Project Name:
N5 Ballaghaderreen Bypass

Licence Reference No:
10E0300

Townland Names:
Bockagh, County Roscommon

Site Type:
Bockagh 1 *Fulacht Fiadh*

Nat. Grid Ref.
160548 / 297385

Consultant:
Irish Archaeological Consultancy Ltd.

Excavation Director:
Tom Janes

Report Authors:
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ABSTRACT

The following report describes the results of an archaeological excavation of Bockagh 1 (licence ref.: 10E0300), which was located along the route of N5 Ballaghaderreen Bypass, Co. Roscommon. Bockagh 1 was discovered during a first phase of archaeological testing along the proposed bypass undertaken in 2009 by Headland Archaeology (09E0475).

The Stage (iii) excavation work at Bockagh 1 was untaken on behalf of the National Roads Authority and it took place between the 23rd and 31st of August 2010.

Bockagh 1 located in the townland of Bockagh, lies at *c*. 150m Ordnance Datum (OD) and is located in the parish of Kilcolman. The site is located *c*. 2km northeast of the village of Bohalas and *c*. 2.5km north-west of Ballaghaderreen. The surrounding topography comprises undulating bogland drained by small water courses, with Bockagh Hill rising to the north (height of 227m OD). The main body of the site was a large kidney shaped burnt mound or waste from activity carried out in an associated rectangular wooden lined trough. Bockagh 1 was located close to a cluster of other burnt mounds in Bockagh townland at Bockagh 2, 3 and 4 (reported on separately). It was a *fulacht fiadh* and has been dated to the middle to late Bronze Age period with a date range of 1489–1317 BC (UBA 16915) to 1299–1059 (UBA 16953).

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1 INTRODUCTION

1.1 General

This report presents the results of the Stage (iii) Excavation Services at Bockagh 1 carried out in the townland of Bockagh, Co. Roscommon (Figures 1–2). This work was undertaken as part of an archaeological mitigation program completed under the Archaeological Consultancy Services Contract for the N5 Ballaghaderreen Bypass, County Roscommon. Archaeological fieldwork was directed by Tom Janes of Irish Archaeological Consultancy Ltd (IAC) under Licence as issued by the DOEHLG in consultation with the National Museum of Ireland (10E0300). The work was untaken on behalf of Roscommon County Council and the National Roads Authority and it took place between the 23rd and 31st of August 2010.

The purpose of the Stage (iii) Excavation Services is to preserve-by-record through appropriate rescue excavation any significant archaeological features or deposits discovered by earlier investigations, so as to mitigate impacts on the archaeological remains that may be discovered within the footprint of the project.

1.2 The Development

The N5 National Primary Route stretches from Westport (Co. Mayo), through Co. Roscommon to join the N4 National Primary Route at Longford Town; a distance of *c*. 134km. The proposed development consists of the construction of a Bypass, 13.6km long, to the north of Ballaghaderreen Town to upgrade the N5 to National Primary Route Standard.

The scheme traverses the following townlands (from west to east) Currinah, Cashelcolaun, Bohalas, Tonregee, Bockagh, Coolaghtane, Derrynagur, Ballyoughter, Toobrackan, Magheraboy, Tullaghanrock, Banada, Keelbanada, Ballinphuill, Teevnacreeva, Ratra and Rathkeery.

1.3 Topography & Site Description

Bockagh 1 located in the townland of Bockagh, lies at *c*. 150m Ordnance Datum (OD) and is located in the parish of Kilcolman. The site is located *c*. 2km north-east of the village of Bohalas and *c*. 2.5km north-west of Ballaghaderreen. The surrounding topography comprises undulating bogland drained by small water courses, with Bockagh Hill rising to north (height of 227 m OD).

In terms of the Irish National Grid Bockagh 1 is located at 160548 / 297385.

2 EXCAVATION RESULTS

2.1 Excavation Methodology

The excavation area measured *c*. 30m x 30m (900sqm) and it had already been mechanically stripped of topsoil as part of the Stage (ii) Pre-excavation Services.

All archaeological features revealed were cleaned by hand and excavated and recorded using customised field record sheets or 'context sheets', as well as supporting records in the form of registers or lists of drawings, photographs, and the excavation director's field diary. All archaeological features found were drawn to scale, photographed and OD levels taken. Comprehensive drawings were produced at appropriate scales.

The excavation area and the locations of any features recorded within them were recorded by a surveyor using GPS survey equipment and have been tied into the National Grid for the report illustrations. A detailed topographical survey of the mound was undertaken prior to excavation (Figure 3).

2.2 Excavation Results

The site comprised a large kidney-shaped burnt mound with associated trough. Charcoal dated form the site returned a mid to late Bronze Age date.

2.2.1 Natural Geology

Contexts:

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
2	N/A	N/A	N/A	N/A	silty clay with frequent small angular stones	Subsoil.

Finds:
None.

Interpretation:
The natural subsoil consisted of firm sandy clay with frequent sandstone and limestone inclusions and was uniform across the site. It was the glacially deposited natural subsoil underlying the entire area.

2.2.2 Archaeological Phase

2.2.2.1 Trough

Contexts:

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
6	1.1	2.32	0.3		Rectangular, vertical sides flat base	Trough cut
10					Worked stakes	Stakes in the trough
7					Three pieces of split timber	Trough Timbers
9		0.6	0.05	0.05	Dark brownish black moss	Moss lining
4		0.20	0.8	0.20	Stones lining the base of the trough	Trough base slabs
5		1.1	2.32	0.3	Mod compact peat and stone	Fill of trough

Finds:
None.

Interpretation:
The trough C6 was rectangular in plan with rounded corners and near vertical sides with a flat, level base (Plate 2 and 3; Figure 4). Six stakes (C10) were driven into the

eastern end of the trough. From the position of the stakes (alder (*Alnus glutinosa*), oak (*Quercus sp*), hazel (*Corylus avellana*), willow (*Salix sp*) and holly (*Ilex acqufolium*), it can be assumed that they were the remains of timber supports that held, reinforced or were repairs to the timber lining (C7) of the trough. A fragment from one of the alder stakes produced a date of 1299–1059 BC (UBA 16953).

Three pieces of the original alder lining C7 were identified on the north and south sides of the trough. They were placed along the long axis of the trough and varied between 0.47m and 0.60m in length. They were embedded in deliberately placed moss (C9) which was below and on the cut side of the trough (not within the actual trough) which appears to have been a lining.

A layer of flat, slab like stones (C4) was identified across the base of the trough and one, which measured 0.82m x 0.44m x 0.18m, was placed vertically to form part of a stone lining at the southwest of trough. The trough was filled with a mixture of peat mixed with heat shattered stone (C5) and it appears that it may have been cleaned out before being abandoned as peat had developed within it. A sample of willow (*Salix sp*) returned a date of 1489–1317 BC (UBA 16915). The heat shattered stone component of the fill appears to have been slump from the surrounding mound.

Five taxa types were identified from the wood assemblage comprising alder (Alnus glutinosa), oak (*Quercus sp*), willow (*Salix sp*), hazel (*Corylus avellana*) and holly (*Ilex acqufolium*). Alder was used for the trough lining. The stakes were alder, oak, willow and hazel indicating mixed woodland in the area during the middle to late Bronze Age period. The presence of fine tooling noted on several timbers from Bockagh 1 indicates knowledge of wood working and indirectly the use of wooden tools. Splitting would have been carried out using wooden wedges and a mallet or club. The presence of varied axe signatures on some samples and their absence from others would indicate that a number of tools and therefore, possibly a number of people, were involved in the timber production (O'Carroll, Appendix 2.2).

2.2.3 Burnt Mound

Contexts:

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
8		9	7	0.55	Burnt stones, charcoal rich sandy silt	Kidney shaped mound
3		9.5	7.25	0.36	Peat with charcoal and heat shattered stone	Burnt mound upper fill

Finds:
None.

Interpretation:
This represents the burnt mound material or waste from activity carried out in the trough (C6). The primary layer (C8) of heat shattered stone material formed a kidney shaped mound focussed on the trough. The upper layer of the mound (C3) was similar to the primary layer however it contained less silt and was mixed with and sealed by the peaty topsoil (Plate 4; Figure 3 and 5). A sample of the stones from C8 was identified as pale-grey, immature, medium-grained sandstone (Unitt, Appendix 2.3). Sandstone is typically found on burnt mounds.

2.2.4 Topsoil

Contexts:

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
1	N/A	Site	Site	0.40	Firm peaty silt.	Topsoil overlying site

Interpretation:
The topsoil sealed all the archaeological features on site. It was a peaty silt with moderate inclusions of small and medium stones and was consistent across the site. No finds were identified from the topsoil.

3 SYNTHESIS AND DISCUSSION

3.1 Landscape setting

Bockagh 1 located in the townland of Bockagh, lies at *c*. 150m Ordnance Datum (OD) and is located in the parish of Kilcolman. The site is located *c*. 2km north-east of the village of Bohalas and *c*. 2.5km north-west of Ballaghaderreen. The surrounding topography comprises undulating bogland drained by small water courses, with Bockagh Hill rising to north (height of 227m OD).

The Topography, Geology and Hydrology of the N5 Ballaghaderreen Bypass in Co. Roscommon

The N5 Ballaghaderreen Bypass is located in the north-west corner of Co. Roscommon and travels in a north-west direction where it joins the N5 Charlestown Bypass and continues into Co. Mayo. It is an inland county with an area of 2463km² which is bounded by the River Shannon to the east and the River Suck to the west (Hickey & Drew 2003, 35). Roscommon has an abundance of surface streams and rivers, the majority of which feed into these two rivers (*ibid*, 37). The present road scheme traverses the River Lung which feeds into Lough Gara located *c*. 4km to the north-east. A cluster of lakes are also situated to the SSW of the scheme *c*. 10km away; these all feed into the River Suck which meanders to the south. A number of caves have also been explored in the county. The largely fossil Pollawaddy cave is located near Ballaghaderreen (*ibid*, 38) and some 1.5km to the south of Frenchpark (directly to the south of the present scheme), there are four stream sinks (*ibid*, 39). Pollnagollum Cave and Doline is also located in the south-west of Frenchpark (*ibid*, 45).

The landscape of the scheme is undulating and the present road scheme passes through the Lung River Valley. Bockagh Hill (227m) rises to the north and Mullaghanoe Hill (234m) is situated to the WNW of the scheme. To the north-east, the Curlew Mountains are situated *c*. 10km away and just beyond these to the north are the Bricklieve Mountains. The Curlew Mountains form a narrow ridge of resistant Devonian Sandstone (Lee & Daly 2003, 8). The geology of the county is complex with both temporal and lateral changes in rock composition (*ibid*, 8). The majority of the rocks of Roscommon (90%) are limestone of various degrees of purity and structure (Hickey & Drew 2003, 35) however the landscape crossed by the N5 Ballaghaderreen Bypass is underlain with Devonian Sandstone (EPA 2011). Deposition of the Old Red Sandstone (ORS) rocks took place on a desert like environment which was subjected to intense erosion and then the deposition of gravel, and some clay in the flood plains of the meandering rivers (Lee & Daly 2003, 11). The Sandstones are reddish-brown in colour reflecting the avid sub-arial oxidising conditions under which these rocks were formed (*ibid*.). In these rocks, the groundwater circulation is probably limited to faults and fractures and the assumed low permeability is supported by the drainage in the area, which is often poor with most of the rainfall running off to the nearest surface watercourse (*ibid*, 36). In the townland of Toobrackan, the underground geology consists of both Devonian and Carboniferous Sandstones (EPA 2011). The Lower Carboniferous was a period of marine deposition, where on land rivers deposited sand and silts; now represented by the Boyle Sandstone (Lee & Daly 2003, 11).

Many of the sub-soils in Co. Roscommon were laid down during the last glaciation affecting Ireland (Lee & Daly 2003, 11). The sub-soils underlying the present scheme consist of Devonian Sandstone Tills and cut-over peat with the exception of Toobrackan, where Carboniferous Sandstone Tills are also present (EPA 2011). Till is the dominant Quaternary deposit and has a variable thickness in Roscommon; it is

generally thin or absent in uphill areas, with bedrock outcropping frequently, and thickness in low-lying areas where till thickness of over 30m are not uncommon (Hickey & Drew 2003, 37). It is a diverse material that is largely deposited sub-glacially and has a wide range of characteristics due to the variety of parent materials and different processes of deposition (Lee & Daly 2003, 17). The deposition of peat occurred in post-glacial times with the onset of wetter and warmer climatic conditions (*ibid*.). Peat is an unconsolidated brown to black organic material comprising a mixture of decomposed and undecomposed plant matter that accumulated in a water logged environment (*ibid*.). The over lying soils of the scheme consist of Surface Water Gleys and Ground Water Gleys as well as Basin Peats and Blanket Peats (EPA 2011). Surface water gleys are formed in slowly permeable materials as a result of poor drainage of surface water and ground water Gleys are soils whose drainage problems stem not from the soil material but from their topographic position close to the water table (Conway 2011).

3.2 Bronze Age Archaeological Landscape

Dates ranging from the early to late Bronze Age (2400–800 BC) period have been recovered from nine sites along the N5 Ballaghaderreen Bypass. The Bronze Age activity uncovered consisted of burnt mound activity. Two of the nine sites, both of which were located in Bockagh townland, returned varying dates indicating a continuity of use at these sites throughout the Bronze Age period. It has been recognised that *fulacht fiadh*, and related sites, tend to be located in the vicinity of a water source, either beside streams or in waterlogged places (Ó Drisceoil 1991; Feehan 1991; Higgins 1991; O'Connor 2007, 20). The surrounding topography of the scheme comprises undulating bogland drained by small water courses ideal for burnt mound activity. Although known to date mostly to the Bronze Age, the precise function of *fulacht fiadh* and burnt mounds is not completely understood (O'Connor 2007, 5). Nevertheless, it is generally accepted that they were used to bring water to the boil by a form of hot-stone technology (Brindley, et al. 1989-90, 25; *ibid*.). *Fulacht fiadh*, or burnt mounds, are usually found as crescent shaped heaps of fire-cracked stones or, if they have been levelled as a spread of stones and charcoal in a ploughed field (Buckley 1998, 111). Excavation has shown that they usually had a pit or wood-lined trough with an adjacent hearth (*ibid*.). In Co. Roscommon there are 43 *fulacht fiadh*, 23 burnt mounds and one burnt spread recorded on the Record of Monuments and Places. The excavation of nine further sites as a result of the N5 Ballaghaderreen Bypass contributes significantly to this data; it also indicates that the count of this feature type throughout the county is much higher.

Early Bronze Age activity along the scheme was excavated at 10E0379 Bockagh 4 where burnt mound material produced a date of 2461–2209 BC (Kyle and Delaney 2011a). Troughs also excavated at this site returned a late Bronze Age date indicating this site was in use throughout the Bronze Age period. Bockagh 4 is located on the north-west end of the road scheme. An early Bronze Age date was also recovered from the fill of one of two hearths excavated at 10E0301 Toobrackan 1 (Kyle and Delaney 2011b), located *c*. 3.4km to the south-east of Bockagh 4. Additional activity at the site included a cluster of pits/postholes that may have formed a screen or perhaps they were all that was left of a truncated structure and may have been associated with the hearths (*ibid*.). At 10E0304 Keelbanada 2, a *fulacht fiadh* with two troughs and pits was also excavated (Bayley and Delaney 2011a); it was located *c*. 2.4km to the south-east of Toobrackan 1. A layer within one of these troughs has been dated to the early Bronze Age (*ibid*.).

Middle Bronze Age activity was also present along the scheme in the form of burnt mound activity. The remains of a burnt mound excavated at 10E0303 Keelbanada 1 returned a middle Bronze Age date (Bayley and Delaney 2011b) as did the timber

lining of a trough excavated at Banada 1 (10E0302) (Kyle and Delaney 2011c). Additionally, stakeholes excavated at the base of a trough at Toobrackan 1 returned a similar date (Kyle and Delaney 2011b). A middle Bronze Age date was also recovered from the fill of the trough at Bockagh 1 (10E0300) however stakeholes within this trough yielded a late Bronze Age date; this site may have had a number of phases of activity (Janes and Delaney 2011). A mid–late Bronze Age date was recovered for the timber lining of a trough at Bockagh 4 (Kyle and Delaney 2011a). An additional timber lined trough at the site produced a late Bronze Age date (*ibid*.). At Bockagh 3 (10E0378) the burnt mound material excavated at the site has returned a late Bronze Age date (Kyle and Delaney 2011d) as has the slippage backfilling a trough at 10E0301 Toobrackan 2 (Kyle and Delaney 2011b).

There are no recorded burnt mounds or burnt spreads in the immediate vicinity of the N5 Ballaghaderreen Bypass. Of note are three *fulacht fiadh* recorded by the Record of Monuments and Places in Currinah (RO008C034, RO008C035001–002). These are situated *c*. 5km to the north-west of Bockagh townland on the northern end of the N5 Ballaghaderreen Bypass. *Fulacht fiadh* are also recorded *c*. 5km to the south-east of the scheme at Mullen (RO015:06001–3) and at Cloonfinglas (RO014:077001–2), located *c*. 8 km to the south-east. Directly to the west in Co. Mayo *c*. 4km away, a cluster six *fulacht fiadh* are also recorded. This was also the most numerous and widespread monument type identified and excavated as part of the N5 Charlestown Bypass (Kerrigan *et al* 2010, 17). As part of this road scheme, three burnt mound sites were excavated at Currinah, Co. Roscommon (*ibid*.). A date returned from a hazel post places the trough construction and *fulacht fiadh* use at Currinah IV in the later part of the middle Bronze Age, contemporary with Currinah II (Kerrigan and Gillespie 2010, 137), where a burnt mound and a trough pit were excavated (*ibid*. 130). At Currinah 1, a burnt mound and a stone lined trough were also excavated however these returned a late Bronze Age date (*ibid*. 129).

Bronze Age funerary activity was not recovered as part of the N5 Ballaghaderreen Bypass excavations. Burial practice dating to this period is represented by a ring barrow recorded at Magheraboy (RO008:024), located directly to the west of Toobrackan townland. Two unclassified barrows (MA082:043 & MA082:046) are also recorded to the south-west, *c*. 12km away in Co. Mayo at Aghamore (Costello By.) and at Scregg (Costello By.). An unclassified cairn is also recorded *c*. 5km to the south of Teevnacreeva at Mullaghnashee (RO014:066) and a cist burial is located *c*. 7.5km to the south-west at Cloonmullin (RO020:058002). A cist and a second possible cist are also recorded in the townlands of Bruff (MA081:019), Mountain Common (MA094:020002) and Coogue North (MA081:033001), *c*. 17km to the south-west. Additionally, three cairns are located *c*. 12km to the west in Co. Mayo at Barnacahoge (MA072:090 & MA0072:127002) and at Barnalyra (MA072:108). As part of the N5 Charlestown Bypass a single cremation burial associated with Bronze Age Food Vessel pottery sherds was excavated at Lowpark, Co. Mayo (Kerrigan *et al* 2010, 17). As part of the N6 Ballinasloe to Athlone national road scheme, a Bronze Age ringditch was recovered at Ardagawna, Co. Roscommon (O'Séaghdha 2010) and the fragmentary remains of a Bronze Age bog body were also recovered from Derrycashel bog in January 2005 (Mulhall 2008).

The Rathcroghan complex is situated *c*. 10km to the south-east of the N5 Ballaghaderreen Bypass and consists of over 60 archaeological monuments of different types located in six townlands, scattered over some 1000ha of elevated ground (Waddell *et al* 2009, 1). Archaeological evidence confirms that Rathcroghan was an important burial-ground and cult centre (Waddell 2009). Among the monuments of ritual character identified by Herity (1983) burial tumuli dominate, with forty five examples; of these thirty-four are ring-barrows (Herity 1983, 137–138). The

traditions which identify the area as a cemetery thus appear to be confirmed by the archaeological remains (*ibid*, 137). In addition to Rathcroghan, a cemetery mound containing eight cist burials and six secondary pit burials has been excavated at Grange, Co. Roscommon (Ó Ríordáin *et al* 1997), located *c*. 24km to the south-east of the N5 Ballaghaderreen Bypass scheme.

Other finds dating to this period include an investigation in 1989 of Correen Ford in Correenbeg, in the south of the county where a late Bronze Age sword was found close to a portion of a pottery vessel, perhaps of the same age (Kelly 1990). A Bronze Age hoard has also been discovered more recently at Coggalbeg bog to the south of the scheme (Gaule 2010). It is clear that the Bronze Age people of Co. Roscommon were an established and affluent populace demonstrated by the funerary rites and high status finds associated with this period, and to a lesser extent the high incidence of burnt mound sites throughout the region. The frequency of this site type more readily reveals the distribution of this population and confirms, in the absence of excavated settlement sites, that Co. Roscommon was extensively settled during the Bronze Age period.

3.3 Typology of Burnt Mounds

Fulacht fiadh sites (also commonly referred to as burnt mounds) are one of the most common field monuments found in the Irish landscape. The last published survey (Power *et al*. 1997), carried out over a decade ago, recorded over 7,000 burnt mound sites and in excess of 1,000 sites have been excavated in recent years through development led archaeological investigations. In spite of this no clear understanding of the precise function of these sites has been forthcoming. Burnt mound sites are typically located in areas where there is a readily available water source, often in proximity to a river or stream or in places with a high water table. In the field burnt mounds may be identified as charcoal-rich mounds or spreads of heat shattered stones, however, in many cases the sites have been disturbed by later agricultural activity and are no longer visible on the field surface. Nevertheless even disturbed spreads of burnt mound material often preserves the underlying associated features, such as troughs, pits and gullies, intact.

Ó Néill (2003–2004, 82) has aptly identified these sites as the apparatus and by-product of pyrolithic technology. This technology involved the heating or boiling of water by placing fire-heated stones into troughs of water. Small shallow round-bottomed pits, generally referred to as pot boiler pits or roasting pits, are often associated with burnt mound sites. The purpose of these pits remains unclear. Occasionally large pits are also identified and may have acted as wells or cisterns. Linear gullies may extend across the site, often linked to troughs and pits, and demonstrate a concern with onsite water management. Post and stakeholes are often found on burnt mound sites and these may represent the remains of small structures or wind breakers.

Burnt mound sites are principally Bronze Age monuments and reach their pinnacle of use in the middle/late Bronze Age (Brindley *et al*. 1989−90; Corlett 1997). Earlier sites, such as Enniscoffey Co. Westmeath (Grogan *et al*. 2007, 96), have been dated to the Neolithic and later sites, such as Peter Street, Co. Waterford (Walsh 1990, 47), have been dated to the medieval period. Thus although burnt mound sites generally form a component of the Bronze Age landscape, the use of pyrolithic technology has a long history in Ireland.

Although there is a general consensus that burnt mound sites are the result of pyrolithic technology for the heating or boiling of water, the precise function of these sites has, to date, not been agreed upon. Several theories have been proposed but

no single theory has received unanimous support. The most enduring theory is that burnt mounds sites were used as cooking sites. O'Kelly (1954) and Lawless (1990) have demonstrated how joints of meat could be efficiently cooked in trough of boiling water. The use of burnt mound sites for bathing or as saunas has been suggested as an alternative function (Lucas 1965, Barfield and Hodder 1987, O' Drisceoil 1988). This proposal is largely influenced by references in the early Irish literature to sites of a similar character and is very difficult to prove, or disprove. Others, such as Jeffrey (1991), argue that they may have been centres of textile production for the fulling or dyeing of cloth. More recent demonstrations by Quinn and Moore (2007) have shown that troughs could have been used for brewing, however, this theory has been criticised by leading Irish environmentalists due to the absence of cereal remains from most burnt mound sites (McClatchie *et al*. 2007).

3.4 Discussion and Conclusion

Bockagh 1 located in the townland of Bockagh, lies at *c*. 150m Ordnance Datum (OD) and is located in the parish of Kilcolman. The site is located *c*. 2km north-east of the village of Bohalas and *c*. 2.5km north-west of Ballaghaderreen. The surrounding topography comprises undulating bogland drained by small water courses, with Bockagh Hill rising to the north (height of 227m OD). The main body of the site was a large kidney shaped burnt mound or waste from activity carried out in the associated rectangular wooden lined trough. Bockagh 1 was located close to a cluster of other *fulacht fiadh* in Bockagh townland at Bockagh 2, 3 and 4 (reported on separately). The site has been dated to the middle to late Bronze Age period.

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APPENDIX 1 CATALOGUE OF PRIMARY

Appendix 1.1 Context Register

Context	Fill of	L(m)	W(m)	D(m)	Interpretation	Description	Finds
1	N/A	Site	Site	0.4	Topsoil	Firm dark brown peaty silt, moderate inclusions of small and medium stones	None
2	N/A	Site	Site	N/A	Subsoil	Firm yellowish brown sandy clay with frequent sandstone and limestone fragments	None
3	N/A	9.5	7.25	0.36	Burnt Mound Upper Fill	Crescent shaped mound aligned N-S, consisting of dark brownish/black peaty silt, frequent charcoal flecks , frequent small medium and large shattered stone	None
4	C6	2	0.8	2 – 18	Trough Lining - Slabs	These stones rested on the base of the cut and formed an incomplete lining of the trough	None
5	C6	1.85	0.75	0.18	Fill of trough	Moderately compact blackish brown peat, 50% of the fill was comprised of heat affected stone	None
6	N/A	1.1	2.32	0.3	Cut of Trough	Rectangular cut aligned NW -SE with rounded corners with a sharp break of slope at the top, almost vertical sides, a graduated-sharp break of slope at the bottom and a flattened base	None
7	C6	N/A	N/A	N/A	Trough Timbers	Comprised of three pieces of split timber, one along the SW side of the cut and two along the NE side. All were set on their sides with moss lining (C9) beneath and around them	None
8	N/A	9	7	0.55	Burnt Mound material	Kidney shaped aligned N-S firm blackish red heat shattered stones in a matrix of charcoal rich peaty sandy silt	None
9	C6	0.6	0.05	0.05	Moss	Spongy dark brownish black moss	None
10	C6	N/A	N/A	N/A	Stakes in the trough	These stakes may have been used to hold C7 in place. All had worked end and element 10:8 was split and wedged behind 10:7	None

Note: All archives, artefacts and ecofacts are currently in storage with IAC Ltd at The Library, Chapel Street, Lismore, Co. Waterford awaiting final submission to facilities at the National Museum of Ireland.

Appendix 1.2 Catalogue of Samples

Sample No.	Context No.	Sample type:	Sample volume (l) / weight (g)	Description of context	Sieving result (g)
1	C.5	Charcoal rich soil	60l	Trough cut	64g charcoal in flot
2	C.8	Charcoal rich soil	60l	Burnt Mound lower layer	302.1g charcoal and burnt stone
3	C.9	Moss lining of trough C.6	20l	Trough cut	18.7g charcoal with wood inclusions
4	C.7	Timber lining of C.6		Trough cut, nw side	
5	C.7	Timber lining of C.6		Trough cut, se side	
6	C.7	Timber lining of C.6		Trough cut, se side	
7	C.10	Timber stake		E. end of trough cut	
8	C.10	Timber stake		E. end of trough cut	
9	C.10	Timber stake		E. end of trough cut	
10	C.10	Timber stake		E. end of trough cut	
11	C.10	Timber stake		E. end of trough cut	
12	C.10	Timber stake		E. end of trough cut	
13	C.10	Timber stake		SE. end of trough cut	

Appendix 1.3 Wood Register

Element No.	Length (cm)	Width (cm)	Diameter	Thickness (cm)	Other Information
07:01					Timber lining Nw side of trough C.6
07:02					Timber lining Se side of trough C.6
07:03					Timber lining Se side of trough C.6
10:01					Stake from E end of Trough
10:02					Stake from E end of Trough
10:03					Stake from E end of Trough
10:04					Stake from E end of Trough
10:05					Stake from E end of Trough
10:06					Stake from E end of Trough
10:07					Stake from E end of Trough

Appendix 1.4 Photograph Register

Photo number	Context #	Direction	Type	Comments
01:17	3	w	Mid-ex	
01:18	3	s	Mid-ex	
01:19	3	n/a	Mid-ex	
01:20	3	s	Mid-ex	
01:21	3	w	Mid-ex	
01:22	4,5,6	e	Mid-ex	Relationship of C.4,5,6
01:23	4,5,6	e	Mid-ex	Relationship of C.4,5,6
01:24	4,5,6	e	Mid-ex	Relationship of C.4,5,6
01:25	4,5,6	e	Mid-ex	Relationship of C.4,5,6
01:26	4,5,6	n	Mid-ex	Relationship of C.4,5,6
01:27	4,5,6	e	Mid-ex	Relationship of C.4,5,6
01:28	4,5,6	s	Mid-ex	Relationship of C.4,5,6
01:29	4,5,6	w	Mid-ex	Relationship of C.4,5,6
01:30	4,5,6	w	Mid-ex	Relationship of C.4,5,6

01:31	4,5,6	s	Mid-ex	wkg shot
01:32	4,5,6	s	Mid-ex	detail of e.end of C.6
01:33	4,5,6	e	Mid-ex	Relationship of C.4,5,6
01:34	4,5,6	n	Mid-ex	detail of ne.end of C.6
01:35	4,5,6	n	Mid-ex	detail of nw.end of C.6
01:36	4,5,6	n	Mid-ex	detail of ne.end of C.6
01:37	4,5,6	e	Mid-ex	
01:38	4,5,6	w	Mid-ex	detail of e.end of C.6
01:39	4,5,6	w	Mid-ex	
01:40	4,5,6	ne	wkg	
01:41	4,5,6	ne	record	C.6 Trough
01:42	4,5,6	se	wkg	
01:43	4,5,6	se	record	C.6 Trough
02:01	4,6	nw		C.6 Trough
02:03	4,6	ne		C.6 Trough
02:05	4,6,7	ne		Timbers
02:07	4,6,7	ne		Timbers
02:09	10	e		stakes
02:11	10	e		stakes
02:12	4,6,7	se		se end of C.6
02:13	4,6	ne		Trough and slabs
02:14	4,6,7	se		Trough and slabs
02:15	4,6,7	se		Trough and slabs
02:16	4,6,7	s		Trough and slabs
02:17	4,6	ne		after slab ex nw end of C.6
02:18	4,6	se		after slab ex nw end of C.6
02:21		n/a	wkg	
02:22		n/a	wkg	
02:23	3,8	w	Section	Section through mound
02:24	3,8	sw	Mid-ex	
02:25	3,8	nw	Mid-ex	
02:26	3,8	w	Mid-ex	
02:27		sw	wkg	
02:28		sw	wkg	
02:29		w	wkg	
02:30		sw	wkg	
02:31	7	sw	Mid-ex	Sample 5 in situ
02:32	7	sw		Sample 6 in situ
02:33	7	sw		Sample 6 in situ
02:34	7,9	n/a		Sample 6 removed
02:35	4,6,9	se	Mid-ex	Side timbers removed
02:36	4,6,9	se	Mid-ex	Side timbers removed
02:37	3,8	s	Section	N.facing section
02:38	3,8	s	Section	N.facing section
1577	6,10	se	Mid-ex	Stakes in trough
1578	6,10	se	Mid-ex	Stakes in trough
1579	10	se	Mid-ex	Stakes in trough
1580	10	se	Mid-ex	Stakes in trough
1581	10	e	Mid-ex	Stakes in trough
1582	10	s	Mid-ex	Stakes in trough
1584	6	se	Mid-ex	Trough C.6
1585	3,8	n	Section	S.facing section
1586	3,8	n/a	Section	S.facing section

1587	6	n	Post-ex	Trough C.6
1588	6	e	Post-ex	Trough C.6
1589	6	e	Post-ex	Trough C.6
1590	6	s	Post-ex	Trough C.6
1591				non arch
1592	10	w	Post-ex	stakes in Ne corner
1593	10	w	Post-ex	stakes in Ne corner
1594	6	n	Post-ex	Trough C.6
1595	6	s	Post-ex	Trough C.6
1596		w	Post-ex	trench in peat
1597		ne	Post-ex	Quarry rock
1598		ne	Post-ex	Quarry rock+trough
1599		ne	Post-ex	Quarry rock
1600		ne	Post-ex	Quarry rock
1601	6	ne	Post-ex	Quarry rock+trough
1602		n	Post-ex	Quarry rock
1603		w	Post-ex	Site
1604		se	Post-ex	Site
1605	6	e	Post-ex	Site
03:01	6	s	Post-ex	Trough C.6
03:02	10	n	Post-ex	stakes in Ne corner
03:03	6	e	Post-ex	Trough C.6
03:04	6	w	Post-ex	Trough C.6
03:05	6	w	Post-ex	Trough C.6
03:06	6	s	Post-ex	Trough C.6
03:07		w	Post-ex	trench in peat
03:08		ne	Post-ex	Quarry rock
03:09		ne	Post-ex	Quarry rock+trough
03:10		ne	Post-ex	Quarry rock
03:11		ne	Post-ex	Quarry rock
03:12	6	ne	Post-ex	Quarry rock+trough

Appendix 1.5 Plan Register and Section Register

Drawing No.	Plan/ Sections	Description	Scale
1	**Plan**	**Pre-ex plan**	**01:50**
2	**Section**	**Section through trough C.6,C.8**	**01:10**
3	**Plan**	**Plan of trough C.6,C.4, C.7**	**01:20**
4	**Section**	**E facing section C.3,8**	**01:10**
5	**Section**	**E facing section C.3,8 (continued)**	**01:10**
6	**Section**	**E facing section C.3,8 (continued)**	**01:10**
7	**Section**	**N facing section C.3,8**	**01:10**
8	**Section**	**S facing section C.3,8**	**01:10**
9	**Section**	**N.w facing section of trough C.6**	**01:10**
10	**Section**	**S facing section C.3,8 (cont)**	**01:10**
11	**Plan**	**post-ex plan of C.6 Trough**	**01:20**

APPENDIX 2 – SPECIALIST REPORTS

Appendix 2.1 AMS dates – QUB Laboratory

The "Measured radiocarbon age" is quoted in conventional years BP (before AD 1950). The error is expressed at the one-sigma level of confidence.

The "Calibrated date range" is equivalent to the probable calendrical age of the sample material and is expressed at the one Sigma (68.3% probability) and two-Sigma (95.4% probability) level of confidence.

Calibration dataset: Calibration programme: CALIB REV5.0.2 - used in conjunction with Stuiver, M., and Reimer, P.J., 1993, Radiocarbon, 35, 215–230.

Context	Sample No	Material	Species id/ Weight	Lab	Lab Code	Date Type	Calibrated date ranges	Measured radiocarbon age (BP)	13C/12C Ratio ‰
C5, trough fill	1	Wood	*Willow* (<0.5g)	QUB	UB16915	AMS(Std)	1433-1393 BC (1 sigma), 1489–1317 BC (2 sigma)	3129 ±32	-24.7
C10, timber stake	8	Wood	*Alder (83 g)*	QUB	UB16953	AMS(Std)	1258-1130 BC (1 sigma), 1299–1059 BC (2 sigma)	2965 ±32	-30.2

Appendix 2.2 Wood/charcoal analysis

Report on wood remains from Bockagh 1, Co. Roscommon 10E0300 N5 Ballaghaderreen By-pass

Ellen O'Carroll MA
February 2011

Introduction

This report comprises the results of wood analysis from samples recovered during excavations at Bockagh 1, Co. Roscommon (10E0300) carried out by IAC Ltd as part of the N5 Ballaghaderreen By-pass (NGR 160548, 297385). The wood was recovered from the partially timber-lined trough **C6** of a burnt mound (Janes and Delaney 2010). A sample of willow from the fill of the trough (C5/S1) returned a radiocarbon date of 1489-1317BC (cal. QUBA 2 Sigma) which places the site in the Middle Bronze Age.

The wood assemblage

Ten pieces of wood (three from the trough lining and seven stakes) were recovered during the excavation at Bockagh 1, all of which were examined for this report (See Appendix 1). They ranged in size from a sample of brushwood 3.1cms in diameter, to a roundwood 9.2cms in diameter. One sample was recorded as being in good condition while the remaining wood samples were noted as being in a poor (6) or in moderate (3) condition.

Recording and Species identification Methodology

The wooden assemblage from Bockagh 1(10E0300) was recorded in August 2010 by the excavation crew using IAC recording sheets on which each sample was described and sketched. A second examination of the material was undertaken by Ellen O'Carroll in December 2010 and the initial records were amended. The original archive is still relevant in terms of contextual and other information on the assemblage. The samples are referenced by their context number/element number/sample number, to facilitate consistency with the preliminary site report (Janes and Delaney 2010).

The process for identifying wood, whether it is charred, dried or waterlogged is carried out by comparing the anatomical structure of wood samples with known comparative material or keys (Schweingruber 1990). Thin slices were taken from the transversal, tangential and longitudinal sections of each piece of wood and sampled using a razor blade. These slices were then mounted on a slide and glycerine was painted onto the wood to aid identification. Each slide was then examined under a microscope at magnifications of 10x to 450x. By close examination of the microanatomical features of the samples the species were determined. The diagnostic features used for the identification of wood are micro-structural characteristics such as the vessels and their arrangement, the size and arrangement of rays, vessel pit arrangement and also the type of perforation plates.

The majority of the worked wood was split and so the method of conversion and any further wood working evidence e.g. toolmarks, was recorded. An overview of the examined samples is presented below in Table 1. The appendices at the end of the report provide dimension detail and a description of each sample.

Table 1 Overview of examined samples

Element Type	No. of Records	Species identified
Split timber / wood	6	Oak (2 samples); Alder (3 samples) Hazel (1sample)
Brushwood	3	Alder (1 sample); Willow (1 sample); Holly (1 sample)
Roundwood	1 (possible)	Alder (1 sample)

Definitions of Element Types and Woodworking Terminology

Constructional Elements

Brushwood Stems or rods measuring 6 cm or less in diameter.

Roundwood A piece of worked or unworked wood in the round and over 6 cm in diameter.

Vertical Stake/Post Upright brushwood or roundwood driven vertically or at an angle into the ground. Sometimes but not always used for stabilization.

Horizontal Brushwood/roundwood or split timber laid flat on the ground.

Twigs Small shoots or branches measuring less than 1 cm in diameter.

Split timber Wood converted from the round including planks, half splits and split pegs.

Woodworking terminology

Chisel point The end of a piece of wood cut to a point on one single face.

Conversion The way in which the primary trunk has been split into smaller elements.

Facet The cut surface produced on a piece of wood by a tool blow. The blow can leave behind a particular signature if the cutting edge of the tool is flawed.

Facet junction The nature of the junctions between each facet was also assessed as to whether they were clean, ragged or stepped.

Jam curves A toolmark on wood retaining the impression of the complete width of the blade used.

Pencil point The end of a piece of wood cut to a point on multiple faces.

Signature A signature is an imperfection in a woodcutter's blade which is transferred onto the timber when the wood is cut. A negative impression or a groove is created where a flange of metal extends beyond the axe blade where as a positive or raised signature is created by a gap in the blade edge.

Wedge point The end of a piece of wood cut to a point on two faces.

Results

The worked wood examined for this report is discussed below based on the classifications outlined above. Discussion of conversion methods and toolmark evidence is confined to samples examined by the author. It should be noted that in the case of some very poorly preserved samples e.g. 7:1:4 and 10:3:9, only very basic information could be ascertained. The discussion of wood working techniques is followed by a discussion of the wood species present.

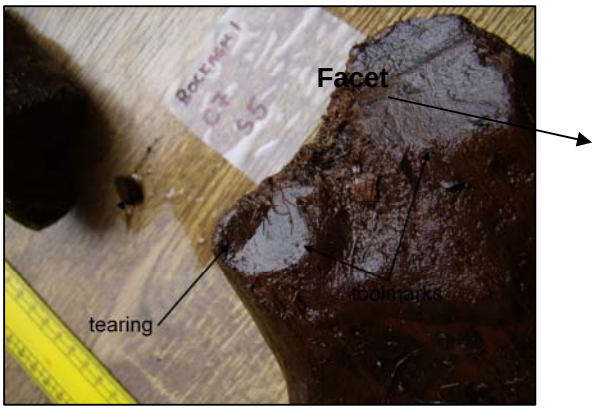
Split timbers / wood

Six samples in total were recorded as having been split or converted from the round. All 6 examples were half split roundwoods. Two were identified as oak (*Quercus* sp; 10:1:7 and 10:5:11), 3 as alder (*Alnus glutinosa*; 7:3:6, 7:2:5 and 10:2:8) and one as hazel (7:1:4). With the exception of the split alder roundwoods (7:3:6 and 7:2:5), which were identified on site as the remains of the trough lining, the remaining split roundwoods were stakes which held the lining in place. Three samples of brushwood were also noted (10:4:10, 10:6:12 and 10:7:13), with diameters of between 3.1-6.1cms. They were identified as willow, holly and alder, respectively.

The gnarly nature of one sample (7:2:5) suggests that it may have been a piece of root, which was adapted for use on the site (Plate 1). Evidence for tearing on the element was noted during analysis. Three small, slightly dished toolmarks were also present (Plate 2).

Plate 1 Sample 7:2:5

Plate 2 Sample 7:2:5 detail



Pointed ends

Although much of the wood was in poor condition worked points were recorded on several samples. The majority were wedge points (4 examples; 7:2:5, 10:2:8, 10:6:12 and 10:7:8; Plates 3 and 4). Two examples of pencil points were noted (10:1:7 and 10:4:10; Plates 5 and 6) and a single example of a chisel point was noted on 7:3:6, a half-split alder roundwood which formed part of the trough lining (Plate 7).

Plate 3 Wedge point on 10:6:12

Plate 4 10:6:12 with inverted signature

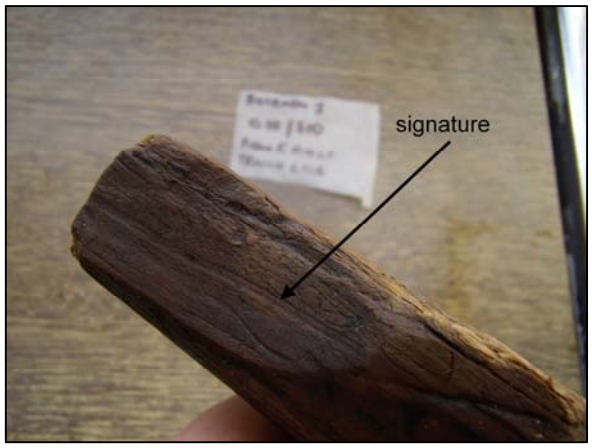


Plate 5 Pencil point (10:1:7)

Plate 6 Pencil point (10:4:10)

Plate 7 Chisel point on 7:3:6

The facet size varied considerably, from 1.1cms on 10:6:12 to an elongated example noted on 10:1:7. (12.7cms) Straight blade edges were noted on 7:2:5 (see Plate 2 above), 10:1:7, 10:2:8 and 10:6:12. There were no complete jam curves recorded on the timbers. All of the toolmarks/facets were slightly dished in character. Axe signatures, where a nick in the axe blade resulted in a raised or inverted ridge on the surface of the wood, were noted on some samples, including 10:2:8 (Plate 8), 10:4:10 and 10:6:12 (Plate 4 above). None of the three signatures were similar therefore it may be concluded that either several axes were used to shape the timbers or that one axe containing several irregularities or nicks on it was used to construct the trough. The former theory is more plausible.

Between 7 and 28 annual tree rings were noted on the samples analysed from the assemblage.

Plate 8 Raised signature on 10:2:8

Roundwood
Although it was in extremely poor condition and very degraded, a possible example of a roundwood, which had been used to line the trough, was identified (7:1:4). No clear evidence for tool marking was observed.

Discussion
The worked wood assemblage from Bockagh 1 (10E0300) was small and overall, in fairly poor condition. Wood working was noted on the majority of samples analysed. Six of the timbers had been half-split, which involves splitting a tree across its width. Two of the split timbers formed part of the trough lining (7:2:5 and 7:3:6), while the remainder comprised the stakes which held the lining in place (10:1:7, 10:2:8, 10:3:9 and 10:5:11). The use of half split timbers in the trough of a burnt mound has parallels with recently excavated examples in Co. Clare, where a trough containing split alder wood was excavated at Caheraphuca 4 (E3653; N18 Gort to Crusheen Road Scheme; Bayley *et al* 2010) as well as along the Charlestown by-pass (O'Carroll 2007). The troughs excavated along the Charlestown by-pass and closely associated to the troughs here at Bockagh in both time and space were constructed from ash and alder planks at Sonnagh and hazel and ash at Currinah and Cloonaghboy respectively. These woods are paralleled here at Bockagh. The comparative material noted above is also dated to the Middle Bronze Age .

The presence of fine tooling noted on several timbers from Bockagh 1 indicates knowledge of wood working and indirectly the use of wooden tools. Splitting would have been carried out using wooden wedges and a mallet or club. Although there are no known Irish examples of mallets dated to the Bronze Age, wooden mallets have been recovered from Iron Age trackways at Edercloon and Corlea, Co. Longford (Moore 2007; Raftery 1996). The presence of varied axe signatures on some samples and their absence from others would indicate that a number of tools and therefore, possibly a number of people, were involved in the timber production.

The majority of the stakes were worked to a point. Four were wedge pointed, two were pencil pointed and one was chisel pointed.

As no wood chips were noted from the assemblage, this suggests that construction may have taken place away from the site.

Wood identification

All of the samples were identified to species. Five taxa types were identified from the wood assemblage comprising alder (*Alnus glutinosa*), oak (*Quercus* sp), willow (*Salix* sp), hazel (*Corylus avellana*) and holly (*Ilex acqufolium*) in order of representation (see Appendix 1 and Figure 1).

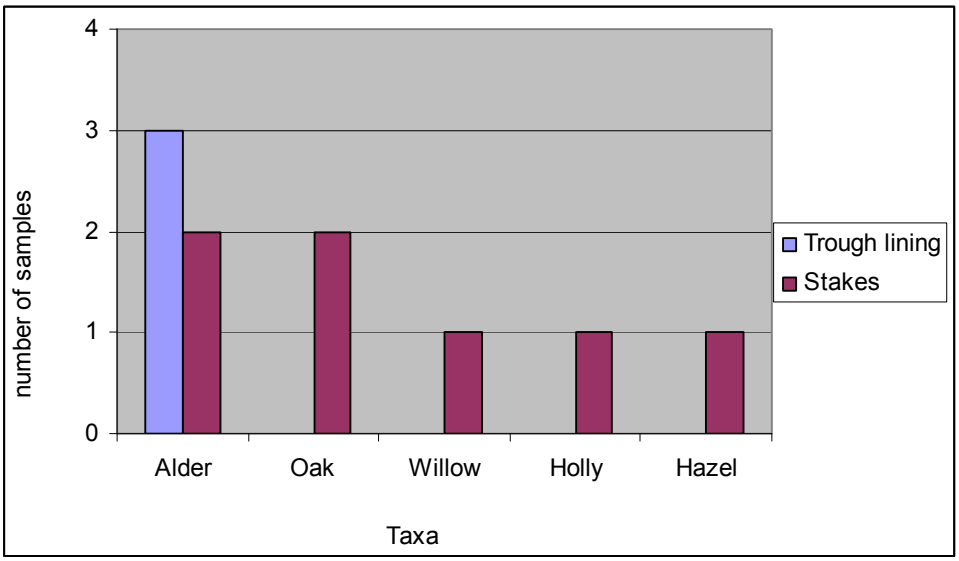


Figure 1 Taxa identified from trough features at Bockagh 1

All of the wood which survived from the trough lining was identified as alder, comprising a possible roundwood (7:1:4) and 2 split roundwoods (7:2:5 and 7:3:6). Two of the stakes, comprising a split roundwood (10:2:8) and a heavy brushwood (10:7:13) were also identified as alder. The remaining stakes were identified as oak (10:1:7 and 10:5:11), with single examples of hazel (10:3:9), willow (10:4:10) and holly (10:6:2) (Figure 1).

The wood types identified point to the presence of mixed woodlands in the area surrounding Bockagh in the Middle Bronze Age. Alder and willow prefer a wetter growing environment and would have grown close or adjacent to a wetland area. Hazel and holly are understorey trees and could have been found within or growing on the edges of mixed woodlands in which oak was present. Hazel, holly and willow also occur in scrubland environments.

The wood identification and selection of wood types fits into wood types used and selected for the construction of troughs elsewhere in Ireland. Wood identified from Caheraphuca, Clooneen and Srangalloon in Co. Clare contained a similar array of taxa which included alder and oak used for the lining of troughs (O Carroll 2008). Research has also shown that alder, ash, hazel and oak were the preferred taxa types used for the construction of the wooden troughs, platforms and windbreaks along the western seaboard, notably on sites along the N5 Charlestown Bypass (O Carroll, 2007). Approximately 38 *fulachta fiadh* were identified during work on the bypass. As was the case with Bockagh 1, some of the troughs were lined with moss and the troughs dated to the Middle Bronze Age periods (Sonnagh) were mostly lined

with ash and alder planks as is the case here at Bockagh 1. A large alder trunk was used to line the base of the trough associated with a *fulacht fiadh* dated to the Middle Bronze Age at Ballycorrick, Co. Clare (02E1186; O'Donnell 2005). Wood from troughs identified from the N11 Rathnew to Arklow road show that alder and oak were preferred, with hazel used for wattle panelling planks (OCarroll 2006). It is probably true to say that wood selection is related to the localised vernacular nature of these *fulachta fiadh* sites whereby small extended families were constructing the troughs using locally available trees and timbers. This site at Bockagh 1 conforms to that hypothesis.

Description of wood types identified from the assemblage

Alnus glutinosa (Alder)
The trough lining was identified as alder. Alder is a widespread native tree and occupies wet habitats along stream and river banks. It is an easily worked and split timber and therefore quite commonly manufactured into planks. Though it certainly flourishes best where its main roots are just above the water, the alder is also tolerant of stagnant water. The wood of the tree is white when growing, but when it is cut, turns red. It is soft, with short fibres, giving it a homogeneous texture and of moderate density. It is a very durable wood and was specially selected for boat-making and for dug-out canoes. Alder was used by the Romans for water-pipes, bridges and as a revetting timber for riverbanks. The city of Ravenna, in northeastern Italy, was founded on piles of alder wood. It loses about a third of its weight and a twelfth of its bulk in drying, but does not warp. It is suitable for wood-turning and is a common timber in barrel- and wheel-making. Because of its almost waterproof nature, wood analysis has shown that alder wood was used to line troughs associated with burnt spread/*fulachta fiadh* sites.

Quercus sp (Oak)
Two stakes surrounding the trough were constructed from oak. Sessile oak *(Quercus petraea)* and pedunculate oak *(Quercus robur)* are both native and common in Ireland and the wood of these species can not be differentiated on the basis of their anatomic characteristics. Pedunculate oak is found growing in areas of heavy clays and loams, particularly where the soil is alkaline. Sessile oak is found on acid soils and often in pure stands. Unlike pedunculate oak, it thrives on well-drained soils but is tolerant of flooding (Beckett 1979, 40-41). Both species of oak grow to be very large trees (30-40m high).

Oak was one of the most prevalent trees growing in Ireland throughout the medieval period. The anglicised form of the Irish name for oak (derry/*doire*) is included in many townland names today. Out of 62,000 townlands in Ireland about 1,600 contain the word "derry" in one form or another, either as a prefix or suffix (Mc Cracken 1971, 23). Oak also has unique properties of great durability and strength and was frequently used in the manufacture of posts and wooden planks.

Salix sp (Willow)
One stake was identified as willow. Willow is a native species in Ireland and can be found in a tree and shrub form. According to Webb (1971, 160-2), 13 species of willow are found growing wild in Ireland, of which eight are certainly native. The wood of *Salix* trees and shrubs cannot be differentiated to species on the basis of anatomical features. Willow is a very strong wood in tree form and is excellent for the use as posts. It is also a very flexible wood and was commonly used for wickerwork and basketry. Ireland has the perfect climate for fast growing willows, which are also known as 'sallys'. In the 19th and 20th centuries, no farmstead would be complete without a 'sally garden' which provided a ready source of 'sally rods' for domestic

use. Willow prefers a wet climate and thrives when growing on a bog, marsh or along a riverbank. It is a native species to Ireland and can be found in a tree and shrub form.

Corylus avellana (Hazel)
One stake was identified as hazel. Hazel is a native species and was very common up to the end of the 17th century. McCracken (1971, 19) points out that 'it was once widespread to a degree that is hard to imagine today'. With the introduction of brick, steel and slate the crafts associated with hazel became obsolete, and today the woods that supplied hazel have diminished rapidly. Hazel wood has been used for making furniture, fencing and wickerwork. Hazel is normally only about 3-5m in height and is often found as an understory tree in broadleaf woods dominated by oak. It also occurs as pure copses on shallow soils over limestone, as seen today in The Burren in Co. Clare and survives for 30 to 50 years. Its main advantage is seen in the production of long flexible straight rods through the process known as coppicing. Hazel also makes good fuel. In early Irish law, hazel was considered one of the *airig fedo* or 'nobles of the wood'. It also played a central role in Irish mythology and was associated with wisdom, truth and kingship (Mac Coitir 2006, 72-81). In folklore, it was used as a protection against evil (*ibid.*).

Ilex acqufolium (Holly)
One stake was identified as holly Holly is a shrub found quite commonly in hedgerows alongside blackthorn and gorse and in the understory of oak woods. The *Bretha Comaithchesa* (Laws of Neighbourhood), which records holly as one of the *airig fedo* or 'nobles of the wood', as it was used in the construction of cart-shafts and wheels. Its leaves were also valued as cattle fodder during the winter months (Nelson 1993, 43; Muhr 2002). Although it is associated with Christmas, when it is used to decorate houses and protect them from evil during the festive season, holly was also historically associated with the festival of Lughnasa, the time of chariot races (Mac Coitir 2006, 66, 71). Its use as a raw material for tool-making also links it to this time of year, when a flail traditionally made with a holly handle was used in threshing. Holly features in many of the early mythologies, where various types of weapons were fashioned from its wood. In the *Táin Bó Cuailgne*, Cúchulainn is attacked by a warrior called Náth, who fires twenty seven spears made from sharpened and charred holly at him. It has been suggested that Cúchulainn's name is derived from the Irish name for holly (*cuileann*; *ibid.*, 69). It was widely believed to have protective powers (MacCoitir 2006, 66-67). Holly is a fast burning wood, which ignites with a bright flame (Rackham 1980, 189). It has a low calorific value and although it can be burned unseasoned, it performs better with seasoning.

Summary and Conclusions
The wood assemblage from Bockagh 1 (10E0300) showed that the inhabitants at Bockagh 1 had the knowledge and skill in timber splitting and this is demonstrated by the different conversion methods and split types used to make the timbers which lined the trough.

Alder was selected to line the trough while a variety of timbers including alder, oak, hazel and holly were used in the construction of the stakes. Although very little of the trough lining remained, it is possible that alder was deliberately selected for use for its waterproof qualities.

The wood types identified compare well with wood types identified and used for the construction of wooden troughs in Bronze Age Ireland. The oak wood points to the presence of mixed woodlands with possibly hazel and holly as an understorey tree in

existence in the area of Bockagh, with alder and willow growing in wetter environments close to the site.

Recommendations

The timbers have been recorded in detail on timber sheets and dated. They have also been planned, photographed, species identified and analysed and carpentry techniques have also been described. It is my specialist opinion that this material has been recorded sufficiently and may be disposed of.

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Appendix 1 Catalogue of wooden remains

Context No.	Element No.	Sample No.	Sample type	Species	Condition	Diameter /length	Annual tree rings present	Wood working	Point type	Facet (cm)	Jam curve	Comment	Context type
7	1	4	Wood	Alder	Poor	8cms (d); 0.55m (l)	14	Roundwood	n/a	n/a	n/a		Lining NW end of trough
7	2	5	Wood	Alder	Moderate	6.6cms (d); 0.45m (l)		Half split roundwood	Wedge	3cms x 2cms	Yes	This sample seems to be a natural piece of wood/tree root which has been shaped to a point-very gnarly and twisted, suggesting it may be a root. 3 slightly dished toolmarks present, as well as a jam curve and evidence for tearing. No signatures.	Lining SE end of trough
7	3	6	Wood	Alder	Poor	6.1cms (d); 0.61m (l)	12	Half split roundwood	Chisel	10cms x 2cms	No	Very poor condition. Single surviving toolmark is slightly dished. No signatures. Very gnarly wood (similar to C7/S5 above).	Lining SE end of trough
10	1	7	Wood	Oak	Good	9.2cms (d); 0.48m (l)	28	Half split roundwood	Pencil	max. 12.7cms x 1.5cms; min: 4.5cms x 1.9cms	Yes	Wood in good condition with clear toolmarks on outer face and sides. Slightly dished toolmarks, 21 in total. Bark present.	Stake from E end of trough
10	2	8	Wood	Alder	Poor	10.2cms (d); 0.34m (l)		Half split roundwood	Wedge	4.3cms x 6.6 cms	Yes	Wood degraded and fragmented. Traces of bark still present. Axe signatures noted on several toolmarks, approx. 1.3cm apart. Noted a lot of water	Stake from E end of trough

												reed on this sample. Use for dating.	
Context No.	**Element No.**	**Sample No.**	**Sample type**	**Species**	**Condition**	**Diameter /length**	**Annual tree rings present**	**Wood working**	**Point type**	**Facet (cm)**	**Jam curve**	**Comment**	**Context type**
10	3	9	Wood	Hazel	Poor	8cms (d); 0.80m (l)		Split roundwood	Not possible to identify	n/a	n/a	Very degraded and gnarly-trunk?	Stake from E end of trough
10	4	10	Wood	Willow	Moderate	5.6cms (d); 0.24m (l)	7	Half split brushwood	Pencil	max: 7.6cms x 2cms; min: 3cms x 1cm	No	Single elongated toolmark with raised signature. Remainder small toolmarks-slightly dished. 8 in total survive but sample fragmented and truncated.	Stake from E end of trough
10	5	11	Wood	Oak	Poor	7cms (d); 0.15m (l)	14	Half split roundwood	Not possible to identify	n/a	n/a	Very poor condition. No toolmarks surviving. No bark noted.	Stake from E end of trough
10	6	12	Wood	Holly	Moderate	3.1cm (d); 0.25m (l)	20	Brushwood stake	Wedge	1.1cms x 2.3cms	Yes	No bark noted. Broken tip, some damage to sides and wood splitting.	Stake from E end of trough
10	7	13	Wood	Alder	Poor	6.1cms (d);0.50m (l)	12	Heavy brushwood stake	Wedge	9.4cms x3.9cms	No	4 toolmarks noted	Stake from E end of trough

Appendix 2 Summary of samples examined

Sample No.	Context No.	Excavation Record	Wood working examination	Species examination	IAC Sample list	Comment
4	7	No sheets from this site	Y	Y	Y	Condition too poor for tool marking identification
5	7		Y	Y	Y	
6	7		Y	Y	Y	
7	10		Y	Y	Y	
8	10		Y	Y	Y	
9	10		Y	Y	Y	
10	10		Y	Y	Y	
11	10		Y	Y	Y	
12	10		Y	Y	Y	
13	10		Y	Y	Y	

Appendix 2.3 Petrological Report – Richard Unitt

Stone Artefacts from the N5 Ballaghaderreen Bypass

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Stone Artefacts from the Ballaghaderreen Bypass

Introduction to the Geology
The geology of the Ballaghaderreen area is a mixture of Lower Devonian rocks (~410Ma) belonging to the Curlew Mountain Inlier and the basal clastic rocks of the overlying Lower Carboniferous period (~350Ma).

The oldest rocks belong to the Moygara and Keadew Formations, believed to be Lower Devonian in age. The Moygara Formation consists mainly of conglomerates, with minor red brown coarse and pebbly sandstones. The Keadew Formation consists of sheets of quartz-rich sandstone with minor sun-cracked mudstone. The Bockagh Member of the Keadew Formation consists of andesitic volcanics, a mixture of lavas and pyroclastic rocks.

The Lower Devonian succession is unconformably overlain by sediments of the Lower Carboniferous age Boyle Sandstone Formation. The formation is made up from minor conglomerates and purple sandstones grading into pale grey and occasionally pink sandstones.

The townlands north and east of Ballaghaderreen are underlain by the Keadew Formation and the Boyle Sandstone Formation.

Results
The burnt stones, recovered from *Fulacht Fiadh*, reflect the underlying geology and were derived locally.

The andesitic rocks were derived from the Bockagh Member of the Keadew Formation. The sandstones, however, may have come from any of the underlying formations. It is most probable, however, that the pale-grey sandstones were derived from the Boyle Sandstone Formation.

10 E 0300 Bockagh 1, S2, C8
Pale-grey, immature, medium-grained sandstone.

APPENDIX 3 GLOSSARY OF TECHNICAL TERMS

Access Road	A new private/public road provided for access to lands where previous access has been cut off by road development
Barrow	Circular burial monument of the Bronze Age and Iron Age with a central area defined by a ditch and an external bank
Bivallate	Two sets of ramparts
Bronze Age	*c*. 2400–800 BC the introduction of metallurgy in Ireland. A time of technological, social and economic development and change
Cairn	Mound composed of stones, sometimes with internal structures; usually a burial monument, but sometimes used as a memorial
Cashel	A ringfort with stone instead of earthen banks
Cist	Pits lined with stone flags containing a burial
Code of Practice	The Code of Practice is an agreement between the Minister (Department of Environment, Heritage and Local Government) and the National Roads Authority acting on behalf of the Authority and the local authorities in relation to archaeology and the development of national roads
Chainage	Road scheme centreline distance in metres from scheme start point to finish, in this case south to north
Context No	The individual number used to record a feature uncovered in an archaeological excavation.
CPO	Compulsory Purchase Order used to compulsorily acquire land required for the development, in this case a road
Cropmark	Where buried features such as ditches or walls affect the covering soil and alter the colour of the surface vegetation and/or crop
Directions	Under 2004 National Monuments (Amendment)Act Section 14A(2) – any works of an archaeological nature that are carried out in respect of an approved road development shall be carried out in accordance with the directions of the Minister, which directions shall be issued following consultation by the Minister with the Director of the National Museum of Ireland
DoEHLG	Department of the Environment Heritage and Local Government

Dún	A ringfort, usually with earthen banks, but a name also given to prehistoric ceremonial enclosures
Earthwork	Any monument made entirely or largely of earth
Enclosure	Any monument consisting of an enclosing feature, such as a bank or a ditch, usually earthen, such as barrows or ringforts.
Excavation	Or resolution is an archaeological term and means the manual and mechanical excavation by an archaeologist-led team with specific objectives with regard to information, preservation, recording, etc. of archaeological information. Its purpose is to fully investigate archaeological deposits and features
Feature	Archaeological feature, an artificial (man-made) structure or cut or deposit
Field system	Pattern of fields, now no longer in use, sometimes visible as low earthworks and often associated with medieval or earlier settlements
Fosse	A ditch
Fulacht fiadh	Bronze Age cooking site characterised by a crescentic mound of burnt stone; usually built in damp areas, where the trench for cooking in would fill with water; usually found in groups and also referred to as Burnt Mounds (plural: *fulachta fiadh*).
Geophysics	A non-invasive survey method involving one or more of the following; earth resistance, various types of magnetometry and ground penetrating radar
Henge	Large earthen embanked enclosure with an internal ditch and external bank
Hillfort	Large late Bronze Age/Iron Age defensive hilltop enclosure defined by one or more large ramparts and consisting of banks with external ditches
Holy well	A natural spring or well associated with a saint or a tradition of cures
In situ	Archaeological features or artefacts found in their original position in the ground
Iron Age	Prehistoric period from *c*. 500 BC to *c*. AD 500. Also described as the Celtic period, when influences from central Europe and Britain led to the adoption of the Celtic language and the development of an Irish style of Celtic art.
Landtake	The land acquired for the road development (see CPO)

Licencee	An archaeologist qualified under the DoEHLG to direct the excavation of archaeological sites
Lime kiln	A stone and brick structure utilised for the burning of lime. Mostly built in the 18th and 19th centuries when the burning of lime as an agricultural fertiliser was widespread.
Megalithic tomb	Literally 'large stone,' a Neolithic tomb
Mesolithic	Prehistoric period from *c*. 7000–4000 BC
Moated site	An Anglo-Norman defended homestead consisting of a square or rectangular enclosure defined by a bank and a broad, flat-bottomed ditch; date to the thirteenth and fourteenth centuries and often built in damp land in order that the moat would fill with water
Motte and bailey	An Anglo-Norman defensive structure consisting of a large, steep-sided earthen mound – the motte – with a rectangular enclosure at the base – the bailey; date from the twelfth and thirteenth centuries
Multivallate	More than two sets of ramparts
National Monument	A monument or the remains of a monument the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto.
NGR	National Grid Reference
NMI	National Museum of Ireland
Natural	Natural sub soils located beneath the topsoil in which archaeological features are located
Neolithic	Pertaining to the New Stone Age *c*. 4000–2500 BC, when agriculture and cattle husbandry was developed in Ireland
Occupation site	A settlement site; the term is usually used to indicate a prehistoric site
OS	Ordnance Survey
Passage tomb	Megalithic tomb dating to the Neolithic characterised by an oval or circular mound, kerbing, and a passage, often terminating with a chamber in which cremated burials were placed; often situated on hilltops
Rath	A ringfort, usually with earthen banks, or any circular enclosure
Raheen	Small fort

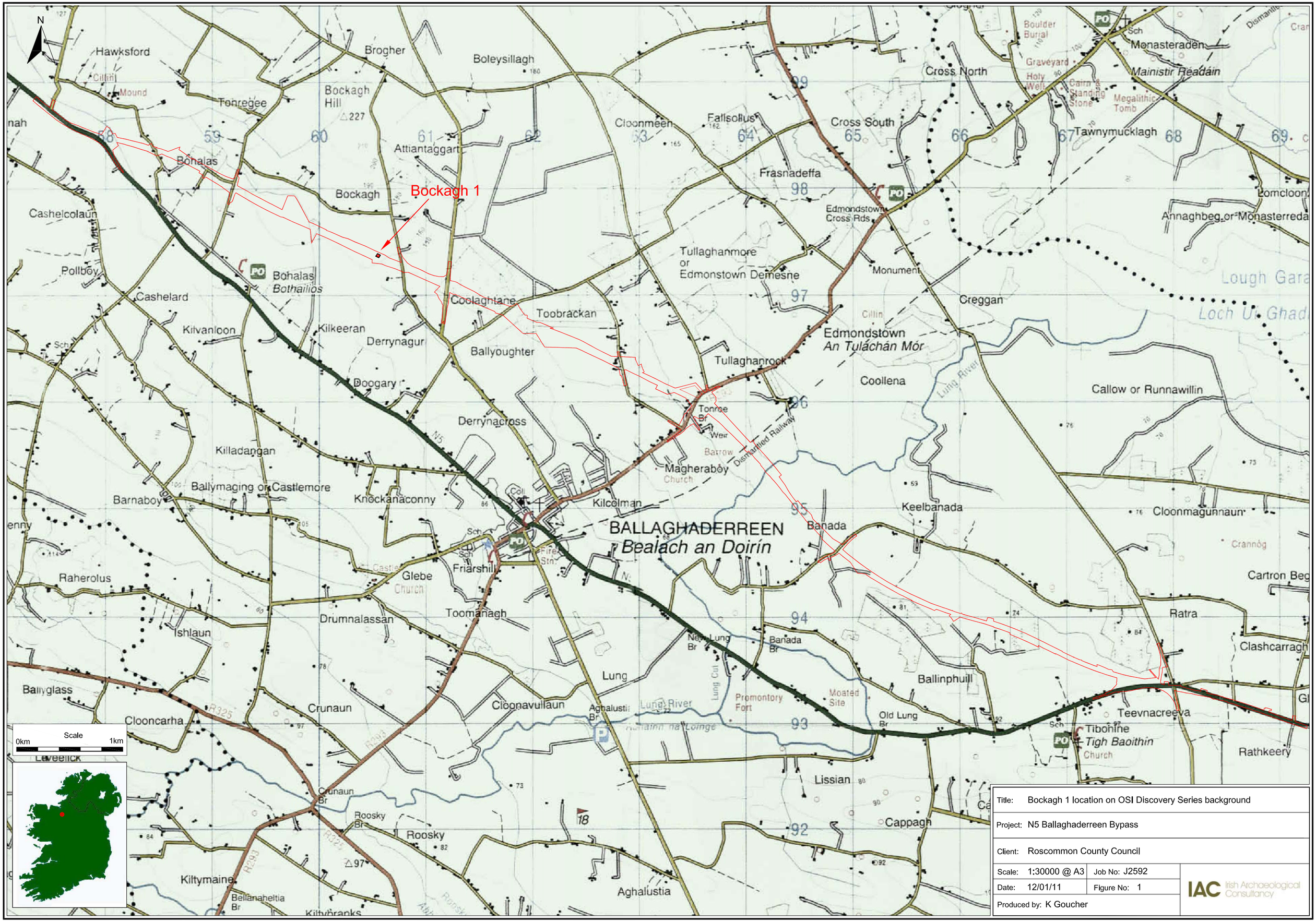
Resolution	See excavation above
Ring barrow	Barrow with raised or domed central area
Ring ditch	Barrow with flat or dished central area
Ringfort	Early Christian (*c*. AD 500 to 1100) defended secular settlement consisting of a bank and external ditch defining a central circular area that contained dwelling structures of occupants; also called fairy fort, rath, lios, or cashel (the latter constructed of stone as opposed to earth)
RMP	Record of Monuments and Places – a list of monuments and places and accompanying maps complied by the State. Sites designated an RMP are subject to statutory protection under the National Monuments Act.
Roadtake	The outer edge of the road including any embankment.
Souterrain	Underground passages, probably built for storage purposes or possibly as temporary refuges; often associated with ringforts
Standing stone	Upright stone, usually single but sometimes in pairs and groups. They can be shaped or natural and are usually dated to the Bronze Age but occasionally to the Neolithic. Used to mark routes, sacred areas, boundaries or, occasionally, burials
Site	Archaeological site – an individual or group of artefacts and/or features in an area.
Test excavation	A form of archaeological excavation where the purpose is to establish the nature and extent of archaeological deposits and features present in a location that is proposed for development. Its purpose is not to fully investigate those deposits or features.
Test trenching	See Test excavation
Tower house	Small castle, usually of three storeys, dating from the 14th to 16th centuries
Tumulus	Burial mound composed of earth, sometimes with internal structures
Uncoursed masonry	Wall laid in a random form
Univallate	Single set of ramparts

Zone of archaeological Potential

A buffer area around an archaeological site or monument where greatest potential exists for the recovery of archaeology associated with a site or monument

APPENDIX 4 COPY OF NRA DATABASE ENTRY

Database entry	Comment
Excavation number	10E0300
Townland	Bockagh
Site name	Bockagh 1
County	Roscommon
Project reference	N/A
Year of excavation	2010
Grid reference (Easting)	160548
Grid reference (Northing)	297385
OD Height (m)	150 m
Landscape setting	Bockagh 1 located in the townland of Bockagh, lies at c. 150 m Ordnance Datum (OD) and is located in the parish of Kilcolman. The site is located c. 2 km north-east of the village of Bohalas and c. 2.5 km north-west of Ballaghaderreen. The surrounding topography comprises undulating bogland drained by small water courses, with Bockagh Hill rising to north (height of 227 m OD).
Project Archaeologist	Deirdre McCarthy
Site Director	Dave Bayley
Archaeological consultancy	Irish Archaeological Consultancy Ltd.
Identification technique	Archaeological Test Trenching
Site type	Burnt mound
Site activity	Burnt mound
Dating period	Mid to late Bronze Age
Radiocarbon dates	UBA 16915 Cal. 1489–1317 BC (2 Sigma) and UBA 16953 Cal. 1299–1059 BC (2 Sigma).
Dendro-chronological dates	None
Descriptions	The main body of the site was a large kidney shaped burnt mound or waste from activity carried out in an associated rectangular wooden lined trough. Bockagh 1 was located close to a cluster of other burnt mounds in Bockagh townland at Bockagh 2, 3 and 4.
Artefacts	None
Environmental evidence	*Environmental:* Wood; alder (*Alnus glutinosa*), oak (*Quercus sp*), hazel (*Corylus avellana*), willow (*Salix sp*) and holly (*Ilex acqufolium*) identified from trough *Petrological:* Burnt stone from spread identified as pale-grey, immature, medium-grained sandstone
Additional information	N/A
Publication	Publication proposal submitted to client.


N
Bockagh 1
Hawksford
Brogher
Boleysillagh
Bockagh Hill
△227
Tonregee
Bohalas
Attiantaggart
Bockagh
Cloonmeen
Fallsollus
Cross North
Cross South
Monasteraden
Mainistir Readáin
Tawnymucklagh
Frasnadeffa
Edmondstown Cross Rds
Tullaghanmore or Edmonstown Demesne
Monument
Creggan
Edmondstown
An Tulachán Mór
Tullaghanrock
Coollena
Callow or Runnawillin
Lough Gara
Loch Ui Ghadh
Annaghbeg or Monasterreda
Lomcloon
Cashelcolaun
Pollboy
Cashelard
Bohalas
Bothailios
Coolaghtane
Toobrackan
Kilvanloon
Kilkeeran
Derrynagur
Ballyoughter
Doogary
Derrynacross
Killadangan
Barnaboy
Ballymaging or Castlemore
Knockanaconny
Kilcolman
Magheraboy
Church
BALLAGHADERREEN
Bealach an Doirín
Banada
Keelbanada
Cloonmagunnaun
Raherolus
Glebe
Church
Friarshill
Toomanagh
Drumnalassan
Ishlaun
Ballyglass
Clooncarha
Crunaun
Cloonavullaun
Lung
Aghalustia Br
Lung River
Lung Cut
New Lung Br
Banada Br
Promontory Fort
Moated Site
Old Lung Br
Ballinphuill
Teevnacreeva
Tibohine
Tigh Baoithin
Church
Rathkeery
Cartron Beg
Ratra
Clashcarragh
Crannóg
Lissian
Cappagh
Aghalustia
Crunaun Br
Roosky Br
Roosky
Kiltymaine
Bellanaheltia Br
Kiltybranks
Tonroe Bf
Weir
Barrow
Dismantled Railway
Scale
0km
1km
Title: Bockagh 1 location on OSI Discovery Series background
Project: N5 Ballaghaderreen Bypass
Client: Roscommon County Council
Scale: 1:30000 @ A3
Job No: J2592
Date: 12/01/11
Figure No: 1
Produced by: K Goucher
IAC Irish Archaeological Consultancy

N

Bockagh 6

ockagh 5

Burnt Mound
Bockagh 1
1489 - 1317 BC
1299 - 1059 BC

RO008-007----

38Kv

CD

CS

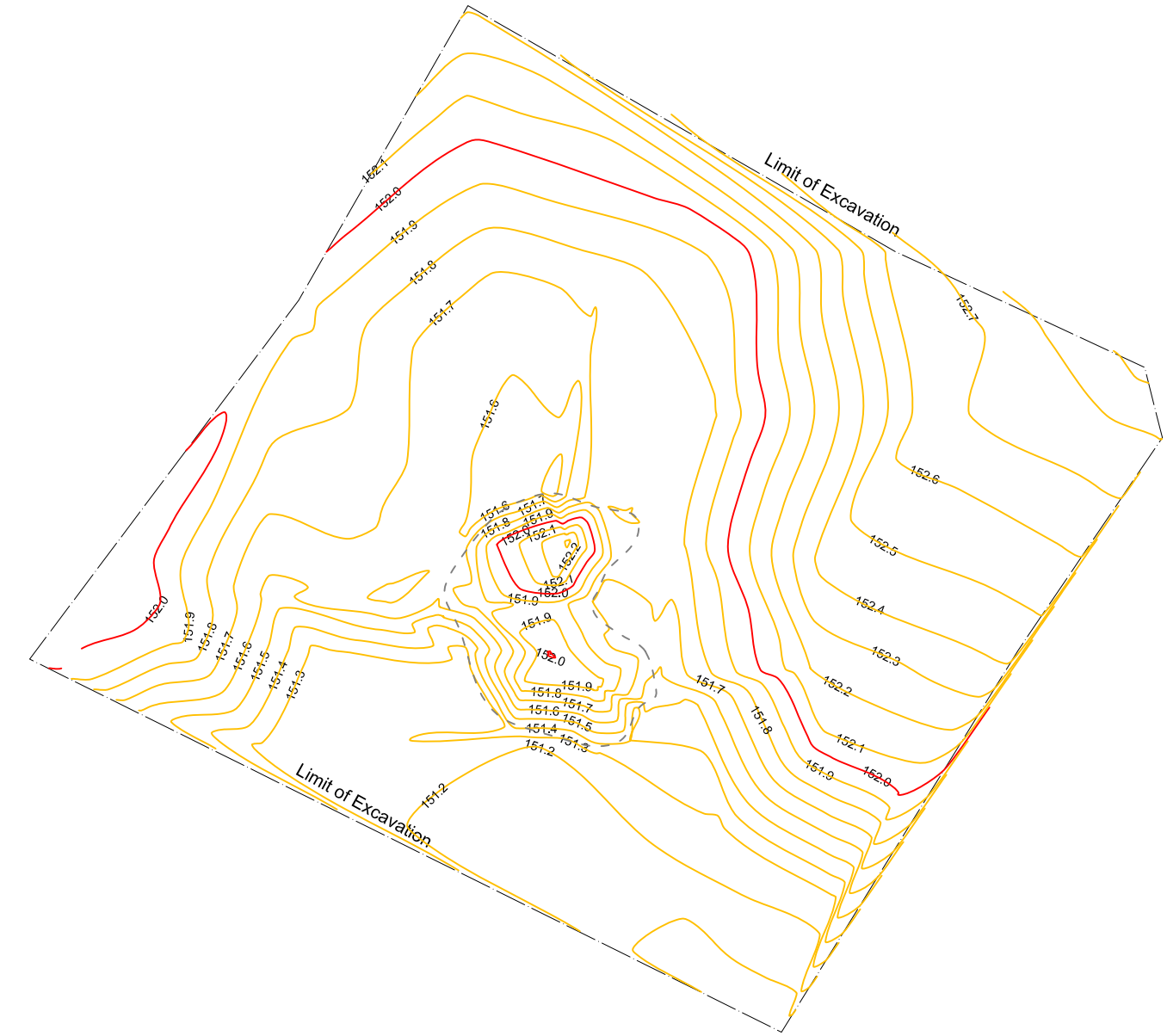
UND

Legend

- CPO boundary
- RMP Site
- Excavated site

Scale
0m 100m

Title:	Bockagh 1 site location	
Project:	N5 Ballaghaderreen Bypass	
Client:	Roscommon County Council	
Scale: 1:2000 @ A3	Job No: J2592	IAC Irish Archaeological Consultancy
Date: 20/12/10	Figure No: 2	
Produced by: G Kearney		



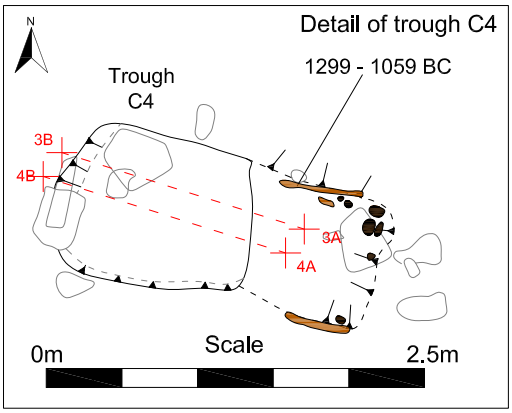
0m Scale 10m

Legend

- CPO Line
- Limit of burnt mound
- Minor contours (0.1m interval)
- Major Contours (1.0m interval)

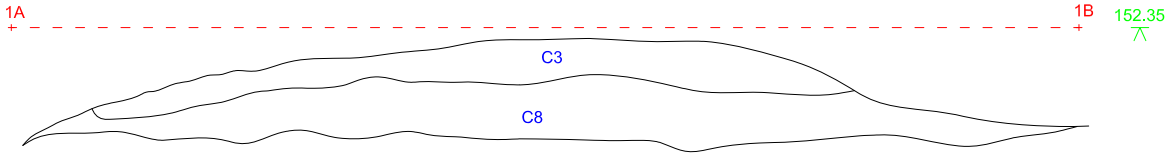
IAC Irish Archaeological Consultancy

Title:	Bockagh 1 topographical contour survey of the mound	Scale:	1:250 @ A4
		Date:	10/01/11
Project:	N5 Ballaghaderreen Bypass	Produced by:	K Goucher
		Job No:	J2592
Client:	Roscommon County Council	Figure No:	3

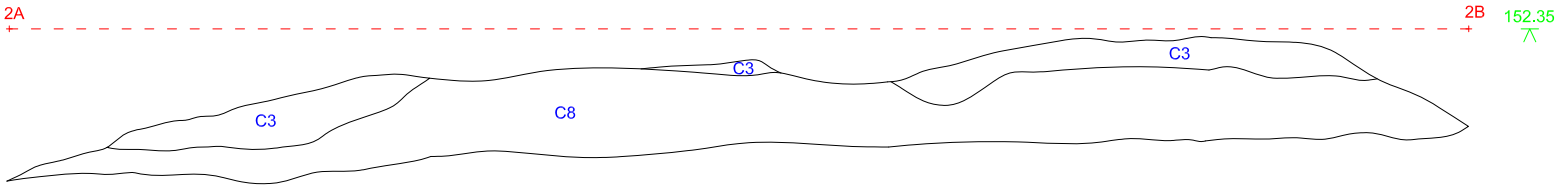


IAC Irish Archaeological Consultancy	Title: Bockagh 1 plan of site	Scale: 1:200 @ A4
	Project: N5 Ballaghaderreen Bypass	Date: 06/01/11
	Client: Roscommon County Council	Produced by: G Kearney
		Job No: J2592
		Figure No: 4

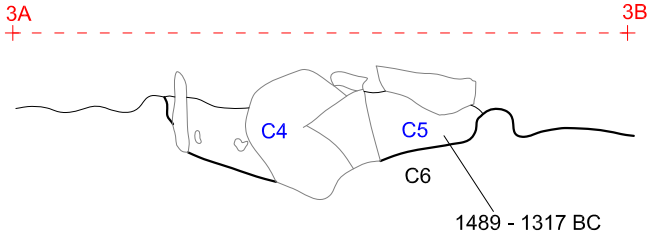
Northwest facing section of C6



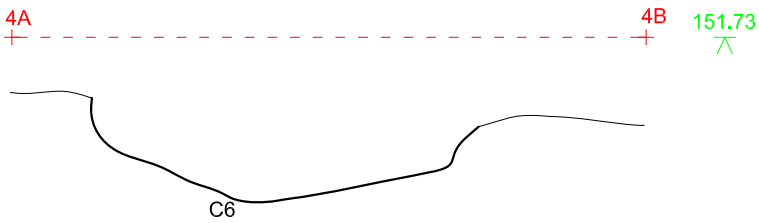
Southwest facing section of C6



Northeast facing section of C6



Southeast-Northwest profile of C6



Scale 1:20

0m 1m

Scale 1:50

0m 2.5m

Legend

Cxx	Cut numbers
Cxx	Fill numbers
	Stone
#	Charcoal
xx.xx	Levels - metres OD

IAC Irish Archaeological Consultancy

Title:	Bockagh 1 sections and profile
Project:	N5 Ballaghaderreen Bypass
Client:	Roscommon County Council

Scale:	As shown @ A4
Date:	10/01/11
Produced by:	G Kearney
Job No:	J2592
Figure No:	5

Plates

Plate 1 - Mound looking east

Plate 2 - Mid-excavation view of trough

Plate 3 - Mid-excavation view of trough

Plate 4 - Section through mound

Plate 5 - Post excavation view of site