ^{14}C Age:	3364±31 BP
Fraction corrected	using AMS δ^{13}C

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Radiocarbon Date Certificate

Laboratory Identification:	UBA-33375
Date of Measurement:	2016-12-15
Site:	Knockaphunta, Castlebar, Co. Mayo; 16E445
Sample ID:	16E445:76 SS#15
Material Dated:	charcoal
Pretreatment:	AAA
Submitted by:	Steven McGlade

Conventional ^{14}C Age:	3257±29 BP
Fraction corrected	using AMS δ^{13}C

Preliminary Excavation Report, Knockaphunta, Castlebar, Co. Mayo

McGLADE 19/10/2016 LICENCE 16E445 PLANNING MAYO P14/691

archaeology plan
HERITAGE SOLUTIONS

SITE NAME

Knockaphunta, Humbert Way, Castlebar, Co. Mayo.

CLIENT

Cynthia Clampett (CEO), Mayo Roscommon Hospice Foundation, Knock, Co. Mayo

PLANNING

Mayo County Council P14/691

LICENCE

Excavation Licence No. 16E445

REPORT AUTHOR

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DATE

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ABBREVIATIONS USED

DoAHRRGA	Department of Arts, Heritage, Regional, Rural and Gealtacht Affairs
NMI	National Museum of Ireland
NMS	National Monuments Service
OS	Ordnance Survey
RMP	Record of Monuments and Places
NIAH	National Inventory of Architectural Heritage
LAP	Local Area Plan

Acknowledgements

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Steven McGlade, 14th October 2016

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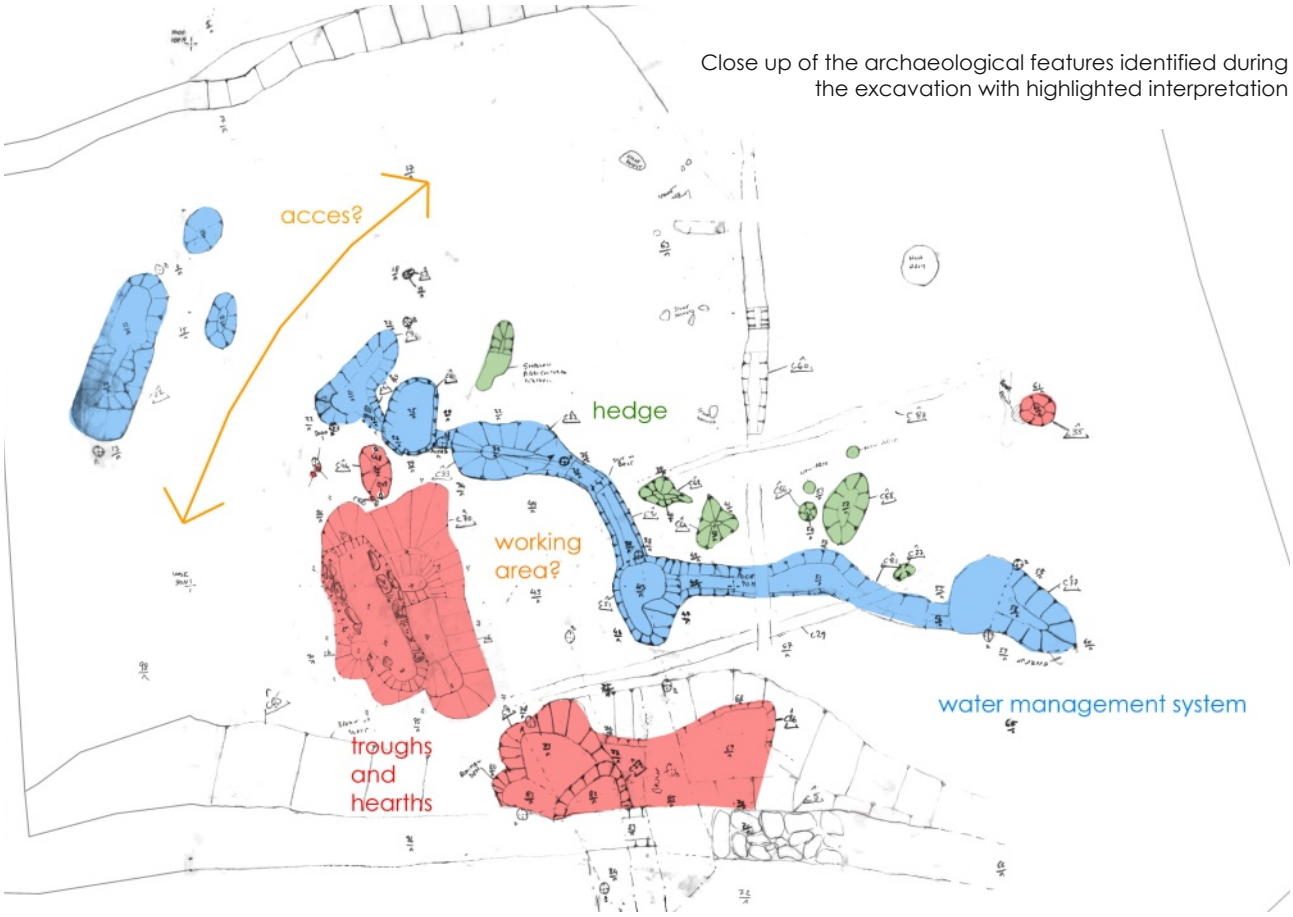
Section 1 Introduction

Report summary

This report presents to results of an excavation of a prehistoric fulacht fiadh at Knockaphunta, Castlebar, Co. Mayo. These sites are generally located in or around wetland locations or streams and consist of a trough or troughs, a mound of fire-cracked stones and charcoal – the waste product of the process – and a hearth (Waddell 1998, 174). The trough or troughs cut were cut into the earth and occasionally lined, and would have been filled with water. Heated stones would have been placed into the troughs heat the water, which could then be used for various purposes. They have a number of proposed uses, such as in cooking, textile processing and production, tanning, bathing and possibly even saunas. A spread or mound of fire-cracked stone and charcoal, the waste material from heating and cooling of the stones, is usually found surrounding the trough and is usually the first indicator for the presence of a fulacht fiadh. Occasionally hearths or fire-pits and structures are also identified at fulacht fiadh sites.

The site uncovered at Knockaphunta consisted of four troughs, one of which was partially stone-lined, a series of interconnecting pits and channels relating to a water management system, a number of possible hearths, a former hedgerow and an associated heavily disturbed spread of burnt stone and charcoal. The site was situated on the southern slope of a low



Close up of the archaeological features identified during the excavation with highlighted interpretation

drumlin. A low-lying area to the south, occupied by a wide backfilled field boundary ditch, was originally a marshy or boggy tract of land between the low drumlin in the north of the development site on which the fulacht fiadh was located, and a second to the southwest. Excavation showed that there were multiple phases of use of the site.

The burnt spread was heavily disturbed during the 19th and 20th centuries, with early modern ceramics and glass apparent throughout. The field boundary to the south was depicted on the 1830s Ordnance Survey map, and later agricultural and drainage features were identified during the excavation and testing programmes. There is anecdotal evidence that the site was used as a dump during the 20th century, with waste material from St. Mary's Hospital being dumped on the site and subsequently used in local road surface works (Andy Neary pers. comm. 2016). Towards the end of the 20th century the site was part of a pitch and putt course.

Site location

The excavation site was situated in a small (1.75ha) field situated southwest of Castlebar, Co. Mayo, in the townland of Knockaphunta (NGR 513837/789214). It is situated on the western side of Humbert Way, off the Westport Road.

Development and Planning

The owner of the land intends to develop it into a new Hospice Facility for the charity of the Mayo Roscommon Hospice Foundation. This will involve construction of a Palliative Care Centre building primarily of single story height, with some parts two-storeys high. Landscaped gardens, parking spaces (70), services areas and other associated works are also included.

Condition 1 of the Request for Further Information (Mayo CC P14/691) required an archaeological assessment, including a site visit and desktop study as well as possible survey, testing or monitoring. Based on the desktop assessment, and as discussed with the local authority archaeologist Gerry Walsh in Mayo County Council, a programme of archaeological testing was carried out on the site by Antoine Giacometti in May 2015.

The development was subsequently granted planning permission in September 2015. The Grant of Planning Permission has four conditions relating to archaeology (Conditions 6-9).

Location of the proposed development site with the excavation boundary highlighted in blue (top)

Plan of the proposed development site with the location of the excavation overlayed in green (bottom)

Condition 6 states that 'the thick deposit of black soil containing a high quantity of stone, some of it burnt, and charcoal' may be the remains of a fulacht fiadh, ancient cooking site. This potential archaeological site must be archaeologically resolved under licence from the National Monuments Section, Department of Arts, Heritage and the Gaeltacht.

Condition 7 requires that the developer employ a suitably qualified archaeologist to monitor all ground disturbance associated with the proposed development. The monitoring should be undertaken in agreement with the National Monuments Section of the Department of Arts, Heritage and the Gaeltacht.

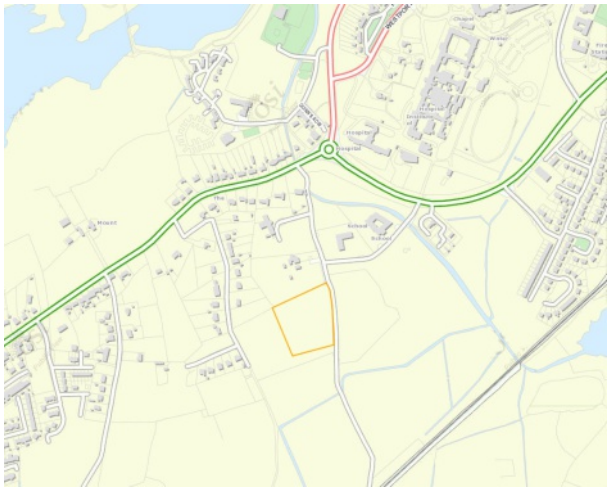
Condition 8 states that should archaeological material be uncovered during the course of monitoring, the archaeologist shall have work on the site stopped, pending a decision as to how best to deal with the archaeology. The developer shall be prepared to be advised by the National Monuments Section of the Department of Arts, Heritage and the Gaeltacht with regards to any necessary mitigating action (e.g. preservation in situ, or excavation) and should facilitate the archaeologist in recording any material found.

Condition 9 requires that Mayo County Council, the National Monuments Section of the Department of Arts, Heritage and the Gaeltacht and the National Museum of Ireland be furnished with a report describing the results of the monitoring.

Previous investigations on the site

A desktop assessment of the archaeological, architectural, historical and cartographic background of the site was carried out and included in previous reports (Giacometti 2015, McGlade 2015, McGlade 2016).

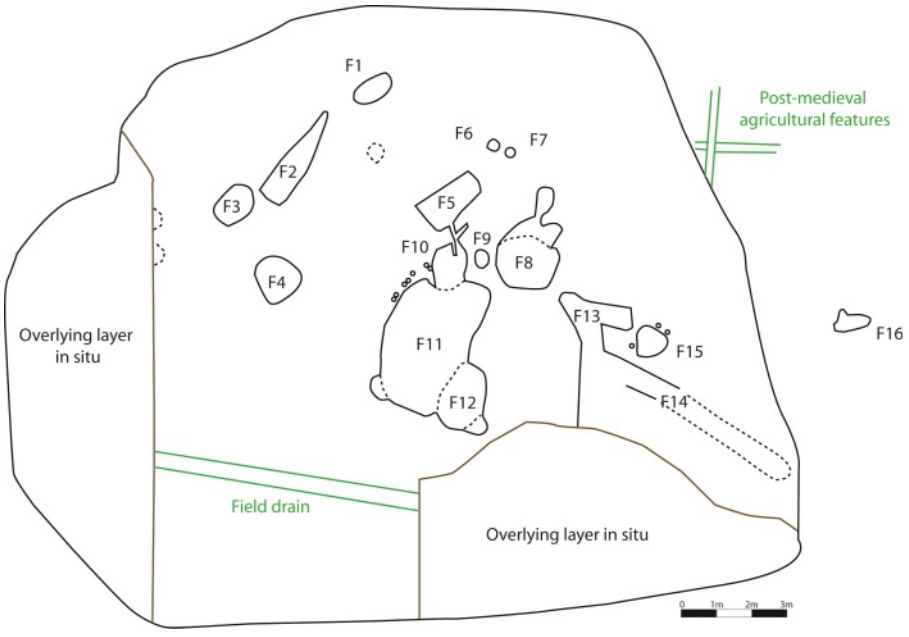
A table of the features idenitifed during the monitoring phase of the works is given on the following page.



Location of proposed development (orange) to the south of Castlebar town (top)

Aerial view of Castlebar showing the location of the proposed development (bottom)

Feature No.	Description	Context No.
Feature 1	Sub-oval pit with burnt stone and charcoal fill.	C20
Feature 2	Teardrop-shaped pit with burnt stone and charcoal fill	C22
Feature 3	Irregularly shaped feature with burnt stone and charcoal fill. Half-sectioned and was found to have an irregular base with a sharp break of slope at the top and irregular sides. Probably a stone socket from where one of the large boulders in the area was removed. It measured 0.9m x 0.7m and was 0.15m in depth. This was investigated during the excavation and was interpreted as non-archaeological.	n/a
Feature 4	Shallow irregular depression with burnt stone and charcoal fill. This measured 1.2m x 0.9m and was 0.1m in depth and appeared to be a natural hollow filled with burnt spread material from above. This was investigated during the excavation and found to be non-archaeological.	n/a
Feature 5	Sub-rectangular pit with burnt stone and charcoal fill	C9
Feature 6	Possible posthole measuring 0.3m in diameter with burnt stone and charcoal fill	C3
Feature 7	Possible posthole measuring 0.23m in diameter also with burnt stone and charcoal fill. This was investigated during the excavation and found to be non-archaeological.	n/a
Feature 8	Irregularly shaped spread of burnt stone and charcoal	C33
Feature 9	Possible small pit or posthole with burnt stone and charcoal fill.	C41
Feature 10	Slightly irregular to sub-circular pit	C46
Feature 11	Large irregular shaped spread to the south, possible trough location	C70 and C73
Feature 12	Sub-oval spread to the south	Part of C70
Feature 13	Linear feature running north-south	C31
Feature 14	Linear feature running northwest-southeast	C81
Feature 15	Sub-circular pit	C64
Feature 16	Oval pit with a spur running to the north giving it a slightly irregular shape	C35
Feature 17	An east-west running drain containing frequent large stones and boulders	C5



Plan of features identified during the monitoring programme

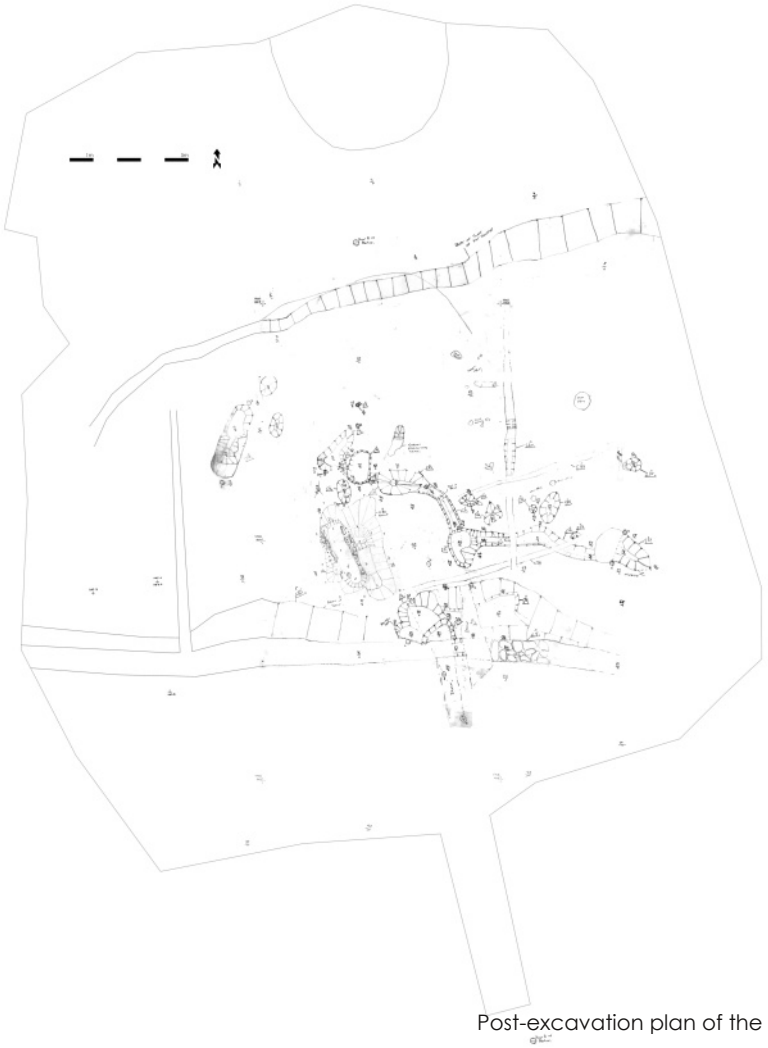
Section 2 The excavation

The key finding of the excavation was a prehistoric settlement located on the slopes of the northernmost drumlin. Evidence for this settlement was identified in the form of a water management system and associated fulacht fiadh troughs. The water management system consisted of a series of pits and interconnecting channels that controlled the flow of water, probably a former stream course, from the top of the drumlin to the north and diverting it to the southeast around the fulacht troughs

The archaeological features were concentrated in the central part of the site on a shallow slope down towards the former field boundary. This suggests that the field boundary was located along a longstanding former stream course or marshy area between the two drumlins that occupy the northern and southwestern portions of the site.

Methodology

The archaeological excavation of the site was carried out over two weeks from the 12th-23rd September 2016 under Archaeological Licence No. 16E445. The site was located on the south-facing slope of a small drumlin with the northern end of the site being relatively flat and the remainder of the site sloping off to the south. A second small drumlin was located beyond the limit of excavation in the southern corner of the proposed development site with a strip of low-lying wet ground running between the two drumlins. The site measured 34.2m in length and 25m-30.5m in width east-west, widening to the south. An additional trench 8m in length and 2m in width was excavated across the low-lying area to the south of the site to investigate the field boundary depicted in this location on the First Edition Ordnance Survey map in the 1830s.

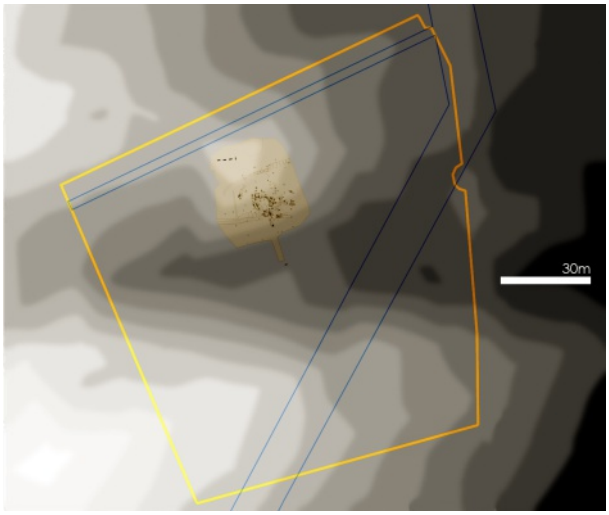


Post-excavation plan of the site

The disturbed burnt spread (C2) had been identified during the initial testing programme (Giacometti 2015). This identified a substantial spread of fire-cracked stone and charcoal in a black sandy silt matrix with frequent inclusions of modern ceramics, glass and iron throughout. No archaeological features were identified in the remainder of the site during the initial testing programme. Features relating to 19th century drainage, 19th and 20th century disturbance, and the use of the site as a pitch and putt course in the late 20th century were uncovered. A second testing programme (McGlade 2015) was carried out to further investigate the scale and extent of the disturbed burnt spread in the northern end of the development site. A programme of archaeological monitoring was carried out in the vicinity of the disturbed burnt spread, with a buffer zone of 5m around the edges of the burnt spread given. This involved the careful monitored reduction of the disturbed burnt spread. During the course of the works a number of potential archaeological features were identified beneath the disturbed burnt spread. It was decided that these would require further archaeological investigation in the form of archaeological excavation.

The excavation involved further investigation of the remaining portions of the disturbed burnt spread (C2), which was reduced by hand in a number of areas of the site. The sixteen features identified during the monitoring programme were planned, photographed and recorded. It some cases it was confirmed that these features were shallow pockets relating to the overlying burnt spread material collecting in undulations in the underlying natural, however thirteen were found to be archaeological in nature.

Additional features were found beneath the spread, however all features were located to the north of the field boundary ditch depicted on the 1830s OS map.

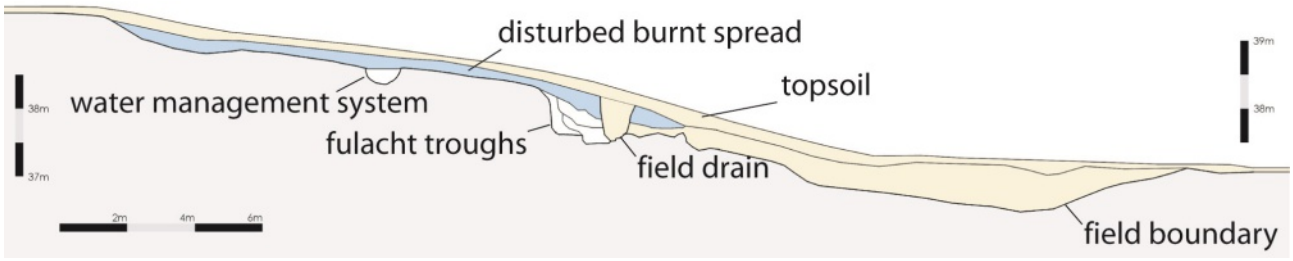


Contour map of the proposed development site showing the site of the excavation on the southern slope of the drumlin to the north just above the low-lying area between the two drumlins (top)

Plan of the site showing the extent of the disturbed burnt spread and the sections of the spread reduced by hand during the excavation (bottom)

Stratigraphy

The site initially had a shallow layer of topsoil overlying it, this varied in depth across the site, with the disturbed burnt spread occasionally be-



West-facing profile of the site showing the slope of the ground level from the north (left) to south (right), width the field boundary occupying the low ground to the south. The disturbed burnt spread can also be seen to overlie the fill of the field boundary. 2:1 height exaggeration

Context	Type	L. (m)	W. (m)	D. (m)
C1	Topsoil	34.2m	25-30.5m	0.05-0.2m
C2	Spread	22.8m	17.7m	0.17-0.4m
C19	Fill	30.5m min	12m	0.31m
C30	Spread	5m min.	3m min.	0.15-0.34m
C85	Cut	30.5m min	12m	0.31m

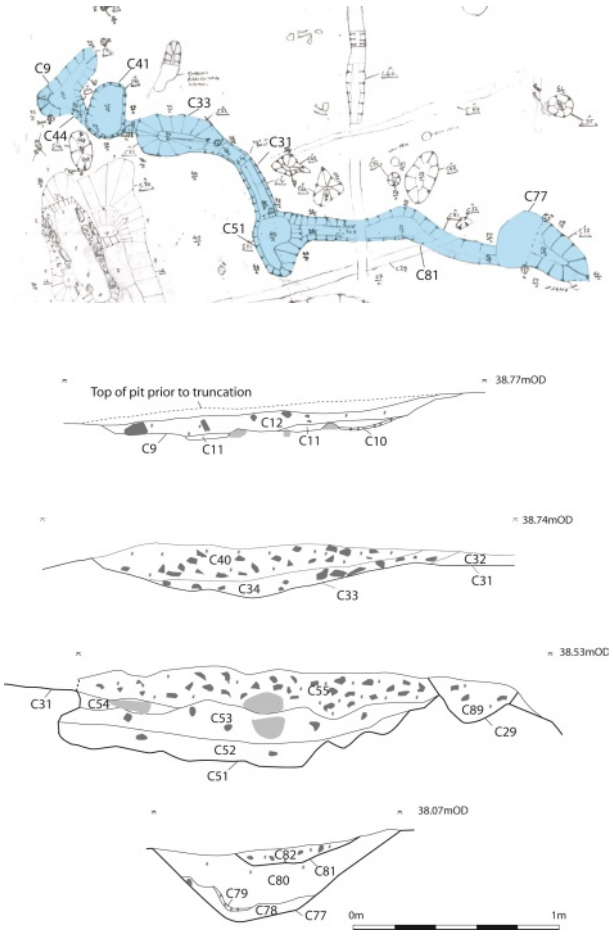
ing present immediately beneath the sod. Topsoil varied from a blackish-brown organic peaty soil 200mm in thickness in the north of the site to a mid-brown less organic soil 200m in thickness in the south of the site. Fragments of pearlware, spongeware and creamware in the topsoil date to the c. 19th century. Some animal bone was also identified. No earlier material or archaeological artefacts were noted in the topsoil. The topsoil had been removed from the site during the monitoring phase of the works in July 2016.

The underlying disturbed burnt spread (C2) consisted of dark brown to black sandy silt with frequent inclusions of burnt stone and charcoal and moderate inclusions of early modern ceramics, glass and metal throughout. This appeared to be the heavily disturbed remains of a ploughed out burnt mound associated with prehistoric fulacht fiadh activity. The site was truncated during landscaping for the pitch and putt course in recent years, and prior to that had been used as a dumping ground for waste material from the furnaces of St. Mary's Hospital.

Location of the excavation (in blue) and development site (orange) on the First Edition Ordnance Survey map (top left)), Third Edition OS map c. 1910s (centre left) and revised Third Edition OS map c. 1950s (bottom left). Limekilns in the vicinity marked on the maps are circled in green

The site may also have been used as a dumping ground for waste material from the nearby limekilns, of which several are depicted cartographically in close proximity from the end of the 19th century. There is some uncorroborated suggestion that the burnt material from the furnaces was reused for road surfacing in the last century. If this is the case it is likely that the underlying burnt mound material was also disturbed at that time.

The spread was archaeologically confirmed to be ex-situ and to overlie the fill (C19) of the former field boundary (C85) to the south. This field boundary is depicted on the First Edition Ordnance Survey map in the 1830s and is still depicted in the Third Edition OS map in the 1910s. It was backfilled by the 1950s revision of the Third Edition OS map. To the west the burnt spread was found to overlie a buried topsoil (C30) to the north and the fill (C19) of the former field boundary (C85) to the south. This suggests that the burnt spread material was intensively impacted upon in the early 20th century, dispersed over the surrounding area. It is unknown whether prior to this the spread was in a more discrete area or mounded up. It was not possible during the excavation to pinpoint where the burnt mound or mounds relating to the waste material from the use of the fulacht fiadh would have been, though there is some suggestion that a late example lay to the south within the large shallow pit (C86). Elsewhere, the upper fill of many of the features consisted of dispersed burnt spread material indicating it had been spread over a considerable area in the past.



Close-up plan of the features along the water management system (top)

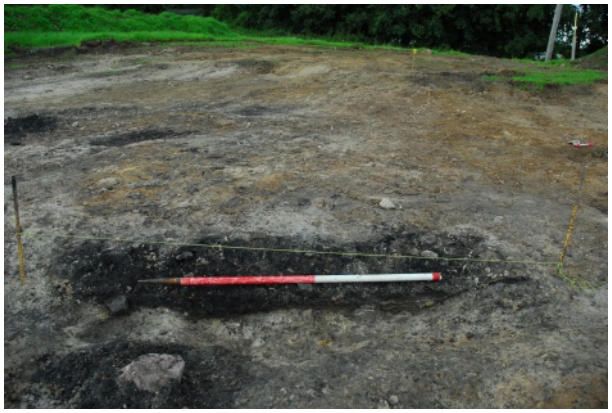
Sections of pits along the water management system:
Southeast-facing section of pit C9 (upper)
South-facing section of pit C33 (2nd from top)
West-facing section of pit C51 (2nd from bottom)
Southeast-facing section of pit C77 (bottom)

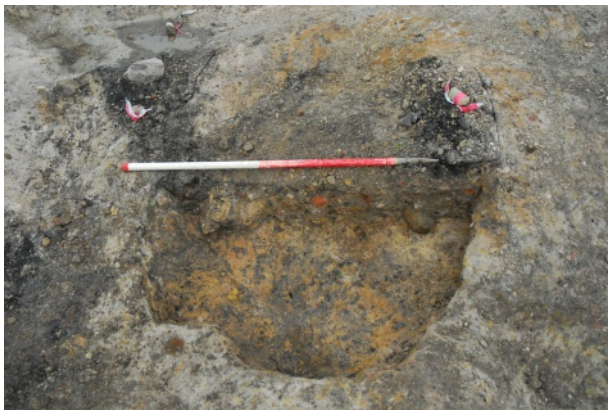
The spread overlay two variations of natural subsoil; a white and yellow sand to the north, and a yellow boulder clay with large grey degrading sandstone boulders apparent to the south. The boulders protrude up through the spread in the southern portion of the site.

The water management system

A series of pits (C9, C41, C33, C51 and C77) were excavated running from northwest to southeast across the site. These appear to have been managing a source of water, likely to have been an existing stream, running from the top of the drumlin to the north and controlling the flow and directing the water to the southeast away from the fulacht troughs. The pits were connected by a number of channels (C44, C31 and C81), which - although shallow during excavation - are likely to have been more substantial prior to the truncation of the site in the 19th and 20th century. The features were largely cut into the yellow and white natural sand subsoil in the central portion of the site. The unstable nature of this material combined with the flow of water through the pits and channels meant that there was evidence for col-

Context	Type	L. (m)	W. (m)	D. (m)
C9	Cut	1.85m	0.83m	0.17m
C10	Fill	0.53m	0.39m	0.02m
C11	Fill	1.09m	0.68m	0.05m
C12	Fill	1.85m	0.83m	0.08 0.01m
C31	Cut	2.55m	0.46-0.58m	0.04-0.11m
C32	Fill	2.55m	0.46-0.58m	0.04-0.11m
C33	Cut	1.55m	0.95m	0.25m
C34	Fill	1.45m	0.9m	0.09m
C40	Fill	1.55m	0.95m	0.13-0.19m
C41	Cut	1.46m	1.05m	0.27m
C42	Fill	1.00m	0.26m	0.07m
C43	Fill	1.46m	1.05m	0.21m
C44	Cut	0.80m	0.25-0.50m	0.04-0.12m
C45	Fill	0.80m	0.25-0.50m	0.04-0.12m
C51	Cut	1.55m	1m	0.48m
C52	Fill	1.2m	0.85m	0.11m
C53	Fill	1.55m	0.85m	0.19m
C54	Fill	0.5m	0.48m	0.08m
C55	Fill	1.75m	1m	0.22m
C77	Cut	2.50m	1.30-0.80m	0.38m
C78	Fill	2.2m	0.51m	0.07m
C79	Fill	1m	0.14m	0.03m
C80	Fill	2.5m	1.3m	0.2m
C81	Cut	6m	0.60-0.70m	0.07m
C82	Fill	6m	0.60-0.70m	0.07m
C94	Cut	0.3m	0.3m	0.14m
C95	Fill	0.3m	0.3m	0.14m





Mid-ex photo of pit C9, looking northwest (top left)

Mid-ex photo of pit C41 and channel C44 to left, looking north (centre left)

Post-ex photo of pits C41 and C33, looking east (bottom left)

lapse and undercutting of edges, mixing of fill material with natural sand eroded from the base and sides of the features and infiltration of charcoal in to the sandy natural below. There was also evidence for alterations/maintenance to the system, and at least one of the pits (C41) was (intentionally) backfilled prior to the system going out of use.

The most northerly pit (C9) was a sub-rectangular pit with concave sides and a slightly uneven base. It was orientated northeast-southwest and appears to have been the first of the series of pits along the water management system. Three fills were identified within the pit. The basal fill (C10) was a thin layer of black silt with frequent charcoal located in the slightly deeper north-eastern end of the pit, likely to relate to the period when the pit was in use. This was overlaid by a mottled redeposited natural-type material (C11) which contained occasional burnt stone and charcoal, relating to the period after the pit went out of use and before the burnt spread was dispersed over the entire area. The upper fill (C12) was the main fill of the pit and indicates that the majority of the pit had yet to fill in by the time the burnt spread was dispersed over the area and into the pit.

It was connected to the second pit (C41) along the water management system by a funnel-shaped channel (C44). This was orientated northwest-southeast and was wider to the northwest and sloped slightly to the southeast,

funnelling water in that direction. Two stones set into the base of the channel near the north-western end may have aided the control of the flow of the water through the channel. The channel had a step in its base as it entered the pit (C41) to the southeast, dropping 0.12m, again possibly related to the control of water through the system. At this point the channel was seen to truncate the lower fill (C43) of the pit, indicating that it related to a later phase of use of the pit, however this version of the channel may have replaced an earlier version without a step in the base. The fill (C45) of the channel was similar to the upper fills (C12 and C42) of the two pits (C9 and C41), however contained a higher silt content with no sand present. This suggests the feature may have silted up naturally as water carried burnt spread-type material through the water system.

The second pit (F41) of the water management system was sub-rectangular in shape with near vertical sides and a flat base, and orientated north-south. This pit was the most obviously managed pit along the water management system. Its location immediately to the north of two of the fulacht troughs (C70 and C73) is interesting, leading to the suggestion that this may be the pit that was used to collect water for the troughs, like a cistern. The eastern side of the pit was partially undercut through water erosion, caused by this side being opposite the incoming water through the western channel (C44). The pit had two fills (C42 and C43). The basal fill (C43) was a very compact redeposited natural material with inclusions of occasional burnt stone and charcoal that appeared to be an intentional backfilling of the pit. It was cut by the deeper section of the channel (C44) to the west indicating the pit had been partially backfilled prior to the water management system going out of use. This may suggest that the initial purpose of the pit had altered, possibly as water was no longer needed at this location. The upper fill (C42) of the pit was consistent with the upper fill of the other pits along the water management system, and relates to the burnt spread being dispersed over the area. This indicates that a shallower version of the pit survived after the initial pit had been partially backfilled. Presumably this was to maintain the water management system.

Mid-ex photo of pit C33, looking north (top right)

Mid-ex photo of channel C31 with step in base visible in centre, looking south (centre right)

Mid-ex photo of pit C33 with channel C31 curving towards pit C51 to right, looking east (bottom right)

To the south of the eastern side of the second pit (C41) a short channel (C94) orientated east-west diverted the water into the third pit (C33) of the water management system. The fill (C95)

of the channel was similar to basal fill (C34) of the pit (C33) to the east, suggesting they silted up at the same as one another and prior to the overlaying of the area with the dispersed burnt spread.

The third pit (C33) of the water management system was an oval linear pit orientated east-west. Similar to the first pit (C9) it had concave sides and a concave base. There were channels connected to the western (C94) and eastern (C31) ends of the pit. The top of the feature initially looked irregular in plan, extending beyond the edge of the pit to the north suggesting that there was some spill over of the upper fill (C40). Below this however the pit was quite uniform. The basal fill of the pit (C34) merged with the fills of the channels to the east and west, though there was some suggestion that it partially overlay the fill (C32) of the channel to the east (C31). This suggests that they all were silting up at around the same time, with the deeper pit possibly taking longer to silt up. The upper fill (C40) was the burnt spread-type material seen elsewhere relating to the dispersed burnt spread material accumulating in the partially silted up pit after the water management system had gone out of use.

To the east of this a curving channel (C31) connected the east end of the third pit (C33) with the northern end of the fourth pit (C51) of the water management system. This channel took a distinctive turn, running northwest-southeast initially, before turning to run almost north-south before entering the fourth pit (C51). The base of the channel was relatively flat and the sides were straight. There was an unusual step in the base running straight across the channel. This consisted of a sharp rise in the base at a 60-degree angle rising 0.04m followed by a drop to the southeast at a more gentle 45-degrees to a depth of 0.07m, with the channel continuing to slope down to the south towards the fourth pit (F51) beyond this point. This is likely to have been used to control the flow of the water through the system, however no associated features were identified on either side of the channel, possibly having been truncated away in the past. The fill (C32) of the channel became darker with more burnt spread-type material to the south.

Pre-ex photo of channel C31 curving towards pit C51 in centre ground, with disturbed burnt spread C2 present to south in foreground, looking northwest (top right)

Mid-ex photo of pit C51, looking east (top right)

Post-ex photo of pit C51, looking south (bottom right)

To the south of this was the fourth pit (C51) of the water management system. This was an oval-shaped pit fed by the channel (C31) to the north and a drained by a channel to the west (C81). The pit showed significant signs of

erosion of its edges and base. As with the second pit (C41) to the northwest, the depth and shape of this pit varied from the other more linear pits. The sides appear to have been more vertical and the pit was deeper, though erosion had impacted on the base and undercut some of the sides of the feature. This may have been used as a cistern also, collecting water for the fulacht troughs (C7, C37 and C86) further to the south and southwest. The pit had four recorded fills (C52, C53, C54 and C55). The basal fill of the pit (C52) was a mottled redeposited fill likely to relate to the collapse of the edges and erosion of the base of the pit. This was overlaid by the secondary fill (C53), a reddish brown silty clay with some organic content, relating to the silting up of the pit naturally. Overlying this was a light grey clayey silt associated with decaying limestone to the north of the pit. Another spit of this seen to the west was more suggestive of collapse of the undercut edge of the pit over the secondary fill (C53) after the pit was partially infilled. The upper fill of the pit (C55) was the similar to the upper fills of the other pits to the northwest, relating to the dispersal of burnt spread material over the area. It continued beyond the edges of the pit to the south, possibly relating to the base of the undisturbed burnt spread material, where it was cut by one of the agricultural gullies (C29). It was also seen to overlie the fill (C82) of the channel to the east (C81) indicating that the channel had silted up by the time the final fill was placed in the pit.

The channel to the east (C81) was quite shallow and more meandering than the other channels. It ran east-west initially turning slightly to the east-southeast. It was found to cut the upper fill of the eastern pit (C77) of the water management system indicating that the pit had infilled completely prior to the channel going out of use. The channel was not seen exiting on the far side of the pit, however this is likely to be due to truncation. The channel was filled with a rich dark brown organic clayey silt with occasional charcoal and burnt stone, different to the upper fills of the pits to the west suggesting it had silted up prior to the dispersal of the burnt spread material. The presence of some of this material within the fill is likely to have been due to the proximity of the original burnt mound rather than the later spreading of this material over the wider area.

General mid-ex photo with channel C81 visible to right of centre, looking northwest (top right)

Pre-ex photo of pit C77, looking northwest (bottom right)

The fifth and easternmost pit (C77) of the water management system was orientated east-southeast to west-southwest. It was pear-shaped in plan with steep sides and concave base. The channel (C81) to the west was connected to the wider end and while the channel was still open and in use after the pit had filled in, it is likely they were originally contemporary. No channel was apparent taking water away from the pit to the south or east, though this is likely to be due to truncation and it is probable that some form of channel ran between the pit and the lowlying area between the two drumlins. This is the location of the field boundary (C85) depicted on the First Edition Ordnance Survey map in the 1830s, however given the location

Mid-ex photo of pit C77, looking northwest (top left)

Post-ex photo of pit C77, looking southwest (bottom left)

and peaty, organic nature of the fill (C19), it may originally have been a wetland marshy or boggy area prior to post medieval land drainage improvements. There were three fills (C78, C79 and C80) identified within the pit. The basal fill (C78) was a mottled deposit possibly relating to the collapse of the edges of the pit and the erosion of the base being mixed with the initial silting of the pit. Overlying this, the secondary fill (C79) was a thin layer of charcoal-rich silt along the south side of the pit. This is likely to relate to the period when the water management system was still in use, with charcoal-rich silts from the burnt mound possibly being washed through the system at times. The upper fill of the pit (C80) was a dense organic peaty fill with few stones, suggestive of the pit slowly silting up with organic matter over time. This may suggest the system had been abandoned for a time before being reused, with this pit not being reinstated and the channel being dug across the now infilled pit.

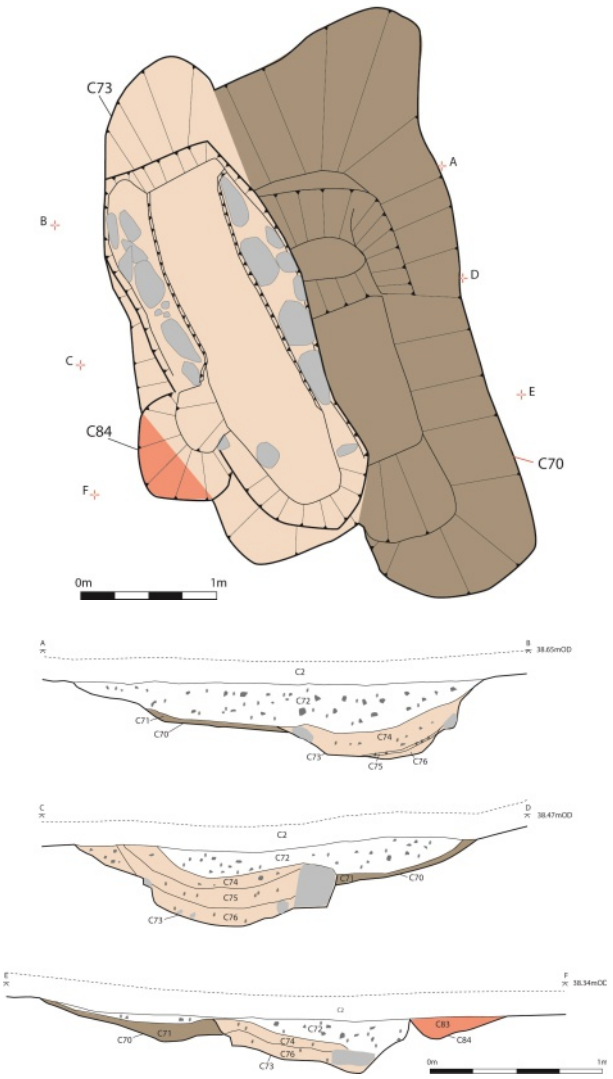
Fulacht troughs

Four pits (C7, C37, C70 and C73) were excavated on the site that were interpreted as fulacht fiadh troughs. An additional two pits (C84 and C86) may also relate to fulacht fiadh activity given their proximity to the probable troughs. The troughs were grouped in two locations with two (C70 and C73) to the south of the second pit (C41) of the water management system towards the west of the site and two to the southwest of the fourth pit (C51) of the water management system towards the south of the site.

The western troughs

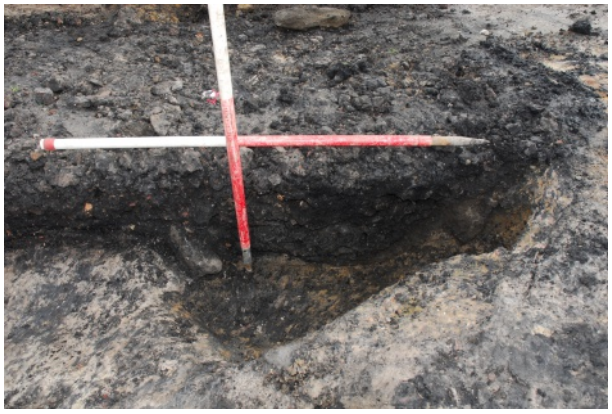
The two western troughs (C70 and C73) were orientated north-northwest to south-southeast and were constructed one after the other. The earlier trough (C70) was a more informal construction with concave sides and a flat base. It was a large, relatively shallow pit and was sub-rectangular in plan. The eastern side of the pit was steep while the northern and southern ends of the pit were more gently sloping. It was truncated along its western side by the later trough (C73), but the original width could be reconstructed as the edge survived to the south. One fill (C71) survived within the earlier trough. This was a sticky silty clay and related to the silting up of the trough after going out of use. The fill does not appear to have filled the entire pit by the time that the second trough (C73) was excavated to the west.

Context	Type	L. (m)	W. (m)	D. (m)
C70	Cut	4.2m	1.56m min.	0.5m
C71	Fill	4.2m	0.82-1.1m	0.03-0.1m
C72	Fill	4.2m	2.40m	0.05-0.28m
C73	Cut	3.74m	1.3m	0.6m
C74	Fill	3.01m	0.75-1.03m	0.07-0.14m
C75	Fill	c. 2m	0.49-1.04m	0.01-0.11m
C76	Fill	3.01m	0.41-0.85m	0.05-0.11m
C83	Fill	0.7m	0.6m	0.15m
C84	Cut	0.7m	0.6m	0.15m



Plan of troughs C70 and C73 with section points highlighted (top left)

Sections through troughs C70 and C73:
north-facing section (A-B) at northern end (top section)
south-facing section (C-D) through centre (central section)
north-facing section (E-F) at southern end (bottom section)



Mid-ex photo of north-facing section through troughs C70 and C73 (A-B), looking south (top right)

Mid-ex photo of south-facing section through troughs C70 and C73 (C-D), looking north (centre right)

Mid-ex photo of north-facing section through troughs C70 and C73 (E-F), looking south (bottom right)

The later trough (C73) was located immediately to the west of the first in a similar alignment. It was more formally constructed and included a rough stone lining. The trough was shorter that the first and the cut was straight-sided down to a small level step 0.3m in width upon which the stone lining was constructed. This step was 0.08 to 0.13m in height, slightly higher to the west along the side that had been newly excavated, the eastern edge having been cut through the abandoned earlier trough. The base of the trough was flat. The stones forming the lining of the trough were present along the northern

ends of the east and west sides, however there was no evidence for the northern side itself having been lined. The lining was largely missing from the southern end of both sides, with one ex situ stone to the west and one in situ stone to the east being all that survived. It is possible the lining was damaged through agricultural activity or landscaping in the past, with some suggestion that the trough would originally have been constructed on more level ground, possibly sloping away to the south beyond the southern end of the trough originally. The stones forming the lining were sub-rounded unburnt degraded sandstone boulders common in the boulder clay nearby. They ranged in size from 150 x 130 x 10mm to 410 x 180 x 170mm to 320 x 280 x 260mm and were not placed in any particular order. There were seven stones along the western side with an additional stone ex situ to the south and eight stones to the east.

The trough had three fills (C74, C75 and C76). The basal fill (C76) was a mottled sandy clay of moderate compaction with occasional small unburnt stones and charcoal flecking, likely to relate to the initial silting up of the trough. Overlying this was a loosely compacted layer of charcoal and burnt stone in a black sandy silt (C75), relating to burnt mound material spilling into the trough after its abandonment. Over this was the upper fill (C74) of the trough, a mid-grey sandy silt with occasional charcoal and burnt stone inclusions. This appeared to be a water-related deposit, possibly caused by pooling over the mostly infilled trough and was present to the top of the stones lining the east side of the trough.

General mid-ex photo of troughs C70 and C73, looking east (top right)

Post-ex photo of troughs C70 and C73, with lining of trough C73 apparent, looking north (middle right)

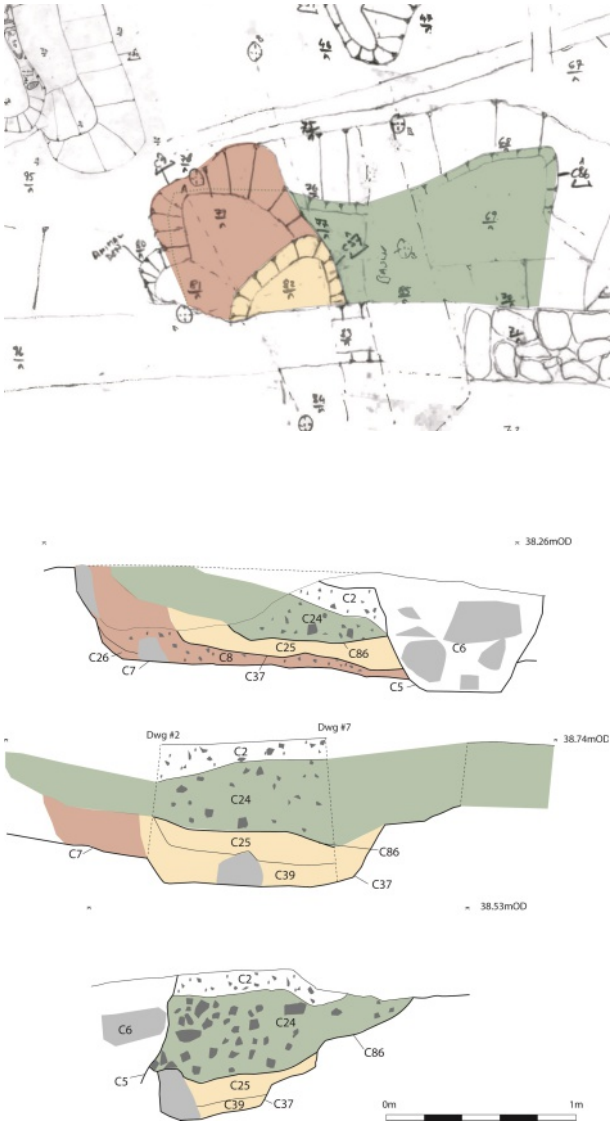
Post-ex photo of trough C73 with lining apparent, looking south (bottom right)

To the west of the later trough (C73) a relatively small pit (C84) was identified, also cut by the trough. It was oval in plan, orientated north-south, and had concave sides and base. It was filled with a single fill (C83), a mid-grey clayey silt with a thin layer of burnt stone and charcoal on top. It may have been related to the earlier trough (C70) to the east, which was also truncated by the later trough (C73).

Overlying the upper fills of the three features final fill (C72) was apparent. This was a loose burnt spread type fill likely to have been deposited in the depression formed by the three cuts as their fills settled while the burnt spread was being dispersed.

The southern troughs

Two more intercutting troughs (C7 and C37) were identified towards the south of the site. These were both relatively simple pit troughs. The earliest (C7) was orientated east-west and located at the edge of the final break of slope down to the low-lying area between the two drumlins now occupied by the field boundary (C85). It was truncated by the later trough (C37). In more recent times the southern end of the pit was truncated away by the east-west running field drain (C5) and an animal burrow (C92) or den that had been dug in from the side of the drain. The trough (C7) was probably originally sub-rectangular in shape, with sides at 60-degrees to the west, 70-degrees to the east and 80-degrees to the north. The sides were slightly concave with a sharp break of slope at the top and slightly more gentle at the base, which was generally flat. There was one upright stone along the northern edge of the pit that may relate to a former lining, however no more stones were noted around the edge of the pit. There were two surviving fills (C8 and C26) within the trough. The basal fill was a mottled sandy silt with a thin lens of charcoal at the base, likely to relate to material collapsing from the sides and eroded from the base mixing with some of the initial fill of the trough. It was only present at the northern end of the trough. Overlying this was the surviving upper fill of the trough (C8), which was a loosely compacted black sandy silt with burnt stone and charcoal inclusions, likely to derive from burnt spread-type material being dumped into the pit. One



Plan of southern troughs C7 and C37 with large shallow pit C86 also highlighted (top)

Sections trough troughs C7 and C37, and pit C86:
Southwest-facing section (top section)
South-facing section (central section)
East-facing section (bottom section)

Context	Type	L. (m)	W. (m)	D. (m)
C7	Cut	1.77m	1.4m	0.51m
C8	Fill	1.5m	1.50m	0.15m
C24	Fill	5m	1.20m	0.40m
C25	Fill	1.25m	1.1m	0.12m
C26	Fill	1m	0.20m	0.12m
C37	Cut	1.3m	1.05m	0.83m
C39	Fill	1.3m	1m	0.09m
C86	Cut	5m	1.20m	0.40m

Mid-ex photo of southwest-facing section through trough C7, looking northeast (top left)

Mid-ex photo of south-facing section through trough C37, looking northeast (centre left)

Mid-ex photo of east-facing section through trough C37, looking west (bottom left)

Post-ex photo of troughs C7 and C37, looking northeast (top right)

Post ex photo of trough C7 to left, looking northeast (centre right)

Post-ex photo of trough C37 with C8 still in situ within trough C7 to left, looking northeast (bottom right)

piece of unburnt animal bone was retrieved from this fill.

A later trough (C37) was dug through the southwestern end of initial trough (C7) after it had been backfilled. The later trough was orientated northeast-southwest and was 0.3m deeper than the first. Again, the southern end of the trough was truncated away by the field drain (C5) and animal burrow (C92). The trough (C37) was probably originally sub-rectangular in plan with very steep sides to the northeast and northwest. The southern side of

the trough was largely removed by the drain (C5), however the eastern corner survived indicating the width of the trough. Two unburnt stones in this corner may have been the remains of a stone lining, though to little survived to say this with any certainty. A further large unburnt stone was recorded within the basal fill. There were two surviving fills (C25 and C39) within the pit. The basal fill was a dark greyish brown clayey silt (C39) with charcoal inclusions and some organic content, likely to relate to the initial silting up of the pit. Overlying this was the upper surviving fill (C25), which was a dark brown clayey silt, again with some organic content as well as inclusions of charcoal and burnt stone. This may be a mixture of the basal fill of the pit with some burnt mound material spilling into it as the trough silted up after going out of use.

Truncating the top of both of the fulacht troughs was a large shallow pit (C86) orientated east-west. It is unclear whether this was related to the fulacht activity. The full shape of the pit is unclear as the southern side of the pit was truncated by the drain (C5). The northern edge of the pit was slightly bowed curving further to the south in the centre. The edge was steep at c. 70-degrees to the north and appeared to be more gentle to the east and west. The base was relatively flat, sloping slightly to the south. The pit was filled with a densely packed single fill (C24), a reddish brown burnt stone fill with less silt and charcoal than other burnt spread related fills seen on the site. The fill was seen to slump slightly into the soft silty fills of the later trough (C37). The large shallow pit may have been dug to hold fire-cracked stone waste from fulacht troughs elsewhere. This may suggest that the fulacht troughs to the west (C70 and C73) are later than the ones to the south (C7 and C37).

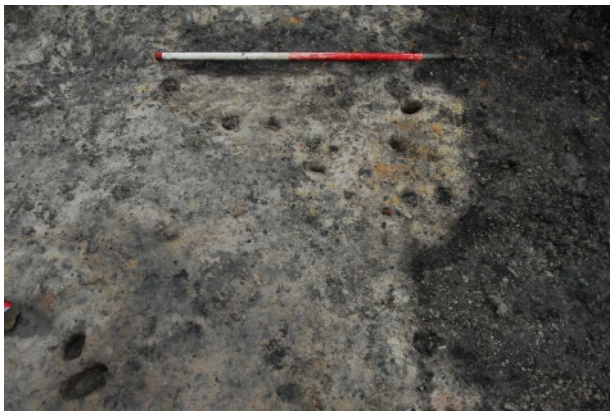
Other features in the vicinity

Seven pits (C3, C13, C17, C20, C22, C35 and C46) and five stake-holes (C15, C16, C48, C49 and C50) were identified in the vicinity of the fulacht fiadh during the excavation.

Two (C13 and C46) of these pits were located between the westernmost fulacht troughs (C70 and C73) and the western end of the water management system. The western pit (C13) was a small oval pit orientated northwest-southeast, of similar dimensions to Pit C3 to the northeast. It was filled by a single fill (C14) relating to the dispersal of the burnt spread material. Below the southern end of the pit a stake-hole (C15) was identified, filled with a similar burnt spread-type material. A second stake-hole (C16) was identified immediately to the southwest of

Post-ex photo of northeast end of trough with possible stones of lining to right. The horizontal ranging rod lies along the base of pit C86, looking northeast (bottom left)

Context	Type	L. (m)	W. (m)	D. (m)
C3	Cut	0.33m	0.25m	0.13m
C4	Fill	0.33m	0.25m	0.13m
C13	Cut	0.50m	0.26m	0.05m
C14	Fill	0.50m	0.26m	0.05m
C15	Stakehole	0.08m	n/a	0.1m
C16	Stakehole	0.12m	0.07m	0.8m
C17	Cut	1m	0.54m	0.11m
C18	Fill	1m	0.54m	0.11m
C20	Cut	0.84m	0.60m	0.02m
C21	Fill	0.84m	0.60m	0.02m
C22	Cut	2.37m	0.88m	0.34m
C23	Fill	2.03m	1.24m	0.04-0.07m
C35	Cut	0.72m	0.61m	0.09m
C36	Fill	0.72m	0.61m	0.09m
C46	Cut	0.90m	0.60m	0.03m
C47	Fill	0.90m	0.60m	0.03m
C48	Stakehole	0.06m	0.06m	0.07m
C49	Stakehole	0.08m	0.06m	0.08m
C50	Stakehole	0.06m	0.06m	0.12m
C67	Fill	2.37m	1.20m	0.05-0.18m
C68	Fill	2.06m	0.55m	0.04-0.07m
C69	Fill	2.75m	0.24m	0.03-0.12m



Plan of the additional features in the vicinity of the fulacht fiadh (top)

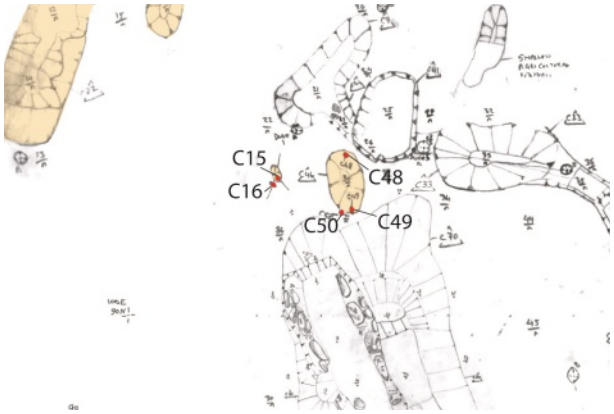
Mid-ex photo of pit C13 with stake-holes C15 and C16 in the foreground, looking north (centre left)

Mid-ex photo of pit C46 with stake-holes C48, C49 and C50 visible. Other potential stake-holes were investigated and found to be under 20mm in depth, possibly relating to stones pressed into the natural from the overlying burnt spread (bottom left)

the pit. This was more oval in shape and was filled with a similar material.

Further to the east, a larger shallow pit (C46) was identified. This was oval in plan and orientated north-south. It was very shallow with only the base of the feature surviving. The fill (C47) was again indicative of the burnt spread dispersal. Two stake-holes were identified at the base of the pit, one to the north (C48) and one to the south (C49). Both were seen to have tapering bases, while the southern stake-hole leaned slightly to the south giving it an oval appearance. Immediately to the southwest of the pit another stake-hole (C50) was identified. This stake-hole also had a tapering base and leaned to the south. The location of this pit, in close proximity to the western fulacht troughs, and the presence of stake holes at either end of the base of the pit may suggest the feature represents a hearth, with the stake-holes possibly the remains of a light spit or associated structure. The stakes would have been very lightweight however, and there was no in situ burning noted within the pit. The location of this pit between the presumed water supply for the fulacht and the troughs as also somewhat problematic as the presence of a hearth here would likely have been an obstacle while the fulacht was in use.

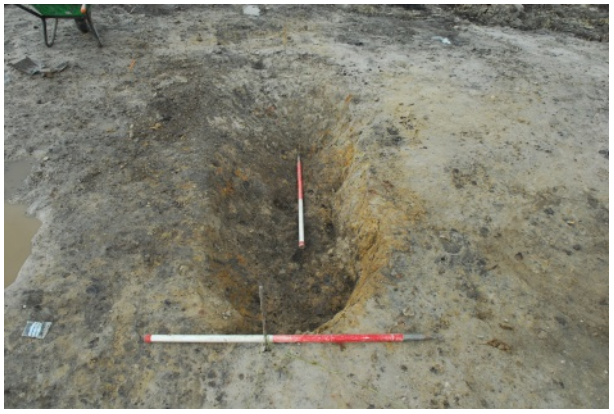
The five stake-holes (C15, C16, C48, C49 and C50) do not form an obvious pattern, though they may be the deepest stake-holes of a feature that has largely been truncated away over time. A number of additional pockets of burnt spread material were investigated in the vicinity but were too shallow to interpret as stake-holes.



Plan showing the location of the five stake-holes identified (top)

Mid-ex photo of pit C20, looking west (2nd from top)

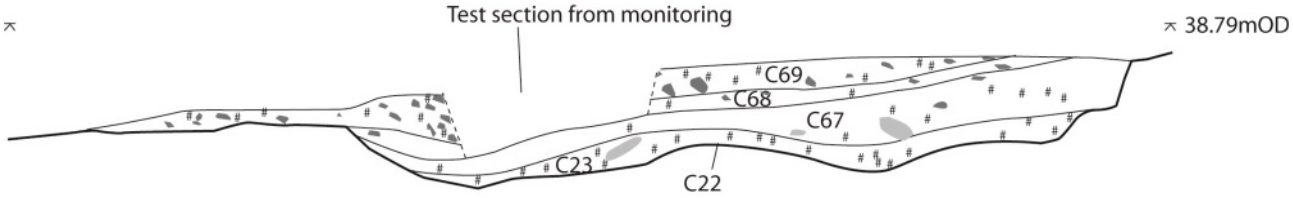
Mid-ex photo of pit C22, looking northwest (2nd from bottom)



Post-ex photo of pit C22, looking southwest (bottom)

As mentioned above, the location of the two stake-holes (C48 and C49) at either end of the base of the shallow pit (C46) may also be of interest and possibly suggestive of a light spit or superstructure associated with the possible hearth.

Two pits (C20 and C22) were identified to the west of the northwestern pit (C9) of the water management system. Although the two pits are unrelated physically, they both follow a similar trend running northeast-southwest, in a similar orientation to the northwestern pit (C9) of the water management system. It is possible they relate to a former stream course or second poorly surviving water management system steering water away to the west of the main fulacht area. Only the base of the more northerly pit (C20) survived, but its northeast-southwest orientation was apparent, as well as its oval shape. The fill of the pit (C21) was very shallow, though the presence of burnt stone and charcoal was noted within it. To the southwest of this was a larger and deeper pit (C22). This was orientated north-northeast to south-southwest and was sub-rectangular in plan, with a flat base to the north and a more sinuous V-shaped base to the south. The pit showed evidence of having been eroded through water action. The basal fill (C23) of the pit was a dense layer of compact charcoal-rich sandy silt with very occasional burnt stone. This lined the base and sides of the pit and relates to the initial deposition of charred material into the pit. The secondary fill (C67) was a thick layer of compact redeposited natural with occasional charcoal flecking and burnt stone inclusions. This appears to relate to the sides and base of the pit being eroded and churned up with some



Southeast-facing section of pit C22 (top)

Mid-ex photo of pit C17, looking west (2nd from top)

Mid-ex photo of pit C3, looking north (2nd from bottom)

Post-ex photo of pit C35, looking north (bottom)

of the charcoal rich material below and settling onto the base of the pit over time. Above this was the tertiary fill of the pit (C68), an interface fill between of clayey silt between the secondary fill and upper fill of the pit. The nature of the fill suggested it was a water-laid deposit. The upper fill of the pit (C69) was the loose burnt stone and charcoal rich black sandy silt seen overlying the pits of the water management system to the east and is likely to relate to the dispersal of the burnt mound material over the wider area after the fulacht fiadh had gone out of use. The upper fill was found to extend on beyond the edge of the pit to the southwest. While no additional features were identified to the southwest of the pit, two patches of material similar to the upper fill were noted suggesting there may previously have been more to this trend than has survived.

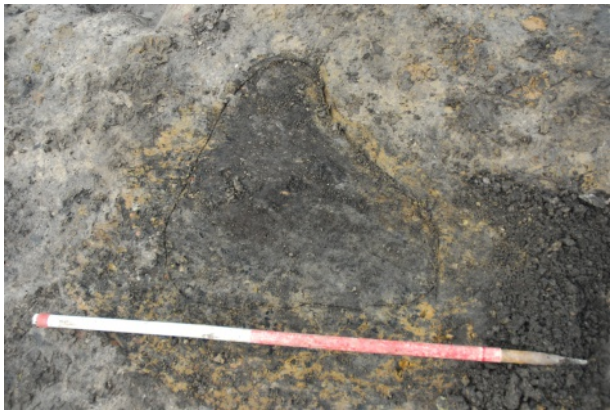
To the east of this an oval pit (C17) was identified orientated north-south. It had a sharp break of slope at the top, concave sides and an uneven base. It was filled with a single fill (C18), consistent with the burnt spread material. It was unclear what purpose the pit may have served.

To the northeast of the northern pit of the northern pit (C9) of the water management system was a small pit or posthole (C3), located 0.97m from the pit. It had a single fill (C4), which consisted of burnt spread type material. The eastern side of the feature sloped more gently than the others, possibly to aid the erection of a post. There were no other associated postholes identified in the surrounding area, however another pit (C13) of similar proportions was identified to the southwest of Pit C9 at approximately the same distance. It is possible that these features relate to postholes at either side of the first pit of the water management system (C9), however neither are distinct enough to be certain. The feature was overlaid by the disturbed burnt spread (C2).

A final shallow pit (C35) was located towards the east of the site, just beyond the eastern edge of the burnt stone spread (C2). This was sub-circular in shape and contained a single fill (C36) with some burnt stone and charcoal present, similar to the other pits to the west. A burnt natural stone was present along the western side of the pit suggesting burning had taken place within the pit, however no scorching was present elsewhere within the pit. Root disturbance was noted immediately to the west of the pit. It is possible that this is the remains of a cleaned out hearth. As with the other pits, the fill (C36) of the pit was more consistent with incidental filling with the dispersed burnt stone spread material rather than a dense charcoal fill that would be expected with a hearth, however the feature may have been cleaned out and the presence of the burnt natural stone protruding from the side is indicative of in situ burning.

Hedgerow?

Five features were identified less than 1m from the northern edge of the water management system. A number of additional possible features further to the north were investigated and were found to be non-archaeological. They included slight depressions where burnt spread material had survived to a slightly greater depth, stone sockets from where one of the natural boulders frequent in the underlying subsoil had been removed allowing a pocket of the overlying disturbed burnt spread to fall into the void, root boles from previous vegetation, and pockets created by degrading sandstone and mudstone rocks within the subsoil.

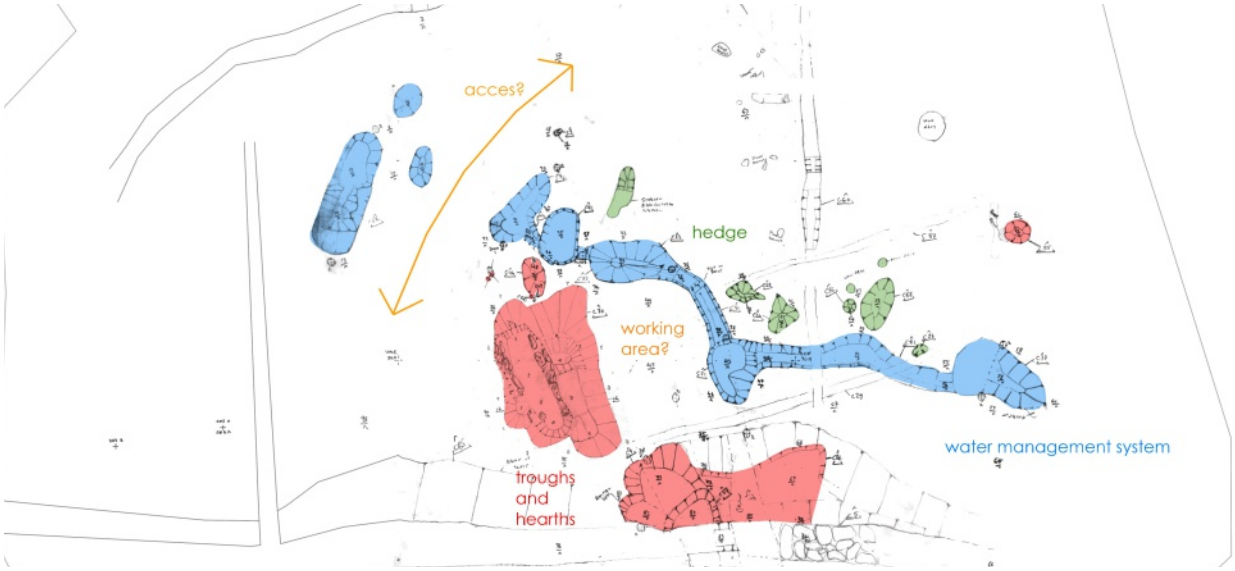


Pre-ex photo of features C56 and C58, looking west. The irregularity suggested these were root boles as opposed to pits (top right)

Mid-ex photo of feature C62, looking northeast (centre right)

Pre-ex photo of feature C64, looking southwest (bottom right)

Context	Type	L. (m)	W. (m)	D. (m)
C27	Fill	0.42m	0.48m	0.07m
C28	Cut	0.42m	0.48m	0.07m
C56	Cut	0.48m	0.44m	0.15m
C57	Fill	0.48m	0.44m	0.15m
C58	Cut	1.50m	0.85m	0.11m
C59	Fill	1.50m	0.85m	0.11m
C62	Cut	1.18m	0.66m	0.09m
C63	Fill	1.18m	0.66m	0.09m
C64	Cut	0.88m	0.86m	0.08m
C65	Fill	0.88m	0.86m	0.03-0.04m
C66	Fill	0.88m	0.86m	0.04-0.05m



Interpretative post-ex plan with the possible hedgerow highlighted in green

A cluster of shallow pits (C28, C56, C58, C62 and C64) was uncovered further to the north of the eastern channel (C81) of the water management system. Four of the pits (C28, C56, C58 and C62) had a single fill (C27, C57, C59 and C63), while they fourth (C64) contained two fills. The fills (C27, C57 and C59) of three of the pits (C28, C56 and C58) and the upper fill (C66) of the pit with two fills (C64) were similar to one another, being consistent with the burnt spread material that would have overlaid the area. The fill of the other pit (C62), the most westerly of this group of pits, was a mix of burnt spread-type material with topsoil, possibly indicating this feature is somewhat later in origin. This shape of this pit was somewhat irregular also and it is possible that it was caused through natural root disturbance. The northern edge of the pit was truncated by the northern east-northeast to west-southwest agricultural gully (C87). The lower fill (C65) of the pit containing two fills (C64) was a brown sandy clay and while it contained some charcoal it was not densely packed as with the other pit fills. This suggests the initial fill built up within the pit prior to the burnt spread being strewn over this part of the site.

None of the pits are consistent with each other in shape or size, nor do they form an obvious pattern or suggest an identifiable function. It was not clear whether the features were indeed archaeological in nature. No finds were retrieved from any of their fills. It is possible that all the pits are non-archaeological, possibly representing a row of root boles of shrubs growing on the slope above the water management system. A cluster of root boles and stone sockets containing burnt spread-type material were also investigated further to the north along the west side of one of the agricultural gullies (C60). None of these turned out to be archaeological with clear evidence for root action, degrading limestone, mudstone and sandstone boulders, or large natural boulders having been removed. The pits along the northern side of the water management system are all shallow in nature suggesting truncation had taken place in the past. This truncation may also be impeding the understanding of these features.

Agricultural features

The latest features on the site were agricultural in nature. The largest of these was the former field boundary (C85) at the southern end of the site. The southern edge of this feature extended beyond the limit of the excavation, however a trench was extended to identify the full extent of this feature. The ditch was found to be 12m in width, and possibly represents a wide in-

Plan showing the location of modern agricultural and drainage features on the site (top left)

View of the trench excavated through ditch C85, looking north (top right)

View of section through drain C5 - beside ranging rod - and trough C7 - to left, looking east (bottom right)

formal waterlogged stream between the two drumlins rather than a formalised ditch, given the width of the feature. The northern edge of the ditch was not identified, having been truncated away by the later drain (C5), which appears to have been inserted along the northern edge of the ditch after it was backfilled. The fill of the ditch (C19) contained peaty organic material with inclusions of post-medieval ceramics, slag and glass. The disturbed burnt spread (C2) was found to overlie the backfill of the field boundary (C19).

Field drain

An east-west running field drain (C5) ran across the site near the northern edge of the field boundary ditch. It was partially stone-lined in places though in other large boulders, common in the surrounding boulder clay, had been randomly deposited into the drain cut, aiding drainage though with less formal construction. Overlying the stones a layer of redeposited burnt stone, charcoal and topsoil relating to the material the drain was cut into formed the remainder of the fill of the cut, while between the stones a silt was identified relating to the silting up of the drain. The drain was still partially functional. The drain cut the disturbed burnt spread (C2), the buried topsoil (C30) to the west and the fill (C19) of the field boundary (C85) to the south. It also truncated the large shallow pit (C86) relating to fulacht activity towards the southern end of the site, and the deeper fulacht trough (C37), which was also truncated by the

large shallow pit (C86). The drain is likely to be a relatively recent agricultural feature, possibly created in the 20th century when the field boundary to the south was removed.

Dug in from the northern edge of the drain cut, a small animal burrow or den (C92) was uncovered, which truncated the southwestern corners of two of the fulacht troughs (C7 and C37). This appeared to be a relatively modern feature and it contained a loose backfill of collapsed material (C93). A number of animal bones were retrieved from the base of the feature. This is likely to have been a fox den or rat hole accessed via the drain.

Gullies

Four gullies were identified across the site, two running north-south (C60 and C90) and two running east-northeast to west-southwest (C29 and C87). The two north-south gullies were generally wider than the latter two gullies, and are likely to have brought water from the top of the slope to the north towards the drain (C5), which they ran perpendicular to. A decorated clay pipe stem and piece of brick were retrieved from the fill (C61) of the eastern gully (C60). They both contained single fills (C61 and C91) that were a mixture of topsoil-like material and the disturbed burnt spread material that the features were cut into. The eastern gully was seen to cut both of the northeast-southwest gullies (C29 and C87), as well as the eastern channel (C81) relating to the water management system.

The two northeast-southwest running gullies (C29 and C87) ran across the archaeological part of the site. They were cut by the eastern north-south gully (C60). They relate to an earlier phase of drainage, possibly prior to the insertion of the field drain (C5) while the field boundary ditch (C85) was still in use, though they run at an angle to the ditch. The gullies were approximately three metres apart. The northern gully (C87) cut across the northern end of one of the pits to the north of the water management system (C62). The southern gully (C29) cut across the eastern channel (C81) relating to the water management system. Both would have truncated additional features, however their survival was too poor to show this clearly. They both contained single fills (C89 and C88) that were a mixture of topsoil-like material and the disturbed burnt spread material that the features were cut into.

Plough furrows

In the northeastern part of the site, at the top of the slope of the small drumlin, a series of eleven plough furrows were identified running north-south across the higher ground. They are present at the point where there was very little topsoil cover over the underlying subsoil and are likely to relate to relatively recent agricultural activity. All were filled with a mid-brown silty clay topsoil-like material. They were not individually numbered.

Section 3 Discussion

Introduction

The excavation revealed that the disturbed burnt spread (C2) previously identified during the two testing programmes (Giacometti 2015 and McGlade 2015) originally related to a prehistoric fulacht fiadh. The remains of the fulacht fiadh uncovered on the site consist of a number of troughs, a series of pits and channels relating to the supply of water to the fulacht area, a large disturbed spread of fire-cracked stone and charcoal, and possible hearths and firing locations. The fulacht was located on a relatively steep slope on the side of a low drumlin, with a low-lying area, previously occupied by a ditch that formed a field boundary, to the south. The field boundary ditch is likely to have replaced a marshy or boggy stretch of land lying between the small drumlin in the north of the development site and a second to the southwest. The large amount of burnt stone and charcoal present suggests the fulacht fiadh may have been used over an extended period.

Interpretative post-ex plan of the site

Fulachtaí fia

A by-product of the recent building boom has seen a large number of fulachtaí fia being excavated and this has resulted not only in an increase in our knowledge of fulachtaí fia but has questioned the basic interpretation as to both their time-frame and function (Dennehy 2008, 5). The term fulacht fiadh has come to be used to refer to a monument type that was involved in pyrolithic technology – or the heating of stones.

The spelling varies in both the singular (Fulacht fiadh, fulacht fian) and the plural (fulachta fiadh, fulachtaí fia). "Fiadh" in Old Irish meant something like "wild", often relating to animals such as deer, while fian refers to the mythological band of hunters and warriors, the Fianna. There are historical references to the use of pits dug into the earth used for cooking and bathing, with one, For a Feasa ar Éirinn, noting that they are known among the peasantry as fulacht fian (O'Neill 2004, 80). Other historical references clearly use the term "fulacht" to describe a cooking spit, a close reading of these accounts suggests that the term actually derives from a word meaning support and probably carries a deliberate reference to the Irish words for blood and meat (ibid., 84). As such the term itself is probably incorrect when discussing sites involved in pyrolithic technology, however this has become the understood name for the monument type. This report uses the term fulacht fiadh for the singular and fulachtaí fia for the plural of the site type.

Fulachtaí fia are relatively common monuments in Mayo with 383 listed in the RMP files and an additional 145 sites recorded as burnt mounds. More examples have been uncovered recently on excavations in the vicinity of Castlebar relating to the town bypass. Fulachtaí fia are found to be primarily of Bronze Age date, though literary sources suggest their continued use, in a limited and perhaps anachronistic and ritualistic way, into the early historic period (O'Neill 2004, 83), while some archaeologically dated examples have been dated as early as the Neolithic period (Hawkes 2015). When excavated, they usually consist of a hearth, a mound of fire-cracked stones and burnt material, and a trough (Waddell 1998, 174-5). Frequently the hearth is absent or does not survive, indicating this was a less formal feature of the site. Fulachtaí fia may also have had additional coverings of light structures, or associated structures and buildings. It is thought that hot stones were dropped into a water-filled trough to heat the water for cooking or other purposes. They are generally located in wet/marshy areas, with many being built into or near streambeds and water sources. Occasionally the waste material is placed in a visible horseshoe-shaped mound surrounding the fulacht fiadh. More frequently fulachtaí fia have no visible above-ground component and take the appearance of a subsurface layer of burnt material, having been spread out through agricultural activity over time.

Although fulachtaí fia have a widespread distribution across the country they are generally found to be clustered in areas where there is other settlement evidence (Grogan 2005, 41-2). This was also noted during some of the recent road schemes, for example at Clonmore North, Co. Tipperary, where a fulacht fiadh was excavated on the same site as a contemporary habitation site, while at Brackbaun, Co. Limerick a Late Bronze Age/ Early Iron Age fulacht fiadh was situated close to an Iron Age settlement and burial site (McQuade et al 2009, 119). It was also noted at Caltragh, Co. Sligo, where three of the fulachtaí fia in closest proximity to the Bronze Age houses uncovered there appear to have been contemporary, suggesting they were components of a more permanent settlement pattern (Danaher 2007, 40). Although no Bronze Age settlement sites have been identified as yet in the vicinity of the site at Knockaphunta, the possibility for such should be considered, perhaps on the slightly higher ground to the west near where the enclosures and earthwork are recorded in the RMP files, or to the northeast in the vicinity of the town itself.

Traditionally, fulachtaí fia have been interpreted as temporary prehistoric cooking/feasting sites, but over the last decade evidence has emerged for non-food related activities taking place on some fulacht sites (e.g., Dennehy 2008), and fleshed out how food and drink may have been cooked/produced at the sites (e.g., Quinn & Moore 2009). At the same time, a better under-

standing of prehistoric settlement in Ireland from several decades of archaeological excavations have allowed for a more nuanced interpretation of fulachtaí fia sites and their role in a complex, settled society of Bronze Age Irish kingdoms (e.g., Hawkes 2015 and the social role of fulachtaí fia).

Alternative suggestions for the use of fulachtaí fia have also been postulated, with some being replicated in experimental archaeology. An experiment carried out in 2009 demonstrated that a fulacht-type feature could be used in the brewing of beer (Quinn & Moore 2009). The general lack of animal bone from fulacht fiadh sites, including the one uncovered at Knockaphunta, is one of the reasons put forward for questioning the traditional cooking place interpretation for all fulachtaí fia. Semi-industrial uses, such as in the washing and dying of clothes and hides or in the preparation of leather, have be considered (Waddell 1998, 177). Recent studies on the environmental evidence from fulachtaí fia has led to the suggestion that some fulachtaí fia may not be related to cooking at all, and were used in textile production (Brown et al., 2016, 26). Experiments carried out in 1999 demonstrated that fulachtaí fia could be used in the processing of textiles, such as washing, dyeing and fulling (Denvir 1999, cited in Dennehy 2008, 14).

Some have suggested they may have been used as saunas or sweathouses, such as that at Rathpatrick, Co. Waterford (Eogan & Shee Twohig 2012, 179) or the large hut encircling a trough found at Cloughjordan, Co. Tipperary (Dennehy 2006). Additionally, they may have been used as bathing places, as suggested in the medieval tale of the Romance of Mis, (O'Drisceoil 1990), where Dubh Ruis bathes Mis in the trough water rich in melted deer fat following their meal. This would suggest a dual function for the feature in question, and this is likely to be the case with many fulachtaí fia, where they would have served more than one function.

It should be noted that the type of stone used in the fulacht may be an indicator as to their function. Sandstone is a better choice of stone for use in these features as it retains heat better (Dennehy 2008, 18). The use of limestone, while not retaining heat as well, would also have had a secondary issue caused by the repeated heating of the stone resulting in a chemical reaction turning it into slaked lime, making it highly unsuitable for cooking or bathing (ibid.). In cases where limestone is present therefore, other functions should be considered. While some burnt limestone was noted within the spread, the majority of the burnt stone recorded was sandstone, which would be suitable for a fulacht fiadh. The predominant use of sandstone at the site is both practical, as it was present within the boulder clay in the surrounding area, and efficient as the stone could be heated and cooled around five times before splitting into unusable fragments (Buckley 1990, 171).

A more detailed comparison with other sites will be made once the environmental analysis and radiocarbon dating has been completed. This will allow for comparisons with fulachtaí fia and other sites of a similar date in Mayo. It will also be of interest to find comparisons for the layout of the fulacht, with associated managed water system being an unusual feature.

Disturbance of the burnt spread

The truncated remains of the fulacht fiadh was uncovered beneath the disturbed burnt spread during the monitoring phase (McGlade 2016) with further features being uncovered beneath the spread during the excavation. The site was found to have been heavily disturbed during the 20th century. The burnt spread (C2) overlay the fill (C19) of the field boundary (C85) at the southern end of the site, which was filled in between the 1910s and the 1950s, as well as a buried topsoil (C30) to the west of the site, which contained early modern pottery. In the central portion of the site the spread was found to contain early modern pottery, glass and metal throughout and it was not possible to identify an undisturbed section of the spread. It can be assumed that the upper levels of all the features identified beneath the spread were truncated during the disturbance of the overlying spread. This is particularly apparent to the south of the stone-lined trough (C73), where the lining has been truncated away from the southern end. It

is unclear where the burnt spread was originally located, or the burnt mound or mounds of burnt stone and charcoal waste from the use of the fulacht fiadh would have stood. The manager of the adjacent Rural Training Centre informed me that ash from the boilers at St Mary's Hospital, Castlebar had been dumped on the site for over a hundred years, and that an old man he knew used this material to make roads in the past (Andy Neary pers. comm. 2016). The site may also have been used as a dumping ground for waste material from the nearby limekilns during the late 19th and 20th century. This may explain the heavily truncated nature of the material and the mix of modern ceramics and glass with the potential burnt mound material associated with the fulacht.

Prehistoric fulachtaí fia with significant modern disturbance have been noted elsewhere in Mayo, with modern ceramics recorded within the disturbed burnt spreads of at least six sites including Deerpark East 1 (Excavation Licence No. 01E0562, Excavations Ref. 2001:906) and Gortaroe (Excavation Licence No. 01E650 ext., Excavations Ref. 2002:1393). The relatively mobile nature of the burnt stone and charcoal mound material allows for intrusive finds of comparatively recent date to occasionally be found within the material, particularly if the site has seen truncation in the past.

Pre-ex view of the disturbed burnt spread C2, looking northeast (top)

View of the limekiln depicted on the 1950s revision of the OS map in the field to the northeast of the site (bottom)

The fulacht troughs

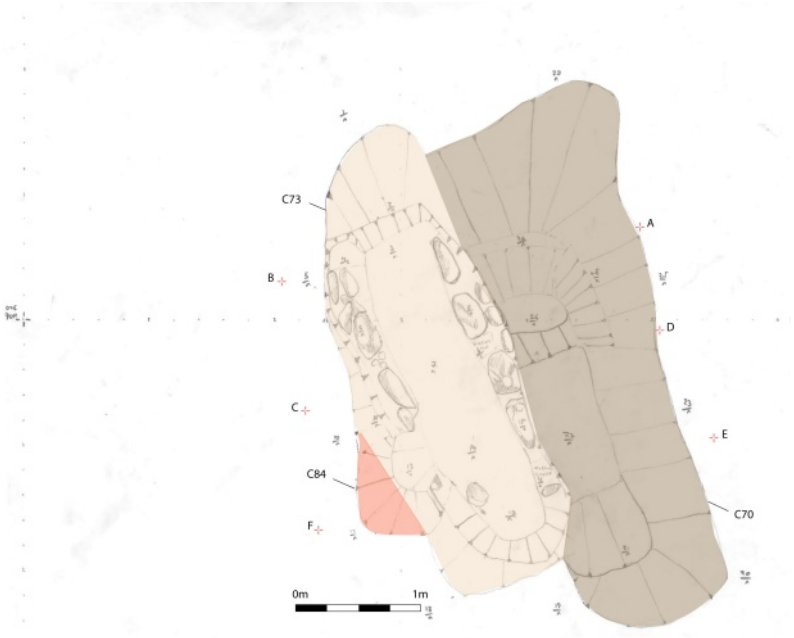
Beneath the disturbed burnt spread a number of features were uncovered. Four of these appear to have been troughs (C7, C37, C70 and C73), with one being relatively informal (C70), two consisting of steep-sided and flat bottomed pits (C7 and C37) suggesting better construction and the fourth (C73), which had a partial rough stone lining, being the best constructed.

The troughs appear to have been dug consecutively, with the earliest of the western troughs (C70) being truncated by the stone-lined trough (C73). The same is seen to the south with an earlier trough (C7) being cut by a later slightly deeper example (C37). In both cases the position of the new trough is only slightly removed from the earlier example, with one side being cut through the fills of the earlier trough. The reason for this repositioning is unclear. There may have been a period of abandonment during which the earlier troughs became partially infilled, with the new troughs being dug beside the earlier example and incidentally cutting into the backfill. Alternatively they may have been moved slightly to the west and south away from the clear central area.

It is not known at present whether a pair of troughs were always open at the same time. It is possible that two of the troughs may have been in use at any one time, or that there was only one in use at a time. What is clear is that by the time the large shallow pit (C86) to the south was constructed the southern two troughs had gone out of use. This infers that there was still activity being carried out at the site, possibly

Post ex plan of troughs C70 and C73 (top)

Post-ex plan of troughs C7 and C37 (bottom)



suggesting the western troughs are later. This will be investigated when looking at the radiocarbon dates for the site.

The four troughs identified on the site were all sub-rectangular in shape, though the western two were more elongated. There was an interesting comparison between the troughs with the earlier troughs being replaced with a broadly similar trough both to the west and south. Does this suggest they served different functions, or that they were constructed at different times? The two western troughs (C70 and C73) measured 3.74-4.2m in length, 1.3-1.56m in width and 0.5-0.6m in depth and the two southern troughs (C7 and C37) 1.3-1.77m in length, 1.4-1.05m in width and 0.51-0.83m in depth. Of the twelve fulachtaí fia excavated along the N8 road scheme in counties Tipperary, Limerick and Cork, the trough sizes ranged from 1.8-5m in length, 0.88-2.5m in width and 0.33-0.77m in depth (McQuade et al 2009, 120). This shows that the Knockaphunta troughs are within the range of trough size seen elsewhere in the country.

A single find was associated with the fulacht troughs: a fragment of unburnt animal skull found in the upper fill (C8) of the earlier of the southern troughs (C7). This is a common feature of fulachtaí fia, where food waste and other finds are notable in their relative absence (Waddell 1998, 177). The remainder of the finds uncovered during the excavation relate to later disturbance of the site. It is possible that this fragment of bone from the trough also derives from modern disturbance or intrusion, as it was retrieved in the vicinity of the animal burrow to the south of the trough.

Intensity of use

The internal dimensions of the lined trough (C73) were significantly smaller at 2.6m in length, 0.6m in width and 0.6m in depth, which indicates that if there previously was a lining in the other troughs, their capacity would have been significantly reduced. When the lining of trough C73 is taken into account, the Knockaphunta troughs have an average capacity of 1.65m3. Enough fire-cracked stones were excavated in the spread (c. 161m3) to fill one of the troughs over 97 times. A water-filled trough would have required at most to be half-filled with stones in order to boil water (Fahy 1960, cited in Sheehan 1990, 35; Dennehy 2008, 14),

but almost certainly far less hot stones were used per trough heating (Hawkes 2015). Experiments carried out by M.J. O'Kelly in 1952 relating to a site at Ballyvourney I, Co. Cork demonstrated that cooking, both with the trough filled and empty of water, could be carried out in fulacht troughs and in his experiments produced c. 0.5m3 of waste broken stone in the process (Waddell 1998, 175). Numerous other experiments relating the use of fulachtaí fia have been carried out since then, for example Denvir's experiments in 1999, which demonstrated that fulachtaí fia could be used in textile processing for washing, dying and fulling (Denvir 1999, cited in Dennehy 2008, 14). She found that only twelve heated stones were required to bring the trough to boil and one stone every ten minutes added to keep a constant temperature (ibid.). As Dennehy has pointed out, (Dennehy 2008, 14) there are issues with using the size of the burnt mound material to exactly identify the number of uses of the site, however it can be used to infer the intensity of use. Based on the volume of waste produced as suggested in O'Kelly's experiments there could have been up to 322 separate heating episodes on the site at Knockaphunta, assuming the stones were heated only once. Using Fahy's figure of a half-filled trough this would suggest c. 195 heating events. Buckley has demonstrated that sandstone, which formed the bulk of the burnt stone spread from the site, could be heated and cooled around five times before breaking into unusable fragments (Buckley 1990, 171). This may suggest that the site could have been used up to 975 (after Fahy),or even 1,610 times (after O'Kelly). Even taking the lowest possible projection of 195 events, this implies an extended presence in the area. The site was used intensively and suggests repeated use.

Linings

One point that should be made relates to the ability of the various troughs to hold water. Two distinct natural layers were identified on the site: a white and yellow sand to the north; and a yellow boulder clay with large degrading grey sandstone boulders to the south. All the features identified on the site were initially cut through the upper sand layer. As well as making the job of the archaeologist very easy, with the

Post-ex photo of partial stone lining in trough C73, looking north (top)

Post-ex photo of trough C37 with stones present in corner that may be the remains of a stone lining (centre)

Mid-ex photo of section through trough C7 with upright stone at northern edge of trough, possibly representing the remains of a stone lining, visible to the left (bottom)

dark fills of the various features standing out clearly from the pale natural sand, this material was also easy to dig. It was also easily eroded, as seen in a number of the features where the edges were difficult to identify clearly as they had collapsed and been undercut in the past. This natural sand would not have efficiently held water, however, as the water would not stand in the pits for long. Interestingly the two troughs to the south (C7 and C37) were dug down through the upper sand layer and into the boulder clay below, suggesting they would have been more water-tight. The two eastern pits of the water management system (C51 and C77) were also dug into the underlying boulder clay.

The question must be posed as to how water was held within these troughs and pits for any great time. Indeed, with the two later troughs, which were partially cut into earlier partially backfilled troughs, the ability to hold water would have been reduced even further. It is highly likely that the troughs previously had linings that have not survived, such as clay or natural materials such as wicker or leather. It is unlikely that they were wood-lined as the cuts were not formalised enough with straight edges to have housed a wooden lining. In the case of the trough that was partially lined, the lining was clearly not intended to create a water-tight container, as the stones were rounded and uneven with gaps and holes. There was some suggestion that the two troughs to the south (C7 and C37) may also have had poorly surviving stone linings. These lining appears to relate to a formalising of the sides of the troughs, possibly in an attempt to avoid collapse, rather than provide a water tight layer.

By contrast, the sides of some of the pits forming the water management system were particularly eroded and undercut, which would have happened naturally as water passed through the water management system, and suggests these pits were never lined.

Partially stone-lined troughs similar to Knockaphunta have been identified elsewhere. A partially stone-lined fulacht trough was excavated in Brackbaun, Co. Limerick with rounded stones recorded along the short side of the trough (McQuade et al 2009, 102). A fragment of timber on the base of the trough suggested it had been lined (ibid.). Another trough partially lined with stone was recorded at Clonmore North, Co. Tipperary (ibid., 107).

72 sites in Mayo are recorded as single or multiple fulachtaí fia in the online Excavations Bulletins. An additional 24 sites are recorded as burnt mounds. Some of these may form part of the 383 fulachtaí fia and 145 burnt mound sites listed in the RMP files for the county. It is interesting to note that of the 96 fulacht fiadh and burnt mound sites excavated, only 8 are recorded as having been dug into a sandy natural. A further seven note the presence of sand, possibly derived from crushed or broken down burnt sandstone, at the base of fulacht troughs. While this could also be due to a lack of sandy subsoils in the county, it would seem that it was not ideal to locate a fulacht on sandy natural in Mayo, with only 8.3% of excavated examples recorded as being cut into this material. The majority were cut into natural boulder clay or peat, with boulder clay offering better impermeability and peat, being water-logged, not causing the troughs to drain easily. Whether the site was located in sandy subsoil intentionally is unknown, however the ability of the troughs to self-drain after use might have been seen as a benefit for cleaning for example. Theoretically, if a temporary lining such as leather was used this could be removed after the processing or cooking was completed allowing the water to seem into the natural sand surrounding the trough and making the removal of the fractured stone from the trough easier.

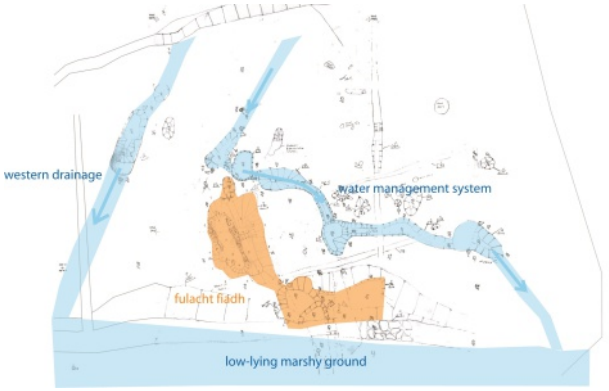
The water management system

To the north of the fulacht troughs a series of pits and channels appear to have managed a small stream or watercourse from the top of the drumlin, directing it through five pits (C9, C41, C33, C51 and C77) via a number of small channels (C44, C94, C31 and C81) from northwest to southeast. The system skirts around to the north of the area the fulacht troughs are located in, diverting any uncontrolled water away from the area and off towards the low-lying, probably marshy ground, to the southeast.

Two of the pits along the system were deeper and more pronounced than the others. Interestingly these also happen to be the pits closest to the fulacht troughs with the second pit of the water management system (C41) lying to the north of the two western troughs and the fourth pit (C51) lying to the northeast of the southern two troughs. These pits could have been used to provide water to the fulacht troughs in a controlled manner.

There was some evidence for the control of water flowing through the system with steps in the base apparent in two of the channels (C44 and C31). This may have allowed some of the pits to be filled and emptied at various times. There was also some suggestion that not all the pits were in use at the same time, with the second pit from the north (C41) having been partially filled in prior to the abandonment of the system.

Was this series of pits and channels created simply to provide a water source for the fulacht troughs, or could they have served an additional purpose? Perhaps they represent another stage in the processing being carried out at the site. In contrast to the hot water being produced in the fulacht troughs, the water managed from this series of channels and pits would have been cold, and simultaneous access to varies temperatures (boiling, tepid, cold) of water may have been an important aspect for the prehistoric activities carried out on the site.



Interpretative plan showing the water management system in relation to the fulacht fiadh with the low lying ground highlighted to the south (top)

Post-ex photo of the step in the base of channel C31 (bottom)

To the author, this water management system associated with the fulacht fiadh appears more elaborate than those seen at other fulacht fiadh sites. The fulacht fiadh was located towards the base of the low drumlin with a low-lying and presumably marshy, wet and boggy area immediately to the south, in the vicinity of the post-medieval field boundary. This could have served to provide water for the fulacht troughs, however a somewhat elaborate water management system was created instead, probably fed by a small streamlet running from the top of the drumlin to the north into the lowland area to the south of the fulacht fiadh. The water in the boggy and marshy area between the two drumlins appears to have been rejected. It is possible that the water in the marshy area was dirty or stagnant and a source of clean fresh water was more desirable.

A second water management or drainage system was recorded to the west with two features (C20 and C22) arranged along a similar northeast-southwest alignment. Previously a third feature was identified to the southwest of the larger pit (C22), however this was very shallow and did not survive well enough to record during the excavation. On reflection, this may be the base of a second water management system to the west of the fulacht, possibly designed to protect the western side of the working area around the fulacht fiadh from inundation, directing water away from the area to the southwest.

The clear areas

The archaeological features on the site were defined by channels and pits cut into the subsoil. However, areas without these would still have been utilised. Limited archaeology was noted to the north of the site, but given the shallow depth of topsoil in this part of the site it is very likely that agricultural activity and other post-medieval and modern disturbance would have impacted on features in this part of the site.

During the excavation it became clear that two areas of the site had conspicuous absences of cut features. The first of these was located to the west between the north-northeast to south-southwest trend of pits (C20 and C22) and northern end of the northwest-southeast running water management system and western troughs. This strip may have been the access route down the slope towards the fulacht troughs. The trend of pits to the west were possibly channelling a second small water course, protecting the western side of the path. This would have allowed for access down to the western troughs along their western side.

View of the site looking east with clear strip possibly representing the access to the site to the west of the unexcavated troughs C70 and C73 visible in the centre. (top)

View of the site looking north with clear area in centre of site apparent surrounded by the dark fills of the cut features (centre)

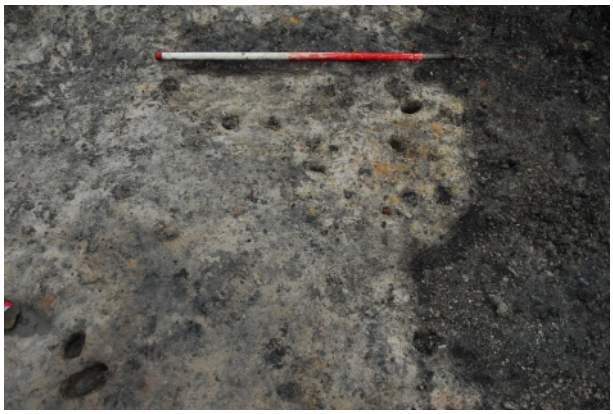
Interpretative plan showing the clear areas (bottom)

The second area where there was a conspicuous absence of features was in the centre of the site between the water management system and the fulacht troughs to the west and south. This area measured 4.2m x 2.6-3m and was roughly parallel to and of similar proportions to the combined area of the two western troughs (C70 and C73). This blank space at the heart of the site was intriguing and was immediately apparent during the excavation. There are two possible suggestions for it being left untouched. The first is that this was the original location of the burnt mound, and the reason no cut features exist in this area was because it was occupied by the pile of burnt stone and charcoal waste created during the use of the fulacht fiadh. This interpretation is supported by the sequence of construction of the fulacht troughs, as later troughs were recut slightly further away from this open area. It could be suggested that there was a need to move the troughs away from the ever increasing and spreading burnt mound. An alternate interpretation is that this open area was kept free as the work area of the site allowing the various pits and troughs to be accessed from a central location. This suggestion is also plausible, as from this central area three of the pits along the water management system (C33, C41 and C51) are readily accessible, as well as the troughs to the south (C7 and C37) and the west (C70 and C73).

Hearths and firing locations

Four possible hearths or firing locations on the site. The first is to the east of the site beyond the eastern limit of the burnt spread and consisted of a small sub-circular pit (C35). This pit was found to have a natural stone along one side of the base that exhibited signs of in situ burning, suggesting the pit may have been used as a hearth. The location of the pit is quite far removed from the fulacht activity however and it seems unlikely that this pit was used to heat the stones for the fulacht as they would then have to be transported while hot to the troughs. The feature may still have been a hearth, but serving a different function.

The second possible hearth is suggested more by its location. This is a pit (C84) to the west of

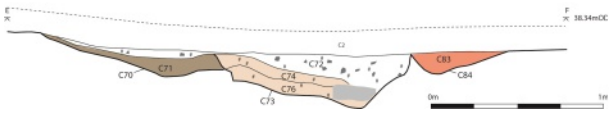


Plan showing the location of the possible hearths and firing locations (top)

Post-ex photo of pit C35, looking north (middle)

Mid-ex photo of pit C46, looking east (bottom)

and cut by the stone-lined fulacht trough (C73). The proximity of this pit to the earlier trough (C70), also cut by the later stone-lined trough, suggests it was associated with the earlier trough, with use as a hearth being a possibility. The location of the pit would have been ideal as



Mid-ex photo of north-facing section through troughs C70 and C73 and pit C84 to right, looking south (top)

North-facing section through southern end of troughs C70 and C73 and pit C84 (middle)

Mid-ex photo of site with the eastern extent of shallow pit C86 apparent to the right of baulk (bottom)

there would not have been a need to move the hot stones any great distance. The grey silt fill (C83) of the pit may derive from a concentration of ash within the hearth, and the fill was different from the fills of the other features in the vicinity.

A shallow possible hearth (C46) was identified to the north of the western troughs. The location of this pit, in close proximity to the troughs, and the presence of stake holes at either end of the base of the pit may suggest the feature represents a hearth, with the stake-holes possibly the remains of a light spit or associated structure. The stakes would have been very lightweight however, and there was no in situ burning noted within the pit. The location of this pit between the presumed water supply for the fulacht and the troughs as also somewhat problematic as the presence of a hearth here would likely have been an obstacle while the fulacht was in use.

The final possible firing location is over and on top of the burnt stone refuse itself. This is suggested by a concentration of fire reddened burnt stone (C24) within the large shallow pit (C86) to the south of the site. The pit (C86) cut and overlay the two troughs to the south (C7 and C37) and was somewhat unusual given its size and the shallow nature of the cut. It is unclear what function this served. One possibility is that it was used to house the growing burnt mound waste material after the southern two troughs had gone out of use. It contained fire-reddened burnt stone in higher concentration than elsewhere indicating these stones had been directly fired. Dennehy has suggested (2008, 11) that concentrations of reddened stone within the burnt mound material may indicate the location of hearths located within the burnt mound rather than on the natural subsoil nearby.

Additional features on the site

A number of other features were identified on the site during the excavation. To the east a series of five features (C28, C56, C58, C62 and C64) were identified to the north of the water management system. It is possible that these features may represent a line of root boles relating to a hedgerow previously running along the northern side of the water management system. This would explain their poor definition and lack of regularity, while also making sense practically. A hedgerow along the higher ground to the north of the water management system would have given some protection to the pits and channels to the south limiting the flow of

water into the system from the sides and firming up the ground above the area of activity associated with the fulacht fiadh. If a hedgerow was allowed, or encouraged, to grow along the side of the water management system, this suggests a long term use of the site, and perhaps a certain level of planning.

Five stake-holes (C15, C16, C48, C49 and C50) were recorded during the excavation in the area between the western fulacht troughs (C70 and C73) and the northern end of the water management system (C9 and C41). It is unclear whether these stake-holes were related to one another. They did not form a regular shape, however they may be deeper surviving elements of a light structure associated with the fulacht fiadh. Alternatively they may have served separate functions, with two possibly associated with a structure relating to a hearth, as suggested above.

Plan showing the location of the possible hedgerow to the north of the water management system (top left)

Location of the closest RMP sites to the site (bottom left)

Occupation in the wider area

In the later 19th century a 26-foot long canoe made of oak (suggesting a dugout canoe), was recovered during drainage works at a lake near Castlebar (NMI Files; Ref 1882:365). The lake is not specified but it may well be Lough Lannagh, which lies just outside the northwestern limits of the town. The boat is recorded as containing some 'stone implements' and some bones, and was presented to the museum by the Governor of Castlebar Prison. A second record for a dugout canoe, identified as having been recovered from Lough Lannagh, refers to a sample from the boat taken for the purposes of radiocarbon dating. It is noted in the files that the boat itself was not in the possession of the museum, and it must be assumed it is a separate boat to that of the 1882 acquisition. The files held no results of the carbon 14 dating, and it is unknown if this was carried out (NMI files).

Archaeological investigations in recent decades have uncovered numerous fulachtaí fia in the wider Castlebar area, indicating human activity in the area in the Bronze Age. The discoveries of the dugout canoes at Lough Lannagh and a bronze axehead, bronze cake and gold bracelets in the neighbourhood of Castlebar, also attest to prehistoric activity in, and possibly occupation of, the area. Castlebar provides an area of fertile ground to the south of the poorer mountainous lands, and close to the shores of Lough Lannagh and other smaller lakes, and thus would have been an attractive settling point in prehistory.

The RMP files also record the presence of a burnt mound, a cairn, a mound and a stone circle, all of which may date to the prehistoric period, in the vicinity of the town. The stone circle, located to the east of the site to the south of Saleen Lough and one of 24 known from

Mayo, lies 1km from the site. These are largely dated to the Bronze Age and are believed to have served a ritual function, further indicating an occupation of the lands in the vicinity of the site during the Bronze Age. A number of undated enclosures in the vicinity are also recorded, though these may relate to later periods.

While the settlement evidence in the immediate area is somewhat low at present, the large number of fulachtaí fiadh in the vicinity would suggest that a relatively substantial population was present in the area throughout the prehistoric period. The evidence from the archaeological excavation of the fulact fiadh at Knockaphunta suggests this site was used repeatedly, probably over an extended period of time, and formed part of the landscape of the people that used it.

Post-ex plan of the site

Section 4 Specialist reports

Specialist analysis and reporting on the archaeological material retrieved from the excavation is to be carried out and will be compiled as part of the final report when they are returned.

The specialists selected for the project are as follows:

Post-medieval pottery: Antoine Giacometti
Environmental analysis: Lorna O'Donnell
Animal bone: To be confirmed

The metal finds will be catalogued and recorded in house.

Based on the results of the environmental analysis it is hoped to identify datable material from a number of key features across the site. Radiocarbon dates will be obtained for the fulacht troughs to date the general period of use of the site and in an attempt to identify the duration of use of the site and order of use of the fulacht troughs. This is dependent on the quality and suitability of the datable material returned from the environmental analysis.

It is hoped that these additional analyses will be able to further the understanding of the site and add the overall picture of the excavation. The dating evidence will help greatly to give context to the fulacht fiadh, allowing it to be placed into a time frame for activity in the Mayo region and allow for comparison with other fulachtaí fia in the region. It will also be possible to see what other sites are present in the surrounding area during this time, giving a further insight into who may have been living in this area and using this fulacht site.

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APPENDIX A Context Register

Context	Type	Fill of	Filled by	L. (m)	W. (m)	D. (m)	Interpretation	Description	Finds/ Ecofacts	Context Above	Context Below
C1	Spread	n/a	n/a	34.2m	25-30.5m	0.05-0.2m	Topsoil	Topsoil. Mid brown silty clay topsoil overlying the disturbed burnt spread in places. In some places the topsoil had been removed in the recent past and the disturbed burnt spread lay directly below the sod	modern pottery, glass	C2	n/a
C2	Spread	n/a	n/a	22.8m	17.7m	0.17-0.4m	Burnt spread	Disturbed burnt spread consisting of dark grey to black sandy silt with occasional burnt sandstone inclusions and frequent charcoal. Orientated E-W. Modern ceramics, glass and metal were found within all levels of the disturbed burnt spread. Slopes down from north to south and overlies majority of the features on site.	bone, modern pottery, glass, iron	Multiple	C1
C3	Cut	n/a	C4	0.33m	0.25m	0.13m	Posthole	Post hole to N of pit C9. Oval in plan, orientated E-W. Sharp break of slope at top, more gentle at base, concave base. Near vertical sides to N and W, gently sloping side to E possibly for erection of post	n/a	Natural	C4
C4	Fill	C3	n/a	0.33m	0.25m	0.13m	Fill of posthole	Fill of post hole C3. Dark grey to black sandy silt with occasional burnt sandstone inclusions and frequent charcoal	SS#1	C3	C2
C5	Cut	n/a	C6	30.85m	0.9m	0.55m	Cut of Post med field drain	Sharp break of slope with a concave base. Stone lined at top and sides. Running E/W cutting burnt spread C7 N to S	n/a	C2	Natural
C6	Fill	C5	n/a	30.85m	0.9m	0.55m	Fill of field drain	Fill consists of rock and stone, some being placed as lining of drain.	bone, modern pottery, glass, iron	C2	C5

Context	Type	Fill of	Filled by	L. (m)	W. (m)	D. (m)	Interpretation	Description	Finds/ Ecofacts	Context Above	Context Below
C7	Cut	n/a	C8, C28	1.77m	1.4m	0.51m	Cut of pit/ trough	Cut of trough pit orientated E-W. Truncated by animal hole C92 to S and later trough pit C37 to SW. A later shallow trough pit (C86) truncates the top of the pit. Sharp break of slope at top and gradual at base, which is flat. Sides are relatively steep at c. 60 degrees to W, 70 degrees to E and 80 degrees to N, being slightly concave. Some suggestion that there may originally have been a stone lining to the pit, however only one stone survives along the northern edge.	n/a	C26	Natural
C8	Fill	C7	n/a	1.5m	1.50m	0.15m	Upper fill of pit/ trough	Dark sandy silt with some burnt stone and charcoal inclusions. Loose compaction. Upper surviving fill of pit/trough C7.	bone, SS#8	C37	C26
C9	Cut	n/a	C10,11, 12	1.85m	0.83m	0.17m	Cut of pit	Sub-retangular pit, part of water management system. Partially truncated during monitoring, surviving better to north. Orientated NE - SW. Break of slope sharp at top to NW & SE. Concave sides with gradual break of slope at base, sides at c.40 degrees. Base slightly uneven with one natural stone protruding into it.	n/a	C10	Natural
C10	Fill	C9	n/a	0.53m	0.39m	0.02m	Basal fill of trough	Thin layer of black silt with frequent inclusions of charcoal. Very compact. Located at east end of pit. Basal fill of C9. Relates to initial use of pit.	SS#3	C11	C9
C11	Fill	C9	n/a	1.09m	0.68m	0.05m	Secondary fill of pit	Mottled light grey, white and dark grey silty sand with occasional charcoal flecking and burnt stone. Re deposited material. Located mainly in deeper section to east. Secondary fill of pit C9. Suggests re-use of pit on more than one occasion	n/a	C12	C10
C12	Fill	C9	n/a	1.85m	0.83m	0.08 0.01m	Upper fill of pit	Dark grey to black gritty sandy silt. Frequent charcoal and burnt stone inclusions typical of fulacht material. Was overlaid by C2 disturbed burnt spread material. Main fill of pit relating to its final backfilling	SS#2	C2	C11

Context	Type	Fill of	Filled by	L. (m)	W. (m)	D. (m)	Interpretation	Description	Finds/ Ecofacts	Context Above	Context Below
C13	Cut	n/a	C14	0.50m	0.26m	0.05m	Shallow pit	Oval in plan. Very shallow, only the base of the feature survives. Concave sides and base. Orientated N - S. Lies to SW of pit C9. A stake hole C15 is located SW of base of pit. The fill of the stake hole was very similar to the fill of the pit, both probably filled at the same time.	n/a	C14	C15
C14	Fill	C13	n/a	0.50m	0.26m	0.05m	Fill of shallow pit	Dark grey to black sandy silt with inclusions of charcoal and burnt stone which is typical of burnt spread material. Overlies stake C15, though the fills are most likely the same .	n/a	C2	C13
C15	Stakehole	n/a	n/a	0.08m	n/a	0.1m	Stakehole	Small circular stake hole, located along the SW side of small pit C13. Vertical sides, slightly tapered base with a stone present at base. Filled with black sandy silt with frequent burnt stone and charcoal	n/a	C13	Natural
C16	Stakehole	n/a	n/a	0.12m	0.07m	0.8m	Stakehole	Stakehole to SW of stakehole C15 outside pit C13. Oval shape in plan with vertical sides and slightly tapered base. Filled with black sandy silt with frequent burnt stone and charcoal	n/a	C2	Natural
C17	Cut	n/a	C18	1m	0.54m	0.11m	Cut of oval pit	Oval shaped pit, running N-S. Sharp break of slope at top, concave sides. Sides to east and west steeper.	n/a	C18	Natural
C18	Fill	C17	n/a	1m	0.54m	0.11m	Fill of oval pit	Dark grey to black sandy sily, with inclusions of fire cracked stone and charcoal. Densely packed with stone in central portion of pit.	n/a	C2	C17
C19	Fill	C85	n/a	30.5m min	12m	0.31m	Fill of field bour	Organic fill of post-medieval field boundary ditch C85. Dark brown organic-rich peaty silt with occasional inclusions of post-medieval pottery and glass	Modern pottery	C2	C85
C20	Cut	n/a	C21	0.84m	0.60m	0.02m	Cut of pit	Very shallow remains of pit towards north end of burnt spread with only base surviving. Orientated NE - SW. Same aalignment as pit C22 to the SW.	n/a	C21	Natural
C21	Fill	C20	n/a	0.84m	0.60m	0.02m	Fill of pit	Dark grey sandy silt with occasional burnt stone.	n/a	C2	C20

Context	Type	Fill of	Filled by	L. (m)	W. (m)	D. (m)	Interpretation	Description	Finds/ Ecofacts	Context Above	Context Below
C22	Cut	n/a	C23, C67, C68, C69	2.37m	0.88m	0.34m	Cut of pit	Sub-rectangular linear pit orientated NNE-SSW to west of site. Flat base to north becoming V-shaped to south. S end has a shallow extension to the south for 0.75m, probably overspill of upper fill over that end. E side is concave. Sharp break of slope to top and gentle at base. N end of W side straight straight and concave to south.	n/a	C23	Natural
C23	Fill	C22	n/a	2.03m	1.24m	0.04-0.07m	Fill of pit	Thick compact black charcoal-rich sandy silt at base of pit. Ocassional unburnt stone present	SS#10	C67	C22
C24	Fill	C86	n/a	5m	1.20m	0.40m	Fill of pit	Red/brown fill consisting of very frequent fire cracked stone. Dense compaction however the lack of soil binding the burnt stone gave the appearance of loose compaction	SS#7	C2	C25
C25	Fill	C37	n/a	1.25m	1.1m	0.12m	Fill of trough pit	Dark brown slightly organic clayey silt with inclusions of charcoal and occasional burnt stone. Loose compaction.	SS#6	C24	C39
C26	Fill	C7	n/a	1m	0.20m	0.12m	Fill of trough pit	Light coloured sandy silt with some stone inclusions and thin lens of charcoal at the base. Loose compaction. Basal fill of trough pit C7 at the northern end. Related to collapsing sides mixing with some of the fill of the trough	n/a	C8	C7
C27	Fill	C28	n/a	0.42m	0.48m	0.07m	Fill of shallow pit	Dark brown silty clay. Located within a sub-circular pit.	n/a	C2	C28
C28	Cut	n/a	C27	0.42m	0.48m	0.07m	Cut of shallow pit	Sub-circular pit. Gradual break of slope with concave base. Adjacent to linear furrow C29.	n/a	C27	Natural
C29	Cut	n/a	C89	8m min.	0.22-0.45m	0.2m	Cut of agricultural gully	Linear furrow or gully running ENE-WSW parallel to C87 gully. U-shaped in profile with concave base and concave sides. Post-medieval agricultural feature	n/a	C89	C2

Context	Type	Fill of	Filled by	L. (m)	W. (m)	D. (m)	Interpretation	Description	Finds/ Ecofacts	Context Above	Context Below
C30	Spread	n/a	n/a	5m min.	3m min.	0.15-0.34m	Buried topsoil	Buried topsoil below C2 to W. Mid-brown silty clay with inclusions of white wares, brick and large boulders. Layer of topsoil overlaid by C2 when the burnt spread was disturbed, probably during the 20th century	Modern pottery	C2	Natural
C31	Cut	n/a	C32	2.55m	0.46-0.58m	0.04-0.11m	Cut of linear feature	Sharp break of slope top and bottom, near vertical sides, flat bottom. Distinct step in the base, slopes down on southern side at approx 45 degree angle, slopes up on northern side at 60 degrees. Top of step is 0.04m below top of feature. Bottom step is 0.11m to south and 0.08m to north. Curved linear feature running NW-SE at northern end, turning to run N-S at southern end. Running from pit C33 to pit C51, which are likely to be contempory. Step was possibly to control flow of water to feature.	n/a	C32	Natural
C32	Fill	C31	n/a	2.55m	0.46-0.58m	0.04-0.11m	Fill of linear feature	Southern end was a very dark grey coarse sandy silt with inclusions of burnt stone and charcoal similar to burnt spread material. Loose compaction. Northern end was a mid- to dark grey silty sand with occasional burnt stone and charcoal, similar to basal fill (C34) of pit (C33) to the NW	n/a	C2	C31
C33	Cut	n/a	C34, C40	1.55m	0.95m	0.25m	Cut of pit	Oval /linear pit with curvilinear channel C31 leading from its E side, connected with a short narrow channel to pit C41 to the W. Appears to be one of 5 interconnected pits, connected with shallow , narrow channels coming down the slope, with C9 leading into C41 via C44 channel, C41 leading into C33 via a 0.2m long and 0.25m wide x 0.1m deep channel, C33 leading into C51 via channel C31, and C51 leading into C77 via channel C81. All appear contemporary. Concave sides, concave base, sides at 45 degrees. Relating to water management system.	n/a	C34	Natural

Context	Type	Fill of	Filled by	L. (m)	W. (m)	D. (m)	Interpretation	Description	Finds/ Ecofacts	Context Above	Context Below
C34	Fill	C33	n/a	1.45m	0.9m	0.09m	Fill of pit	Mid- to dark grey mottled silty sand with burnt stone and occasional charcoal inclusions. Moderate compaction. Similar to C32 to the east but fill sandier and lighter in colour. Basal fill of pit C33. Possibly from initial silting up of feature.	n/a	C40	C33
C35	Cut	n/a	C36	0.72m	0.61m	0.09m	Cut of pit	Sub-circular shape in plan, U-shaped in profile. Concave edges. Sharp break of slope at top more gradual at base. Root disturbance to west.	n/a	C36	Natural
C36	Fill	C35	n/a	0.72m	0.61m	0.09m	Fill of pit	Dark brown clayey silt with inclusions of charcoal and stone, some of them burnt. Loose compaction. At the lower levels the dark fill is mixed with a natural soil and as a consequence has become more compact.	n/a	C1	C35
C37	Cut	n/a	C39, C25	1.3m	1.05m	0.83m	Cut of trough pit	Sub rectangular in plan orientated NE-SW. Sharp break of slope at the top and slightly more gentle at base. Very steep sided to NE and NW, SE side removed though part of corner present to E to N of truncation by drain C5. Base flat. Truncated by field drain C5 to S. Truncates trough C7 to north, being 0.3m deeper than that trough.	n/a	C39	Natural
C38	Cancelled							Fill of cut C37	n/a		
C39	Fill	C37	n/a	1.3m	1m	0.09m	Fill of trough	Dark grey brown clayey silt with orange mottle from decaying organics running through it. No inclusions and a loose compaction. Truncated by field drain C5	SS#5	C25	C37
C40	Fill	C33	n/a	1.55m	0.95m	0.13-0.19m	Fill of pit	Dark grey to black sandy silt, with frequent burnt stone and charcoal inclusions, typical of burnt spread material. Loose compaction. Upper fill of pit C33, relating to deposition of burnt spread type material into pit after it had gone out of use, either intentially or over time.	SS#4	C2	C34

Context	Type	Fill of	Filled by	L. (m)	W. (m)	D. (m)	Interpretation	Description	Finds/ Ecofacts	Context Above	Context Below
C41	Cut	n/a	C42, C43	1.46m	1.05m	0.27m	Cut of pit	Sub-rectangular pit with the upper portion of the pit largely truncated to the W and S. Lies between pits C9 to NW and C33 to E, connected to C9 by channel C44, connected to C33 by a short unnumbered channel. Steep sided, near vertical in places, partially undercut to east, probably through water action cutting into sandy natural giving the side a bowed appearance. Flat base, sharp break of slope at top and base. Intentially backfilled with C43, which was compacted down into pit. Pit forming part of a series of pits & water management channels & associated with burnt stone technology.	n/a	C43	Natural
C42	Fill	C41	n/a	1.00m	0.26m	0.07m	Upper fill of pit	Black sandy silt with frequent inclusions of burnt stone and charcoal. Likely to relate to burnt spread material being eroded into backfilled pit or intentially being dumped into pit. Partially truncated during stripping. Loose compaction. Upper fill of C41 pit surviving to E	n/a	C2	C43
C43	Fill	C41	n/a	1.46m	1.05m	0.21m	Basal fill of pit	Mottled yellow grey silty sand with occasional inclusions of burnt stone and charcoal. Very compact suggesting this is different to basal fills in other pits in system. Cut by channel C44 to NW, this indicates system was still in use when C41 was partially backfilled. Basal fill of pit C41.	n/a	C42, C44	C41

Context	Type	Fill of	Filled by	L. (m)	W. (m)	D. (m)	Interpretation	Description	Finds/ Ecofacts	Context Above	Context Below
C44	Cut	n/a	C45	0.80m	0.25 - 0.50m	0.04-0.12m	Cut of channel	Almost V-shaped in profile with steep sides to the south. Sharp break of slope attop and base. More gradual U shaped to north with wider basw and less steep sides. Slopes down into SW corner of C42 & down slightly into C9, this creates a slight step in the base of the channel just before point it passe into the partially backfilled C41, possibly for water control. Channel leading from C9 pit to the NW into C41 pit to the south. Orientated NW - SE. 2 large stones at NW end beside edge of C9	n/a	C45	C43
C45	Fill	C44	n/a	0.80m	0.25-0.50m	0.04-0.12m	Fill of channel	Black silt with occasional burnt stone and frequent charcoal inclusions. Similar to upper fills of C9 and C41 pits but water related rather than deposited burnt mound material. Lies between pits C41 and C9	n/a	C2	C44
C46	Cut	n/a	C57	0.90m	0.60m	0.03m	Cut of pit	Shallow oval pit to SW of pit C41, between C41 and large pits. Concave sides and base. Orientated NNW-SSE. Gradual break of slope at base which is flat. Largely truncated with stakeholes C48 and C49 at either end.	n/a	C47	C48
C47	Fill	C46	n/a	0.90m	0.60m	0.03m	Fill of pit	Dark grey to black sandy silt with infrequent burnt stone and occasional charcoal. Moderate compaction	n/a	C2	C46
C48	Stakehole	n/a	n/a	0.06m	0.06m	0.07m	Stakehole	Stakehole at N end of pit C46, tapering to point at base. Fill of the stakehole similar to fill of pit	n/a	C2	C41
C49	Stakehole	n/a	n/a	0.08m	0.06m	0.08m	Stakehole	Stakehole at S end of pit C46, sloping slightly to the north. Sub oval in plan. Fill of the stakehole similar to fill of pit	n/a	C2	C41
C50	Stakehole	n/a	n/a	0.06m	0.06m	0.12m	Stakehole	Stakehole to SW of pit C46, sloping slightly to the north, stake would have leaned to the S. Tapering at base. Fill of stakehole similar to other two stakeholes	n/a	C2	C41

Context	Type	Fill of	Filled by	L. (m)	W. (m)	D. (m)	Interpretation	Description	Finds/ Ecofacts	Context Above	Context Below
C51	Cut	n/a	C52, C53, C54, C55	1.55m	1m	0.48m	Cut of pit	Oval shaped pit. Part of a series of pits including C9, C41, C33, connected to channel C31 to N and channel C81 to E. Steep sided, vertical in places. Sides and base are uneven probably due to water erosion, U-shaped in section. Sharp break of slope top and bottom. Relating to water management system.	n/a	C52	Natural
C52	Fill	C51	n/a	1.2m	0.85m	0.11m	Fill of pit	Basal fill of Pit C51. Mottled yellow, brown and grey silty clay with occasional charcoal. Related to collapsing natural edges and eroding base	n/a	C53	C51
C53	Fill	C51	n/a	1.55m	0.85m	0.19m	Fill of pit	Secondary fill of pit C51. Reddish brown silty clay with occasional charcoal and gravel inclusions. Some orange mottling from decayed organics	SS#12	C54	C52
C54	Fill	C51	n/a	0.5m	0.48m	0.08m	Fill of pit	Fill at N end of pit C51. Light grey clayey silt related to remains of decayed stone. Possibly part of fill C53 below	n/a	C55	C53
C55	Fill	C51	n/a	1.75m	1m	0.22m	Fill of pit	Upper fill of pit C51. Fire-cracked stone and charcoal in a dark grey to black sandy silt. Continues beyond S edge of C51 as overflow	n/a	C29	C54
C56	Cut	n/a	C57	0.48m	0.44m	0.15m	Cut of pit	Regular shape in plan, almost circular. V-shaped in profile. E side has a sharp break of slope at the top , W side more gradual. Sharp break of slope at bottom to E and more gradual to W. E side is concave and W is convex.	n/a	C57	Natural
C57	Fill	C56	n/a	0.48m	0.44m	0.15m	Fill of pit	Dark brown clayey silt. Occasional charcoal and burnt stone inclusions. Very loose compaction.	n/a	C1	C56
C58	Cut	n/a	C59	1.50m	0.85m	0.11m	Cut of pit	Irregular shape in plan. U-shaped in profile. Gradual break of slope top and bottom.	n/a	C59	Natural
C59	Fill	C58	n/a	1.50m	0.85m	0.11m	Fill of pit	Dark brown clayey silt. Occasional charcoal and burnt stone inclusions. Hard compaction.	n/a	C1	C58

Context	Type	Fill of	Filled by	L. (m)	W. (m)	D. (m)	Interpretation	Description	Finds/ Ecofacts	Context Above	Context Below
C60	Cut	n/a	C61	15.2m min	0.50-0.70m	0.08m	Cut of agricultural gully	Linear in plan. Steep-sided U-shape in profile. Sharp break of slope top and bottom, relatively flat base. Cuts the two NE-SW gullies as well as channel C81. Likely to relate to field drain C5, which it is perpendicular to	n/a	C61	C89, C88
C61	Fill	C60	n/a	15.2m min	0.50-0.70m	0.08m	Fill of agricultural gully	Light brown sandy silt. Small stone inclusions. Becomes darker to S as the backfill was mixed with spread C2 material that the gully cut through. Very loose compaction. Brick and post-medieval pottery in fill	n/a	C1	C60
C62	Cut	n/a	C63	1.18m	0.66m	0.09m	Cut of pit	Irregular shape in plan. U-shaped in the middle, fill spreading out beyond main body of cut to E and W. Sharp break of slope top and bottom, concave base	n/a	C63	Natural
C63	Fill	C62	n/a	1.18m	0.66m	0.09m	Fill of pit	Mixture of grey brown clayey silt with some areas of black topsoil. Inclusions of burnt stone. Very loose compaction. Cut by agricultural gully C87 and overlaid by layer C2	n/a	C2, C87	C62
C64	Cut	n/a	C65, C66	0.88m	0.86m	0.08m	Cut of pit	Sub-circular shape in plan. Shallow U-shape in profile. Gradual break of slope at top and bottom. Flat base.	n/a	C65	Natural
C65	Fill	C64	n/a	0.88m	0.86m	0.03-0.04m	Lower fill of pit	Light brown sandy clay. Inclusions of charcoal. Very compacted.	n/a	C66	C64
C66	Fill	C64	n/a	0.88m	0.86m	0.04-0.05m	Upper fill of pit	Dark brown to black clayey silt. Inclusions of charcoal. Loose compaction	n/a	C2	C65
C67	Fill	C22	n/a	2.37m	1.20m	0.05-0.18m	Fill of pit	Mottled yellow and pale grey silty sand with occasional stones and charcoal and infrequent burnt stone inclusions. Compact redeposited natural layer. Secondary fill of pit C22	n/a	C68	C23
C68	Fill	C22	n/a	2.06m	0.55m	0.04-0.07m	Fill of pit	Mid-grey mottled clayey silt with occasional burnt stone and charcoal. Interface between C67 redeposited natural and C69 burnt spread material. Tertiary fill of pit C22.	n/a	C69	C67

Context	Type	Fill of	Filled by	L. (m)	W. (m)	D. (m)	Interpretation	Description	Finds/ Ecofacts	Context Above	Context Below
C69	Fill	C22	n/a	2.75m	0.24m	0.03-0.12m	Fill of pit	Black loose burnt stone and charcoal in sandy silt, typical of burnt spread material. Upper fill of pit C22, continues beyond SW edge of pit	SS#9	C2	C68
C70	Cut	n/a	C71	4.2m	1.56m min.	0.5m	Cut of pit/trough	Sub-rectangular in plan orientated NNW-SSE. Concave sides and slightly undulating base. Gradual break of slope to N and S. Convex side to E with sharp break of slope at base and gentle break of slope at top. Truncated by trough C73 to W	n/a	C71	Natural
C71	Fill	C70	n/a	4.2m	0.82-1.1m	0.03-0.1m	Fill of pit/trough	Light brown sticky silty clay with occasional charcoal inclusions. Moderate compaction.	SS#14	C72	C70
C72	Fill	C70, C	n/a	4.2m	2.40m	0.05-0.28m	Top fill of pit/trough	Layer of fire cracked and burnt stone that lies on top of whole depression caused by the backfilled troughs C70, C73. Part of burnt spread that was deposited over troughs C70 and C73 after C73 goes out of use	SS#13	C2	C74

Context	Type	Fill of	Filled by	L. (m)	W. (m)	D. (m)	Interpretation	Description	Finds/ Ecofacts	Context Above	Context Below
C73	Cut	n/a	C74,75, 76	3.74m	1.3m	0.6m	Cut of pit/trough	Cut of partially stone-lined fulacht fiadh trough. Rectangular in plan orientated NNW-SSE. Vertical side to N, gently sloping and concave to S, though possibly truncated in the past. E and W sides vertical down to the top of sterp for lining, slightly convex at top to N and W with shallow lip at edge of pit before sharp vertical drop to the step for the lining, vertically sided part of trough measures 3.01m in length and 0.95-1.25m in width, narrowing slightly to S. Stone-lining does not survive at S end of E and W sides, and not present along N side. Lining sits on a slight step 0.30m width and 0.08-0.13m above base, the step being more pronounced to the W. Base is generally flat. Stones forming lining are sub rounded and unburnt natural degraded sandstone boulders common in the boulder clay nearby. They range in sizes 0.15 x 0.13 x 0.10m to 0.41x 0.18 x 0.17m to 0.32 x 0.28 x 0.26m. 7 stones line the west side with an additional stone ex situ further to the S, 8 stones line the E side.	n/a	C76	C71, C83
C74	Fill	C73	n/a	3.01m	0.75-1.03m	0.07-0.14m	Upper fill of pit/trough	Mid grey sandy silt, occasional unburnt stones. Natural deposition/ pooling occurring in depression caused by infilled pit. Present at top of stones lining east side of pit.	n/a	C75	C72
C75	Fill	C73	n/a	c. 2m	0.49-1.04m	0.01-0.11m	Fill of pit/trough	Dark grey to black sandy silt with frequent charcoal and occasional light grey clay clumps. Also occasional burnt stone. Post use fill. Present in northern 2 sections	SS#16	C76	C74
C76	Fill	C73	n/a	3.01m	0.41-0.85m	0.05-0.11m	Basal fill of pit/trough	Yellow and grey mottled sandy clay with occasional unburnt stone and charcoal inclusions. Present in all 3 sections. Initial silting up of pit.	SS#15	C73	C75

Context	Type	Fill of	Filled by	L. (m)	W. (m)	D. (m)	Interpretation	Description	Finds/ Ecofacts	Context Above	Context Below
C77	Cut	n/a	C78,79, 80	2.50m	1.30-0.80m	0.38m	Cut of pit	Pear-shaped pit with wider end to NW. Sharp break of slope to top and gentle at base. Concave sides and base. Appears to be cut by shallow channel C81 which runs from E side of C51 pit. Part of water management system	n/a	C78	Natural
C78	Fill	C77	n/a	2.2m	0.51m	0.07m	Basal fill of pit	Mottled grey and yellow silty clay with occasional charcoal flecks and stones, some of which are burnt.	n/a	C79	C77
C79	Fill	C78	n/a	1m	0.14m	0.03m	Charcoal layer in pit	Charcoal layer along SW side of pit 0.03m deep. Dark black colour in silt matrix.	n/a	C80	C78
C80	Fill	C79	n/a	2.5m	1.3m	0.2m	Upper organic fill of	Dense peat dark brown organic rich fill with very frequent stones.	SS#11	C2	C79
C81	Cut	n/a	C82	6m	0.60-0.70m	0.07m	Cut of channel	Runs E-W initially, turning to SE near pit C77 then back to E-W through pit.	n/a	C82	C80
C82	Fill	C81	n/a	6m	0.60-0.70m	0.07m	Fill of channel	Rich dark brown organic clayey silt with occasional burnt stone, gravel and charcoal which is more prevalent to W as it emerges from C57. Pre dates C55, upper fill of C51. Loose compaction	n/a	C55, C2	C81
C83	Fill	C84	n/a	0.7m	0.6m	0.15m	Fill of pit	Mid grey clayey silt with thin spread of burnt stone and charcoal on top. Dense fill	n/a	C73	C84
C84	Cut	n/a	C83	0.7m	0.6m	0.15m	Cut of pit	Cut of small shallow pit to west of and truncated by trough C73. Oval in plan orientated N-S. Concave sides and base. May have related to C70 trough, also truncated by C73 to E.	n/a	C83	Natural
C85	Cut	n/a	C19	30.5m min	12m	0.31m	Field boundary ditch	Cut of field boundary ditch to south filled by C19. Wide shallow cut, which extended to S beyond the limit of excavation. Trench inserted to assess full dimensions of ditch. A wide, possibly informal ditch used as a field boundary in the 19th century.	n/a	C19	Natural
C86	Cut	n/a	C24	5m	1.20m	0.40m	Cut of large shallow pit	Wide shallow pit with near vertical side to N, more gentle sides to E and W. Orientated E-W. Truncated to S by C5 field drain. Truncates top of pits C7 and C37. Possibly relates to fulacht activity.	n/a	C24	Natural

Context	Type	Fill of	Filled by	L. (m)	W. (m)	D. (m)	Interpretation	Description	Finds/ Ecofacts	Context Above	Context Below
C87	Cut	n/a	C88	6m	0.15-0.3m	0.1m	Cut of agricultural gully	ENE-WSW gully parallel to and to the N of gully C29. Relates to same drainage system as C29. Post-medieval in date. Concave in profile, concave base.	n/a	C88	C2
C88	Fill	C87	n/a	6m	0.15-0.3m	0.1m	Fill of agricultural gully	Mixed fill of agricultural gully. Topsoil material mixed with disturbed burnt spread type material, becoming more topsoil-like to east beyond limit of C2 spread	n/a	C60	C87
C89	Fill	C29	n/a	8m min.	0.22-0.45m	0.2m	Fill of agricultural gully	Mixed fill of agricultural gully. Topsoil material mixed with disturbed burnt spread type material, becoming more topsoil-like to east beyond limit of C2 spread	n/a	C60	C29
C90	Cut	C90	C91	15m min	0.50-0.70m	0.08m	Cut of agricultural gully	Linear in plan. Steep-sided U-shape in profile. Sharp break of slope top and bottom, relatively flat base. Likely to relate to field drain C5, which it is perpendicular to and gully C60, which it is parallel to	n/a	C91	C2
C91	Fill	C91	n/a	15m min	0.50-0.70m	0.08m	Fill of agricultural gully	Light brown sandy silt. Small stone inclusions. Becomes darker to S as the backfill was mixed with spread C2 material that the gully cut through. Very loose compaction.	n/a	C1	C91
C92	Cut	n/a	C93	1m	0.7m	0.35m	Cut of animal hole/ den	Cut of animal hole dug in from side of drain C5. Dug into S side of pit C7.	n/a	C93	C8
C93	Fill	C92	n/a	1m	0.7m	0.35m	Fill of animal hole/ den	Loose backfill of material or collapsed animal hole. Animal bones present within hole, partially articulated.	bone	C6	C92
C94	Cut	n/a	C95	0.3m	0.3m	0.14m	Cut of channel	Short channel running E-W connecting pits C41 and C33. Concave sides and base. Connected to W end of pit C33 and southern end of eastern side of pit C41, though not exactly in corner	n/a	C95	Natural
C95	Fill	C94	n/a	0.3m	0.3m	0.14m	Fill of channel	Fill of channel C94. Mid- to dark grey silty sand with occasional burnt stone and charcoal, similar to basal fill (C34) of pit (C33)	n/a	C2	C94

APPENDIX B Finds Register

Find No.	Site No.	Context No.	Item No.	Count	Full name	Material	Description
	16E445	C1	1	1	Clay pipe	Clay	1 piece, half of pipe bowl
	16E445	C1	2 - 5	4	Ceramic	Pottery	4 pieces, cream coloured post med pottery
	16E445	C1	6	1	Opaque glass	Glass	1 small fragment of pale blue opaque glass.
	16E445	C2	1	1	Clay pipe	Clay	1 piece stem of clay pipe
	16E445	C2	2-6	5	Ceramic	Pottery	5 pieces post med pottery, possibly same vessel as items 10, 14 & 23
	16E445	C2	7-8	2	Ceramic	Pottery	2 pieces post med pottery, black outer colour and red fine inner material
	16E445	C2	9-10	2	Ceramic	Pottery	2 pieces post med pottery with black flower design.
	16E445	C2	11	1	Ceramic	Pottery	1 piece post med white pottery, pitted on outer edge.
	16E445	C2	12	1	Ceramic	Pottery	1 piece post med pottery with blue design, rim of plate
	16E445	C2	13	1	Ceramic	Pottery	1 piece post med pottery with blue design, part of plate.
	16E445	C2	14	1	Ceramic	Pottery	1 piece post med pottery , part of base of vessel.
	16E445	C2	15	1	Ceramic	Pottery	1 piece post med pottery, rim of mug? Sugar bowl? With brown design evident.
	16E445	C2	16	1	Ceramic	Pottery	1 piece post med pottery, maroon colour
	16E445	C2	17-18	2	Ceramic	Pottery	2 pieces post med off white pottery.
	16E445	C2	19	1	Ceramic	Pottery	1 piece post med pottery with green glaze on inside
	16E445	C2	20-30	11	Ceramic	Pottery	11 pieces various post med pottery.
	16E445	C2	31-43	13	Dark green glass	Glass	13 pieces dark green bottle glass
	16E445	C2	44	1	Dark brown glass	Glass	1 piece dark brown bottle glass
	16E445	C2	45-46	2	Pale green glass	Glass	2 piece very pale green flat window glass?
	16E445	C2	47-48	2	Pale green glass	Glass	2 pieces very pale green flat glass with linear design on one side. Possibly same as item # 4
	16E445	C2	49	1	Dark blue glass	Glass	1 small fragment of dark blue glass
	16E445	C2	50-88	39	Pale green glass	Glass	39 pieces various very pale green glass
	16E445	C2	89-92	4	Slate	Stone	4 pieces blue slate
	16E445	C6	1-7	7	Green glass	Glass	7 pieces of green bottle glass, most likely from same bottle
	16E445	C6	8-9	2	Pale green glass	Glass	2 pieces very pale green, window? glass
	16E445	C6	10	1	Pale blue glass	Glass	1 piece very pale blue window? glass
	16E445	C6	11	1	Clay pipe	Clay	1 piece of clay pipe
	16E445	C6	12	1	Clear glass	Glass	1 piece clear glass
	16E445	C6	13	1	Pale green glass	Glass	1 piece very pale green, thin glass

Find No.	Site No.	Context No.	Item No.	Count	Full name	Material	Description
	16E445	C6	14	1	Clear glass	Glass	1 small piece clear glass
	16E445	C6	15-17	3	Ceramic	Pottery	3 pieces post med pottery, possibly from same vessel
	16E445	C6	18	1	Slate	Stone	1 piece slate
	16E445	C6	19	1	Ceramic	Pottery	1 piece post med pottery, partial flower design evident.
	16E445	C6	20	1	Ceramic	Pottery	1 piece post med pottery with blue design evident.
	16E445	C6	21	1	Ceramic	Pottery	1 piece post med pottery, possibly same vessel as item #10
	16E445	C6	22-23	2	Ceramic	Pottery	2 pieces post med pottery, possibly same vessel. 1 piece decorated with red flower design
	16E445	C6	24-31	8	Metal	Iron	8 various pieces of metal including 1 horseshoe, 2 large nails and a piece of fencing?
	16E445	C19	1-2	2	Ceramic	Pottery	2 pieces cream coloured post med pottery,
	16E445	C19	3	1	Pale green glass	Glass	1 piece very pale green glass with what appears to be an 'N' evident.
	16E445	C19	4	1	Dark green glass	Glass	1 small piece dark green bottle? glass
	16E445	C19	5	1	Slag	Slag	1 small piece of slag
	16E445	C19	6	1	Slate	Stone	1 piece slate
	16E445	C19	7-11	5	Ceramic	Pottery	5 pieces various post med pottery. 3 piece possibly from same vessel as item # 10 & 14. 2 pieces darker pottery.
	16E445	C21	1	1	Metal	Iron	1 piece unidentified iron object
	16E445	C30	1-5	5	Ceramic	Pottery	5 pieces various post med pottery.
	16E445	C61	1	1	Clay pipe	Clay	1 piece clay pipe, base of stem before bowl.

APPENDIX C Sample Register

Sample No.	Context No.	Area	Feature type	Volume (l.)	Process	Result (list materials in g.)	Notes
1	C4		Pit	1/2 A4 bag			Charcoal and burnt stone of posthole C3
2	C12		Pit	10l.			Main upper fill of pit C9
3	C10		Pit	Small bag			Small charcol sample from basal fill of pit C9
4	C40		Pit	c. 8l.			Charcoal and burnt stone upper fill of pit C33
5	C39		Trough	A4 bag			Dark Clayey organic matter, lower fill of trough C37
6	C25		Trough	A4 bag			Loose dark grey clayey mater, upper fill of pit
7	C24		Pit	A4 bag			Fill made up of burnt cracked stone, fill of pit C86
8	C8		Trough	A4 bag			Fill of trough C7, Charcoal and burnt stone
9	C69		Pit	A4 bag			Upper fill of pit C22
10	C23		Pit	A4 bag			Basal fill of pit C22
11	C80		Pit	A4 bag			Organic fill of pit C77
12	C53		Pit	10l.			Secondary fill of pit C51
13	C72		Spread	A4 bag			Burnt spread material over troughs C70 and C73
14	C71		Trough	A4 bag			Fill of trough C70
15	C76		Trough	A4 bag			Basal fill of trough C73
16	C75		Trough	A4 bag			Secondary fill of trough C73

APPENDIX D Bone Register

Context No.	Feature type	Area	Weight (g.)	Notes
C2	Ditch	n/a		28 various pieces of lagomorph bone. Some bones show signs of gnawing.
C6	Ditch	n/a		6 pieces lagomorph? long bones.
C6	Ditch	n/a		5 various pieces animal bone bovid?
C8	Trough	n/a		Animal bone, unburnt, 1 piece