KINTORE EAST

TOFTHILLS

ABERDEENSHIRE

PART 2

Specialist reports on Archaeological Evaluation

by

Murray Archaeological Services Ltd

Report No: MAS 2016-04A

by

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1. Background

1.1 An application for planning permission (APP/2013/3830) was approved for a residential development comprising 600 dwelling houses, neighbourhood centre, landscaping, open space and associated infrastructure on a green field site at Tofthills and Brae Head Farms, on land to the east of Kintore, Aberdeenshire.
An archaeological condition was applied to this application in the context of Scottish Planning Policy (PAN 2/2011, SPP, SHEP).
The condition required that there should be a programme of archaeological works in accordance with a written scheme of investigation approved by the Archaeology Service, Aberdeenshire Council. This stipulated that no development should take place before the implementation of a 7% archaeological evaluation.

1.2 The archaeological condition was applied in the context of planning legislation (PAN 2/2011, SPP, SHEP), which states that it is necessary for developers to arrange for archaeological work to take place prior to development, in appropriate circumstances.

1.3 Murray Archaeological Services Ltd was commissioned by the Kintore East Consortium to undertake the work.

1.4 The evaluation was undertaken between 1st February and 1st March 2016. The post-excavation work has been undertaken between March and October 2016.

1.5 A number of mitigations were recommended in the report on the evaluation (Murray & Murray, 2016). This report covers the immediate post-evaluation phase of the mitigations (Murray & Murray 2016, section 8.2 (i)).

(i) Immediate Post evaluation stage

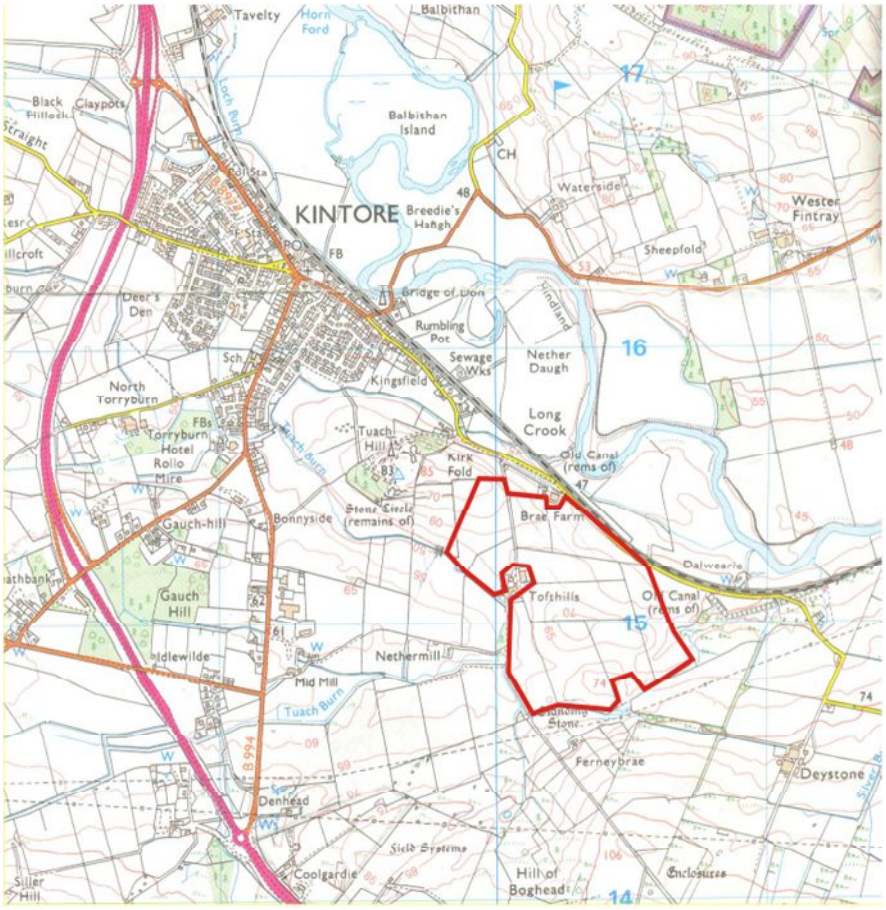
A number of actions are necessary to process the results of the evaluation to allow a fully informed decision regarding the extent of further work in the future, prior to the development.

1. *C14 Dating: Seven samples have been selected for identification and processing by Dr Scott Timpany (Orkney College) and subsequent submission to SUERC for C14 dating.*
   These include two samples from the Field 3 area of prehistoric activity, two from the Field 4 area of prehistoric activity, two from the later iron working in Field 5 and one from the possibly earlier metal working in Field 4.
2. *The lithics to be submitted to Dr Torben Ballin for identification.*
3. *Depending on the C14 date from Trench 36, XRF analysis of any metal residues from the fired clay objects associated with the processing.*
4. *A short supplementary report to be written by MAS Ltd to submit the results of 1-3 above and put them in context.*

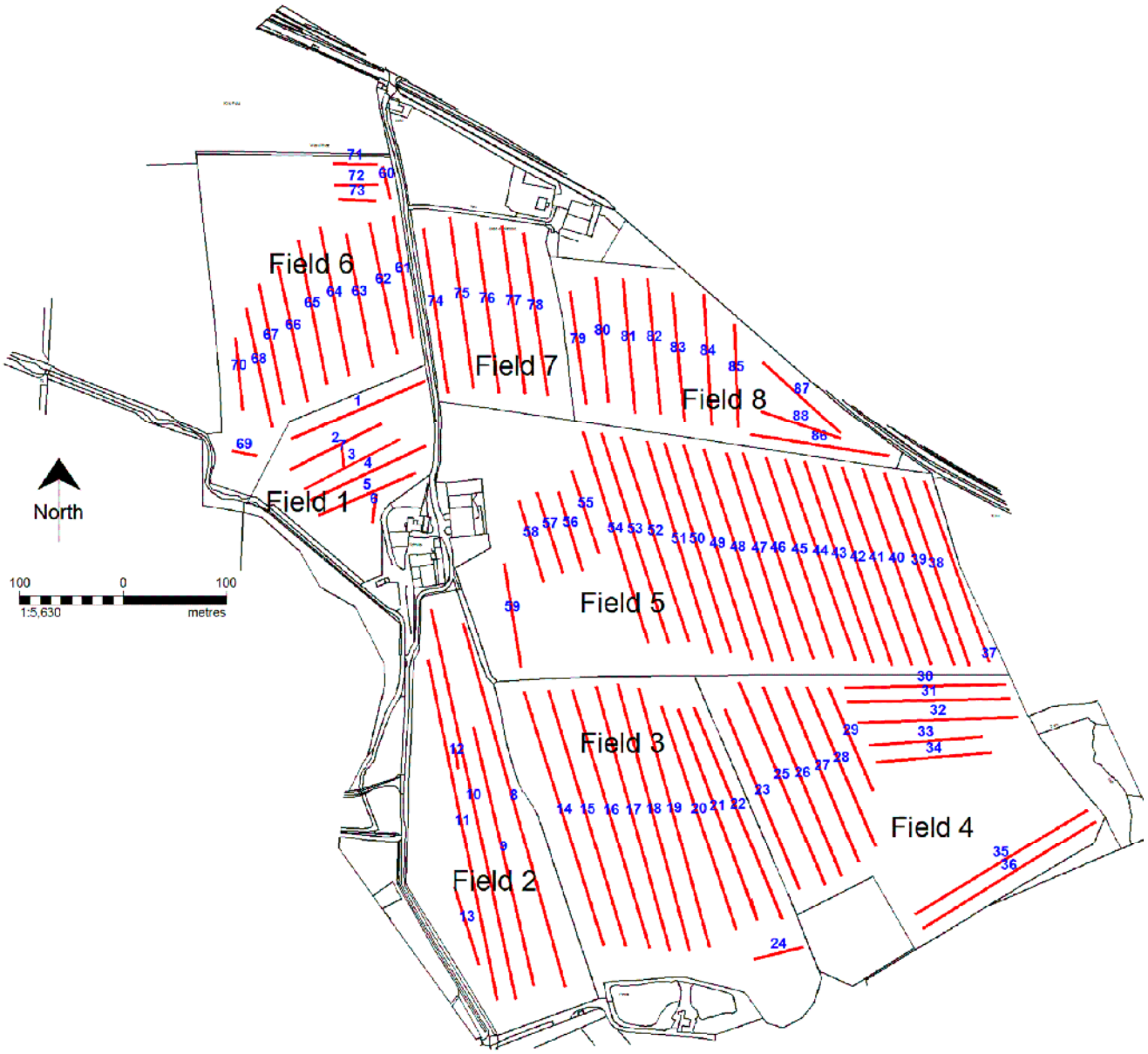
This report does not cover the further stage of mitigations which concern the need for future excavation (Murray & Murray 2016, section 8.2 (ii)).

2. The Site

2.1 The evaluation area lay to the SE of Kintore between the Tuach Burn and the river Don on a series of ridges at 70-74m OD.
The total area was 45.5 hectares.
Parish: Kintore
NGR (central) NJ 80308 15119



Illus 1 Location of site. (development outline in red). © Crown Copyright. All rights reserved License No.100049810



Illus 2 Field layout and trench numbers. OS map reproduced Crown Copyright. License 100041040

3 Summary of the post-excavation results

A total of seven C14 dates were obtained, showing that prehistoric activity and settlement had taken place on the site over a long period along the sheltered S and E facing slopes of Fields 3 and 4. Activity on the W slopes, facing the river Don, appears to represent the deposition of burnt waste from both medieval cultivation and from small-scale Iron Age working of bog iron. The detailed C14 results are included below, as are specialist reports on the lithics, the environmental samples and the residues found in Trench 36, context 42. The

results of these reports are combined in the following discussion (3.1-3.3), with a summary of the mitigations required (3.4).

Illus 3 indicates the areas under discussion.

Details of the features exposed in each area are discussed in the evaluation report (Murray H, K & Murray, J C 2016. *Kintore East, Tofthills, Aberdeenshire.* MAS 2016-04. part 1).

3.1 Field 3.

The dating and specialist reports indicate that the two areas of prehistoric activity noted in this field represent the survival of intermittent occupation and agriculture along this sheltered slope from the Early Neolithic to the Iron Age. The most coherent survival appeared to be around Trenches 15 and 16 which should be the initial focus of excavation in this area. It would also be valuable to open a wider area around the features in Trenches 19 and 20 to examine the extent of the later prehistoric activity, or its survival, on this higher part of the slope.

Area 1: Trenches 15-16

The features in Trench 16 that were interpreted as a possible internal or external occupation surface (Murray & Murray 2016, 24) can probably be dated by the associated pottery and flint (Ballin below) as of Early Neolithic date. However a C14 date from one of the naked barley grains (SUERC-67866) from context 7/1 in Trench 15, yielded a late Bronze Age date (749-403 calBC : 95.4%). So, although naked barley and emmer are cereal varieties common from Early Neolithic contexts (Timpany, below) this would appear to be a later prehistoric agricultural use of the same area.

Area 1a: Trenches 19-20

Trenches 19 and 20 are c 100m NE of Trenches 15 & 16. A C14 date (SUERC-67867) of 666-23calAD indicates late Bronze Age or Iron Age activity; the flint flakes from these contexts not being particularly diagnostic.

3.2 Field 4

Area 2: Trenches 30-33

A group of features, probably including several roundhouses, had been identified on this sheltered E-facing slope above a stream (Murray & Murray 2016, 33-4, 38-56). Two C14 dates suggest that this was a Bronze Age settlement (SUERC-67868: 1611-1446calBC & SUERC-67869: 1686-1526calBC. both at 95.4% probability). Timpany (below) notes that the

charcoal from Trench 32, context 37, which had been interpreted as a possible destruction layer (Murray & Murray 2016, 50), contained much non-oak charcoal, including willow, of c 1cm diameter; this would be consistent with the destruction of a structure incorporating wattle.

Area 3: Trench 36

Originally this was tentatively interpreted as an industrial hearth with an associated working area filled with what was thought to be fuel debris from metal-working (Murray & Murray, 2016, 57-8). Specialist examination (Cruickshanks, below) identified the material as natural bog iron ore, probably collected and brought to this feature, rather than forming there. The examination showed no evidence that metal-working had been undertaken. Pottery from the same features included both Neolithic and Bronze Age sherds (Sheridan in Cruickshanks, below) and flints were of Late Neolithic technology (Ballin, below). A C14 date from the hearth (SUERC-67870: 1659-1507cal BC) gave a Bronze Age date within the same range as the dates from the roundhouses in Trenches 30-33, on the other side of the stream. While it is clear that the processes undertaken here did not include metal working, it does appear that some non-domestic activity may have been taking place here in the Bronze Age and it merits full excavation. The late Neolithic flints and Neolithic pottery would appear to be residual, indicating earlier, unrelated activity on the site.

3.3 Field 5

A C14 date from Field 5 (SUERC-67875: 128-323calAD) indicates Iron Age iron working associated with slag and magnetic residue (Timpany, below); this was one of a number of similar non-structured deposits and suggests small scale processing was intermittently undertaken- possibly near to a source of bog iron.

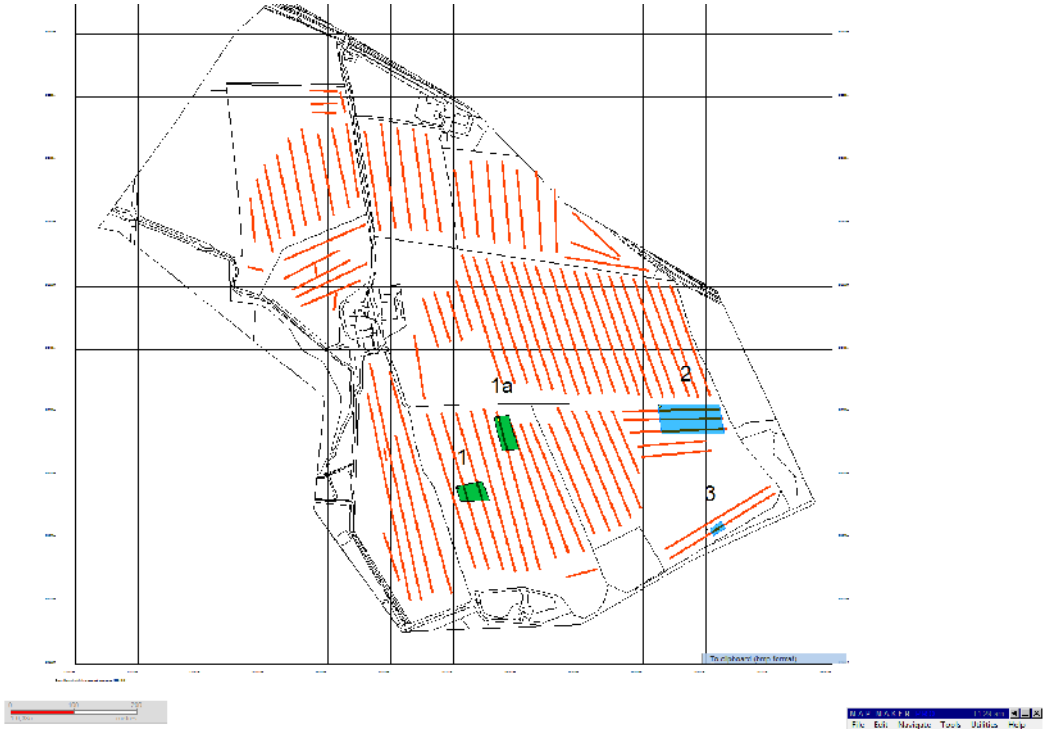
A medieval date (SUERC-67874: 980-1151calAD) was obtained from charred grain from a shallow pit (Murray & Murray, 2016, 67). The pit contents included hulled barley, flax and burnt straw, interpreted as disposal of burnt crop debris, including from flax produced for linen or oil during the medieval period (Timpany, below).

No further work is indicated in Field 5.

3.4 Mitigations

As detailed in the evaluation report, full excavation will be required in the following areas:

- *Area 1: Field 3*, around the features in Trenches 15 & 16 (*Coordinates of suggested minimum area: 380246, 814890; 380202, 814882; 380211, 814859; 380257,814860 = approx 1232 sq m*).
- *Area 1a: Field 3* around the features in Trenches 19 & 20.
- There should be scope to extend along the slope between these areas if the survival of features extends further.
- *Area 2: Field 4,* around the features in Trenches 30-33
- *Area 3: Field 4,* around the features in Trench 36.



Illus 3 Coordinates of areas of archaeological concern

Area 1:
Roughly 30 x 45m
380246, 814890
380202, 814882
380211, 814859
380257, 814860

Area 1A
Roughly 25 x 50m (Trenches 19/20 on basis of C14 date from Tr 19)
380264, 814990
380285, 814993
380330, 814940
380277, 814938

Area 2
Roughly 100 x 50m
380524, 815012
380530, 814966
380628, 814965
380620, 815012

Area 3
Roughly 13 x 20m. (Centred on context (42) 380615, 814813)
380611 814803
380629, 814814
380623, 814826
380604, 814812

The presence of surviving archaeology within the evaluation area does not preclude the possibility of chance finds or archaeological discoveries outwith the evaluation trenches. Should such chance finds occur, then the Archaeology Service, Aberdeenshire Council must be informed immediately so that an appropriate archaeological response can be formulated and agreed by all parties concerned.

4 The Lithic Assemblage Kintore East, Tofthills, Aberdeenshire.

Torben Bjarke Ballin *(*LITHIC RESEARCH, Stirlingshire. Honorary Research Fellow, University of Bradford). Written March 2016.

INTRODUCTION

In connection with the development of an area at Kintore East, Toftshill, Aberdeenshire (centred on NGR: NJ 80308 15119), Murray Archaeological Services Ltd. investigated an area covering *c*. 45 hectares. The evaluation area lay south-east of Kintore, between the Tuach Burn and the river Don, on a series of ridges at 70-74m OD, and the evaluation was carried out between 1st February and 1st March 2016. In total, 88 evaluation trenches were excavated, but lithic artefacts were only recovered from 12 of these.

The lithic assemblage includes 44 pieces, mostly flint, recovered from a number of pits, as well as from occupation areas and workshops. The purpose of this brief report is to

characterize the lithic artefacts in general terms. From this characterization, it is sought to date and discuss the finds. The evaluation of the lithic material is based upon a detailed catalogue (submitted in Microsoft Access format) of the lithic finds from Kintore East, and in the present report the artefacts are referred to by their original SF number.

THE ASSEMBLAGE

From the excavations at Kintore east, 44 lithic artefacts were recovered. They are listed in Table 1. In total, 84% of this small assemblage is debitage, whereas 2% is cores and 14% tools.

Table 1. General artefact list.

Debitage	
Flakes	25
Blades	5
Microblades	1
Indeterminate pieces	4
Crested pieces	1
Platform rejuvenation flakes	1
Total debitage	37
Bipolar cores	1
Tools	
Short end-scrapers	2
Scraper-edge fragments	1
Truncated pieces	2
Serrated pieces	1
Total tools	6
TOTAL	**44**

The definitions of the main lithic categories are as follows:

Chips: All flakes and indeterminate pieces the greatest dimension (GD) of which is ≤ 10 mm.

Flakes: All lithic artefacts with one identifiable ventral (positive or convex) surface, GD > 10 mm and L < 2W (L = length; W = width).

Indeterminate pieces: Lithic artefacts which cannot be unequivocally identified as either flakes or cores. Generally the problem of identification is due to irregular breaks, frost-shattering or fire-crazing. *Chunks* are larger indeterminate pieces, and in, for example, the case of quartz, the

problem of identification usually originates from a piece flaking along natural planes of weakness rather than flaking in the usual conchoidal way.

Blades and microblades: Flakes where L ≥ 2W. In the case of blades W > 8 mm, in the case of microblades W ≤ 8 mm.

Cores: Artefacts with only dorsal (negative or concave) surfaces – if three or more flakes have been detached, the piece is a core, if fewer than three flakes have been detached, the piece is a split or flaked pebble.

Tools: Artefacts with secondary retouch (modification).

Av. dim.: Average dimensions

GD: Greatest dimension.

Raw materials – types, sources and condition

Like most assemblages from Aberdeenshire, this collection is heavily dominated by flint, and it only includes one flake and an indeterminate piece in quartz (SF 43, 89) and one indeterminate piece in an unknown lithic raw material (SF 8). Assessment of the flint's colours is made difficult by the fact that many finds are either corticated (*sensu* Shepherd 1972) or heavily burnt and discoloured, but – like most flint assemblages from Aberdeenshire – the Kintore East collection includes substantial numbers of pieces in honey-brown, red, orange and yellow colours, but grey, beige and cream pieces are also common.

Most of the flint is fine-grained material with excellent flaking properties, but a proportion of the finds is in medium- and coarse-grained forms of raw material, affected by different types of impurities. The site's soft percussion blades, as well as tools based on well-executed blades, are generally in first-grade flint.

Table 2. Reduction sequence of all unmodified and modified flakes and blades.

	Flakes		**Blades**	
	n	*%*	*n*	*%*
Primary	5	16.7	1	11.2
Secondary	13	43.3	4	44.4
Tertiary	12	40.0	4	44.4
TOTAL	**30**	**100.0**	**9**	**100.0**

As shown in Table 2, approximately 60% per cent of all unmodified and modified flakes and blades have varying degrees of exterior cortex, with *c*. 40% being inner pieces. The cortex is

generally smooth and abraded, indicating that the raw material was procured from a secondary source, most likely the shores approximately 15km from the site. In this part of Scotland, flint is continuously being washed ashore from chalk deposits in the North Sea (Harker 2002), and these flint-bearing deposits are closest to land at the north-eastern corner of Aberdeenshire. The dimensions of the artefacts (GD up to 54mm) indicate the general size of the collected flint nodules, and the collected pebbles were probably fairly small. As many as 14 pieces are fire-crazed (*c*. one-third of the collection), with nine of those being defined as heavily burnt or even vitrified (see distribution section).

Debitage and cores

The assemblage includes 37 pieces of debitage: 25 flakes, five blades, one microblade, four indeterminate pieces, and two preparation flakes. Apart from one flake and one indeterminate piece in quartz, and one indeterminate piece in an uncertain raw material, all finds are flint.

As shown in Table 3, there is a distinct difference between the approach followed to produce the site's flakes and that followed to produce the blades. Where approximately two-thirds of the flakes were manufactured by hard percussion, *c*. two-thirds of the blades were produced by soft percussion. However, the definition of one hard percussion flake as a Levallois-like flake (SF 88) suggests that the site was visited on several occasions in prehistoric times, with the different visiting groups following different technological traditions (soft percussion vs hard percussion/Levallois-like technique) (see technology and dating sections). Approximately one-tenth of all flakes and blades were produced by bipolar technique.

Table 3. Percussion techniques applied to produce the site's technologically definable unmodified and modified flakes and blades.

	Flakes		**Blades**	
	n	*%*	*n*	*%*
Soft percussion	1	5.6	5	62.5
Hard percussion	12	66.6	1	12.5
Indeterminate platform technique	2	11.1		
Platform collapse	1	5.6	1	12.5
Bipolar technique	2	11.1	1	12.5
TOTAL	**18**	**100.0**	**8**	**100.0**

The flakes vary between elongated and squat, with the GD of the flakes varying between 14-52mm. The blades are considerably more elegant and (apart from one primary bipolar blade)

clearly represent sophisticated reduction on prepared cores. One intact hard percussion blade measures 43.8 x 16.4 x 9.0mm (L:W 2.7), whereas four intact unmodified or lightly retouched soft percussion blades measure on average 34.9 x 11.4 x 3.4mm (L:W 3.1). The soft percussion blades are notably more slender and thinner than the solitary hard percussion blade. Four indeterminate pieces – all of which are burnt – vary in size between GD 13-36mm. One crested flake (SF 139) measures 17 x 11 x 4mm, whereas one platform rejuvenation flake (SF 98) measures 26 x 16 x 7mm.

Only one core was recovered, namely bipolar core SF 2. This heavily burnt piece is a bifacial piece with one reduction axis (one set of opposed terminals), and it measures 31 x 34 x 11mm.

Tools

Only six tools were recovered from Kintore East, namely two end-scrapers, one scraper-edge fragment, two truncated pieces and one serrated piece. All are in flint. The scrapers are generally based on hard percussion flakes, whereas the truncated and serrated pieces are based on highly regular, narrow and thin, soft percussion blades.

The two short end-scrapers (SF 4 and 135) are of roughly the same general size, with average dimensions of 25 x 22 x 7mm. SF 4 is a small intact piece, based on a primary flake. Its working-edge is at the proximal end, and it is convex and acute. SF 135 is a standard short end-scraper with its working-edge at the distal end. This edge is convex and steep, and overhanging areas indicate that this is a used piece. SF 135 is heavily burnt. SF 17 (GD 27mm) is a broken-off distal end of a flake, with a convex, acute working-edge at its distal right corner.

The two truncated blades both have a short stretch of finely retouched truncation at the distal end – the truncation of SF 55 is straight, and that of SF 100 is oblique. They are both based on highly regular, straight blades with parallel lateral sides and dorsal arrises, and they measure on average 37 x 11 x 4mm with a L:W ratio of 3.4, that is, in relative terms they are quite long. Both have very fine use-wear along one lateral side in the form of ventral spin-offs, possibly corresponding to Juel Jensen's 'micro-scarring' (Juel Jensen 1994, 27). This indicates that they were used for cutting. The serrated piece SF 46 measures 37,3 x 14.8 x 3.3mm with a L:W ratio of 2.5. Its serration is along the right lateral side, and it is heavily worn. It may originally have had 4-5 teeth per cm, which is fine but considerably less fine than some of the later Neolithic serrated pieces from Stoneyhill in the Buchan Ridge area (up to 17 teeth per cm; Suddaby & Ballin 2010, 30). The working-edge of this piece is not only

macroscopically worn but also displays slight gloss, indicating that it may have been used to process plant material, like the Danish Early Neolithic 'micro-denticulates' described by Juel Jensen (1994, 50). The blade blanks of SF 46 and SF 100 were both manufactured in the same manner, that is, by the application of soft percussion, following neat trimming and careful abrasion of their platform-edges. SF 55 suffered platform collapse during production.

TECHNOLOGICAL SUMMARY

This technological summary is based on information presented in the raw material, debitage (tool blanks), core and tool sections above. Although indicators of bipolar technique are present (Table 3 and bipolar core SF 2), the finds are first and foremost characterized by two operational schemas (OPs), one of which may be Early Neolithic and the other later Neolithic.

OP 1 is characterized by the production of highly regular, long (L:W ratios of 2.5-3.5), relatively narrow (W 8-15mm), and thin (Th 3-4mm) blades, produced by the application of soft percussion, following careful core preparation. Although it has not been possible to associate OP 1 with crested pieces or platform rejuvenation flakes, there is little doubt that the cores were decorticated and crested, and as shown by the recovered blades the platform-edges of the cores were neatly trimmed and abraded. Although the blades are fairly straight, they curve slightly along the long axis, suggesting that their parent cores may have been conical. This OP embraces pieces like unmodified and modified blades SF 18, 46, 55, 71, and 100 from contexts in Trenches 16 and 33 (see distribution section). This technological approach corresponds well to the one defined for the Early Neolithic site Garthdee Road in Aberdeen (Ballin 2014, 33).

OP 2 includes slightly coarser material from Context 42 in Trench 36, and the recovery of one well-executed, but robust, hard percussion blade (SF 144) and one archetypal Levallois-like flake with a finely faceted platform remnant (SF 88) suggests that this approach may the so-called Levallois-like technique defined for Grid J/Trench 1 at Stoneyhill near Peterhead, Aberdeenshire (Suddaby & Ballin 2010, 40; Ballin 2011#). This OP is defined by producing robust flakes as well as broad blades from the same flat cores with finely faceted platforms.

DISTRIBUTION AND ACTIVITIES

Table 4 (below) gives an overview of the distribution of lithic artefacts across contexts.

Most of the plain lithic artefacts (eg, waste flakes) reveal little, if anything, and it is uncertain whether they are contemporary with their contexts or whether they are simply residual 'background noise'. However, a number of artefacts associated with OP 1 (see above) were recovered from pits or burnt patches and with prehistoric or likely Neolithic pottery. Several of these features were located in trench 16, but some were located in other parts of the investigated area. Soft-hammer blade SF 71 was recovered from burnt patch C8; soft-hammer blade SF 18 from Pit 27; serration SF 46 from Pit 28; and truncation SF 100 from Pit 40. This East of Scotland deposition in pits of elegant blades and pottery may correspond to the practice of Early Neolithic central and southern Scotland (including the southern parts of eastern Scotland) of depositing pitchstone microblades with Carinated pottery and occasionally flakes of Great Langdale polished axeheads (Ballin 2015).

Although other evidence suggests that C42 in Trench 36 may be a metal-working workshop, the lithic artefacts (particularly one robust hard percussion blade and a certain Levallois-like flake) are associated with OP 2 and indicate a later Neolithic presence at the location. These lithics therefore probably represent residuality. Burnt scraper SF 135 may have been secondarily exposed to fire in connection with the later prehistoric/historic metal-working activities.

As many as 14 pieces are fire-crazed (*c*. one-third of the collection), with nine of those being defined as heavily burnt or even vitrified. These pieces are mainly associated with features in Field 3, such as burnt patch C7 in Trench 15, burnt patch C8 in Trench 16, as well as some of the pits in Field 3. It is uncertain which activities occurred at these locations, other than that high temperatures were reached.

DATING

The collection includes a number of chronological indicators, all of which are of a technological nature. The diagnostic elements generally relate to the definition of two very distinct but different operational schemas, one of which is thought to define Early Neolithic flintwork, and the other later Neolithic flintwork (see technology section). The Early Neolithic indicators are mainly associated with a number of pits, whereas the later Neolithic indicators are associated with Context 42 in Trench 36 (see distribution section).

DISCUSSION

Most of the assemblage consists of simple flakes, recovered in ones and twos across the investigated area, and these pieces generally have little research potential. The discovery of a later Neolithic scatter in Context 42 in Trench 36 is interesting as it adds information relevant to the understanding of the sophisticated (but still relatively poorly understood) Levallois-like technique (Ballin 2011), but as this sub-assemblage is numerically small, and as it represents residual 'background noise' for a later metal-working workshop, it must also be defined as having limited research potential.

The most promising element of the lithic assemblage is clearly the blades and blade tools recovered from pits, and as a group these finds add to our understanding of Scottish Early Neolithic pit depositions. Scottish Early Neolithic pits with lithics include the well-known pitchstone-bearing pits, which frequently combine pitchstone microblades, as well as flakes, with Carinated pottery and occasionally flakes struck off polished axeheads in Cumbrian tuff (Ballin 2015). In eastern Scotland a pit was recently discovered at Feteresso, Stonehaven, combining a soft-hammer microblade in flint, a combined scraper/scale-flaked knife, and *c*. 200 sherds of Carinated pottery (Julie Lochrie/Alison Cameron pers. comm.) (Ballin 2016 [rep]).

BIBLIOGRAPHY

Ballin, T.B. 2011: The Levallois-like approach of Late Neolithic Britain: a discussion based on finds from the Stoneyhill Project, Aberdeenshire. *In* A. Saville (ed.): *Flint and Stone in the Neolithic Period.* Neolithic Studies Group Seminar Papers 11, 37-61. Oxford: Oxbow Books.

Ballin, T.B. 2016: The lithic assemblage. *In* H.K. & J.C. Murray: Mesolithic and Early Neolithic activity along the Dee: excavations at Garthdee Road, Aberdeen. *Proceedings of the Society of Antiquaries of Scotland* 144, 20-35.

Ballin, T.B. 2015: Arran pitchstone (Scottish volcanic glass): New dating evidence. *Journal of Lithic Studies* 2(1), 5-16. [http://journals.ed.ac.uk/lithicstudies/article/view/1166]

Ballin, T.B. 2016: *The lithic assemblage from Feteresso, Stonehaven, Aberdeenshire.* Unpublished report.

Harker, S.D. 2002: Cretaceous. *In* Trewin, N.H. (ed.): *The Geology of Scotland*. London: The Geological Society.

Juel Jensen, H. 1994: *Flint Tools and Plant Working. Hidden Traces of Stone Age Technology. A use wear study of some Danish Mesolithic and TRB implements*. Århus: Aarhus University Press.

Shepherd, W. 1972: *Flint: its origin, properties and uses*. London: Faber and Faber.

Suddaby, I., & Ballin, T.B. 2010: Late Neolithic and Late Bronze Age lithic assemblages associated with a cairn and other prehistoric features at Stoneyhill Farm, Longhaven, Peterhead, Aberdeenshire, 2002–03. *Scottish Archaeological Internet Reports (SAIR)* 45. [http://www.sair.org.uk/sair45].

Table 4. Distribution of the lithic artefacts across contexts.

Field	*Trench*	*Context*	*Context description*	*Flakes*	*Blades, soft perc*	*Blades, other*	*Indet. pieces*	*Prep. flakes*	*Bipolar cores*	*Scra-pers*	*Trun-cations*	*Serra-tions*	*Total*	*Burnt pieces*	*Comments*
1		Unstrat.		1					1				2	1	Incl. prehist. pottery
2	10	6	Irreg. shallow feature							1			1		
3	15	7	Burnt patch w charcoal/burnt bone	3			1						4	3	
3	16	Natural		2							1		3		Incl. prehist. pottery
3	16	8	Burnt patch w charcoal	2	1		1						4	2	Incl. **Neolithic?** pottery
3	16	27	Pit		1								1		Incl. prehist. pottery
3	16	28	Pit									1	1		
3	16	29	Pit	1			1						2	2	Incl. prehist. pottery
3	19	10	Fire pit	1									1	1	
3	19	12	Linear feature	1									1	1	
3	22	16	Pit							1			1		Incl. prehist. pottery
4	30	56	Pit	1									1		
4	31	Natural		2									2		Incl. **Neolithic?** pottery
4	32	37	Charcoal-rich occupation layer	1									1		Incl. **Beaker** pottery
4	32	38	Occupation deposit?	1									1	1	Incl. **Beaker** pottery
4	33	40	Pit			2		1			1		4		Incl. prehist. pottery
4	36	42	Area w hearth/pits involving fire?	7		2	1	1		1			12	2	Incl. one **Levall.** flake; poss metal-working debris
4	48	72	Burnt patch	1									1	1	
5	38	Rabbit run		1									1		
TOTAL				**25**	**2**	**4**	**4**	**2**	**1**	**3**	**2**	**1**	**44**	**14**	

5 Assessment Report on Material from Trench 36, context 42, Kintore East, Tofthills (MAS 2016-4)

Gemma Cruickshanks
National Museum of Scotland

Summary

A range of potential industrial residues and associated material was submitted for assessment. Analysis has identified sherds of Neolithic and Bronze Age pottery, a coarse stone tool and lumps of mineral pan which is tentatively identified as bog iron ore. No evidence of metalworking, as initially suspected, was noted.

Pottery (identifications by Alison Sheridan)

Seven sherds of early prehistoric pottery were identified. Three from Context 42/6 (SF138, 141 and Sample 12B) are undiagnostic wall body sherds with smoothed faces and most likely Neolithic. Four sherds from Context 42 (SF85, 91, 92 and Sample 12A) are of a much grittier, sandier fabric with thicker walls (16mm) and include two flat base sherds. The grittier fabric and flat base are consistent with a Bronze Age date (possibly middle Bronze Age). The presence of both Bronze Age and Neolithic pottery suggests the site was in use for a considerable time.

Coarse Stone Artefact

One end of the water-worn sandstone cobble (SF86) displays an area of pecking and flake-scarring on the end from use as a pounder The conical, smoothed hollow (32mm in diameter and 16mm deep) was worn into the end which may have been an abandoned attempt at perforating, e.g. for use as a weight. Some iron-rich concretions adhering to the surface are due to its association with mineral pan/ bog iron ore fragments; it is not a chronologically distinct type and may have had many functions. Its association with Neolithic and Bronze Age pottery suggests it is of a similar date. A second stone (Sample 12E) was unworked.

Mineral Pan

Just under 6kg of compact, iron-rich material with a nodular structure was collected from Contexts 42, 42/4 and 42/6 (Samples 12A-D). This material is very similar in nature to natural mineral pan accumulation, especially bog iron ore. Mineral pans, including bog iron ore, form entirely naturally and are therefore not necessarily indicative of anthropogenic activity. However, such ores form in areas of slow-moving water and as such it is unlikely it naturally formed here. The association of the fragments with charcoal and artefacts further suggest it had been gathered from elsewhere and brought to the site. Bog iron ore was used for ironworking in Iron Age Scotland, but the early prehistoric pottery and lack of any metalworking residues suggest it was not part of metalworking activity here. Further investigation of a larger area of this site may shed more light on this unusual assemblage in future.

Charcoal

Sample 12B contains several large charcoal fragments (c.50 x 30 x 20) while smaller fragments are adhering to the exterior of some bog iron ore fragments.

Conclusions

The presence of both Neolithic and Bronze Age pottery suggests the site was occupied over a lengthy period. The association of these pottery sherds with fragments of bog iron ore and charcoal is unusual and there is no clear explanation for what process may have been taking place. While the use of bog iron ore is well known in the Scottish Iron Age, it is not well-attested before this.

Sample	Find	Trench	Context	ID	Weight (g)	Notes
12A	-	36	42	Mineral pan (most likely bog iron ore) and one Bronze Age body sherd	1265.8	A lump of bog iron ore with small charcoal fragments adhering to one edge. The pot sherd is a heavily gritted, sandy fabric.
-	92	36	42	Bronze Age pottery sherd	3.2	Gritty fabric suggests this is Bronze Age, but it is a bit too small and abraded to be sure
-	141	36	41/6	Neolithic body sherd	7.1	One face has spalled
-	138	36	42/6	Neolithic body sherd	14.1	Wiped surface treatment
-	85	36	42	Bronze Age base sherd	77.2	In two refitting fragments. Flat base form with heavily gritted, sandy fabric
-	91	36	42	Bronze Age base sherd	22.6	Quite abraded but clearly part of the corner of a flat base.
12E	-	36	42/4	Unworked stone	-	Shist bar with visible inclusions. No sign of modification.
-	86	36	42	Stone pounder/ hollowed	155.7	One end of a sandstone cobble with pitted and flaked area from use as a pounder, after which a conical hollow was worn into the top. This could have been through use or may have been an abandonned attempt to perforate the stone. It is not chronologically distinct in form.
12B	-	36	42/6	Mineral pan (bog iron ore), Neolithic pottery and charcoal	2842.2	Fragments of probable bog iron ore with some large charcoal fragments (e.g. 50 x 30 x 20mm). One Neolithic body sherd with abraded edges and small patches of iron rich concretion (probably bog iron ore) adhering.
12C	-	36	42/6	Mineral pan (bog iron ore)	1707.8	Large plate-like fragment of bog iron ore
12D	-	36	42/4	Mineral pan (bog iron ore)	163.1	Small fragments of bog iron ore

6 Palaeoenvironmental Assessment of Bulk Samples taken from East Kintore, Aberdeenshire.

Scott Timpany (Orca Marine) Written May 2016.

1. Introduction

Murray Archaeological Services Ltd undertook an archaeological evaluation at East Kintore during which a small number of bulk samples were taken from selected features in order to retrieve palaeoenvironmental and archaeological materials, together with establishing a chronology for the activity at East Kintore. These features included a destruction layer associated with a potential roundhouse, pit fills, hearth and charcoal deposits. The environmental remains recovered from the samples may shed more light on the function of these features, providing dating evidence and inform on the activities, economy and diet of the peoples who inhabited this site.

This report presents the results of the bulk sample assessment from the sampled features. A total of 7 bulk samples were taken from the site with all processed for assessment. The aims of the assessment were to:

- Assess the presence, preservation and abundance of any palaeoenvironmental materials within the samples.
- Assess the potential of the material to inform on activities associated with probable different periods of occupation, such as economy, wood fuels, arable farming, cultivation methods and diet.
- Assess whether there is any suitable charred plant remains available from the three areas to provide radiocarbon dating materials.

2. Method

2.1 Bulk Sample Processing

Samples were processed in laboratory conditions using a standard floatation method (*cf* Kenward *et al*, 1980). All plant macrofossil samples were analysed using a stereo-microscope at magnifications of x10 and up to x100 where necessary to aid

identification. Identifications were confirmed using modern reference material held in the collection at Orkney College and seed atlases including Cappers *et al* (2006).

2.2 Charcoal Identification

Charcoal identification samples were taken from non-oak fragments that were observed to have strongly curved rings, indicating that these represent small branch wood and thus may provide the tightest dating material. For identification charcoal samples were fragmented along the radial, tangential and transverse sections using a razor blade and then mounted on a slide and examined under a microscope at x100 and x400 when required. Wood sections were identified using features described by Schweingruber (1978, 1990).

3. Results

The results of the sample processing are provided in Tables 1 (Retent finds) and 2 (Floatation finds). Suitable material for Accelerator Mass Spectrometry (AMS) dating is also identified within each table, with an overview of all materials suitable in Table 3. All plant remains were preserved through charring.

3.1 Charred Plant Remains (CPR)

Charred cereal grain is present in small quantities within three of the samples processed (01, 02 and 06). Sample 01, from charcoal deposit (7/1) contained the greatest variety of cereal grain with naked barley (*Hordeum vulgare var nudum*), possible barley sp. (cf. *Hordeum* sp.), possible emmer wheat (cf. *Triticum dicoccum*) and possible oat sp. (cf. *Avena* sp.) all present in small numbers (Table 2). The preservation of the grain was observed as being good to poor with the naked barley grain being the best preserved and other grain being abraded so that definitive identifications could not be made. A small number of grains were recovered from Sample 02 from the fill of pit [10] with evidence for in-situ burning. Preservation of these grains was too poor to be able to identify them beyond being cereal grain and therefore they have been labelled indeterminate cereal grain (*Cerealia* indet.). Sample 06 from the fill of pit [69] related to metal working contained a small number of hulled barley (*Hordeum vulgare*) with preservation being good to moderate; some grains showing a small amount of breakage.

Together with the charred cereal grain, CPR of wild taxa was also recorded in two samples (01 and 06). These can be generally divided into three categories: arable weeds, foodstuffs and economic plants. Arable weeds were identified within Sample 01 with small numbers of mustards (*Brassica/Sinapis* sp.) and buttercups (*Ranunculus* sp.) present and in Sample 06 where corn-spurry (*Spergula arvensis*), goosefoots (*Chenopodium* sp.) and wild radish (*Raphinus raphinistrum*) were recorded (Table 2). The remains of wild foodstuffs were also recovered from Sample 06 with occasional quantities of charred hazel (*Corylus avellana*) nutshell fragments present. This sample also contained further economic crops with flax (*Linum usitatissimum*) seeds recovered, together with an occasional quantity of straw (culm) fragments.

Wood charcoal fragments were present in occasional to abundant quantities in all, with fragment size ranging from 0.4cm to 7.2cm (Table 1 and 2). Wood charcoal fragments of suitable size and condition for identification/dating purposes have been identified in all samples (Tables 1, 2 and 3). Visual inspection of charcoal fragments suggests the assemblage consists of predominantly non-oak species, with roundwood fragments observed in four samples (01, 02, 05 and 06). The sizeable number of roundwood fragments within Sample 06 suggest this may be the charred remnants of a potential wattle structure/object. One fragment of small branch wood charcoal was identified from five samples (02, 03, 04, 05 and 07) in order to provide material for radiocarbon dating (Table 3) and showed a mixed assemblage of birch (*Betula* sp.), hazel, alder (*Alnus glutinosa*) and willow (*Salix* sp.).

3.2 Other finds

Potential artefacts from the samples are a single flint flake recovered from Sample 03, together with possible quartz flakes. There is evidence for industrial activity with iron (Fe) slag found in Sample 07, while magnetic residue (Mag res) was recovered from all but one sample (05) in abundant quantities. Sample 05 contained material that resembled slag and has been retained for further inspection. Burnt mammal bone was present in rare quantities within four samples (01, 03, 06 and 07), while unburnt mammal bone was recovered from Sample 01 also in rare quantities. A rare quantity of cramp was observed in Sample 02 and possible concrete was recovered from Sample 07 indicating a degree of disturbance to the associated deposit.

4. Discussion

The samples are discussed below by feature.

4.1 Charcoal Deposit and Destruction Layer

Sample 01 was assessed from charcoal deposit (7/1) and was found to contain abundant charcoal fragments and therefore confirming observations made in the field. The charcoal is predominantly non-oak and included roundwood fragments suggestive of the use of small branch wood or possible coppiced rods. This sample also contained a variety of charred cereal grain (Table 2) although present in small numbers and in varying degrees of preservation. The assemblage is indicative of a probable Neolithic date with the main cereals recovered being naked barley and possible emmer wheat, both of which have been identified as the main cultivars during the Neolithic from sites across Scotland (Bishop *et al*, 2009, 87). The presence of probable oat sp. could represent some inclusion of later material but small quantities of oat have been recovered from samples dating to the Neolithic (e.g. Hastie, 2011) including the radiocarbon dating of an oat grain from Balbridie to 3767-3376 cal BC (OxA-1767; 4820±80 BP); although this has also been suggested to represent wild oat (*Avena fatua*) and thus could represent an arable weed (Fairweather and Ralston, 1993).

Arable weeds of mustards and buttercup were also recovered from this context, which are likely to have been accidentally collected with the cereals during harvesting. Small numbers of burnt and unburnt bone fragments also included within this deposit indicate that food waste is likely to have been discarded into the deposit, together with the charcoal. Abundant magnetic residue was retrieved from this deposit but this should be examined to ascertain whether it is associated with metalworking or natural.

One sample (04) was assessed from probable destruction layer (37) and was found to contain abundant non-oak charcoal fragments that had a maximum size of 1cm, together with an abundant quantity of magnetic residue, although again caution should be taken in regard to whether this represents evidence for metalworking. Identification of a single charcoal fragment for radiocarbon dating showed the assemblage to contain willow sp. suggesting wet woodland areas, such as along the River Don were being exploited for wood fuel.

4.2 Hearth features

A single sample (05) was assessed from fuel debris [42/2] and was found to contain abundant charcoal fragments with an assemblage consisting of non-oak fuel and again containing roundwood fragments indicative of small branch wood. A single charcoal identification from this context showed the use of alder wood as fuel and similar to the assemblage from destruction layer (37) suggests the resourcing of fuelwood from wet woodland areas. The only other material recovered from this sample was some non-metallic, slag-like material, which should be further examined to clarify whether it is archaeological or natural.

4.3 Pit features

Four samples (02, 03, 06 and 07) were assessed from pit features associated with in-situ burning and possible metalworking. Sample (02) from the fill of pit [10] was found to contain abundant non-oak charcoal fragments, which again included a number of roundwood fragments indicating the use of small branch wood. A single fragment of charcoal was identified for radiocarbon dating material and showed the use of hazel as a wood fuel. Hazel can grow in a range of conditions and therefore may be present within woodland growing on both dry and wet areas, therefore more identifications would be required from the charcoal to narrow down the woodland type fuel was being resourced from. A single indeterminate cereal grain was also recovered from this context. Possible evidence for metalworking was also present through the recovery of abundant magnetic residue, although again this should be further assessed.

Sample (03) from the fill [of pit [48/2] cut into hearth [48/1] contained an occasional quantity of non-oak charcoal, with a fragment identified for radiocarbon dating showing the use of birch sp. charcoal for wood fuel. Similar to hazel, birch will also grow on dry and wet ground and so further identifications of the charcoal would be needed to characterise the woodland type it was resourced from. Probable food waste was recovered from this pit, with rare quantity of burnt mammal bone present, while a small number of possible lithic material was also recovered in the form of a flint fragment and possible worked quartz flakes. An abundant quantity of magnetic residue was also found but again caution should be erred upon in regard to whether this represents evidence of metalworking.

Two samples (06 and 07) were assessed from the fills [69 and 78/3] of two pits [69 and 78] possibly relating to metalworking activity. Magnetic residue was present in both samples in abundant quantities but iron slag was only recovered from one sample (07) presenting more robust evidence that pit [78] was related to metalworking activity. The fill of pit [69] suggests a different use for this feature with the CPR assemblage showing the presence of flax seeds and arable weed seeds, together with straw and a small amount of hulled barley grain. The recovery of a significant amount of flax seeds suggests that linen or linseed oil production took place at East Kintore. Flax seeds have been recovered from archaeological sites from the Neolithic period (Fairweather and Ralston, 1993; Hastie, 2011) but the presence of hulled barley together with the flax seeds suggests a probable later date for this feature of at least early medieval, with similar assemblages recorded at Tullich, Aberdeenshire dating to cal AD 676-870 (GU-31498; 1250±30 BP) to cal AD 693-890 (GU-31499; 1215±30 BP) (Timpany, 2014). The sample also contained a significant amount of burnt straw fragments, together with arable weeds of goosefoot sp., wild radish and corn-spurry; the latter has been particularly associated with the cultivation of flax (Bond and Hunter, 1987). These remains suggest the disposal of crop processing waste within the pit, although straw may also have been used for tinder on domestic fires. Charcoal was present in abundant quantities within both samples, with sizeable roundwood fragments (up to 7.2cm in length) retrieved from Sample 06 suggesting it may represent the remains of some form of wattle structure. The identification of one fragment for radiocarbon dating from Sample 07 shows that a small branch of birch was used for wood fuel, with no fragments yet identified from Sample 06. Both pits also contained probable discarded food debris with small quantities of burnt mammal bone present, while Sample 06 also contained charred hazel nutshell fragments, which again suggests the disposal of food waste and the collection of wild foodstuffs.

5. Conclusion

- The sample assessment has shown that CPR in the form of charred grain, weed seeds, charred nutshell and charcoal are present in varying degrees of preservation (good to poor) within the assessed samples.
- Material for radiocarbon dating is available in all of the samples assessed.

- The charred grain assemblage indicates at least two phases of arable activity at East Kintore, with a possible Neolithic phase of naked barley and emmer wheat cultivation and a later potential early medieval onwards phase of hulled barley cultivation.
- The recovery of a significant number of flax seeds from one sample (06) suggests linen or linseed oil production may also have taken place.
- The presence of a small quantity of charred hazel nutshell from one sample (06) indicates wild foodstuffs were also collected and consumed alongside cultivated plants.
- The recovery of iron slag from one sample (07) suggests some metalworking took place, while magnetic residue was present in all but one sample (05); although some of this may be natural.
- Charcoal was present in all samples and is predominantly non-oak, with a small range of taxa identified during preparation of material for radiocarbon dating, with birch sp., willow sp., alder and hazel present.

6. Statement of potential

There is available material in all samples for radiocarbon dating with grain or charcoal already having been identified in each sample for dating, which will provide a chronology for the site.

Only small quantities of charred grain were recovered from the assessed samples suggesting there is little further information that could be gained through an analysis stage. The remains of flax seeds are of interest though and quantification of the CPR in this sample would aid in future comparisons of such remains with other sites.

There is sufficient charcoal within four samples (01, 02, 06 and 07) for further analysis that would provide information on past woodland structure and composition, woodland management techniques and fuel wood resources. These samples are likely to span at least two separate time periods, suggested on the basis of the charred cereal grain and other charred seeds to be of Neolithic and early medieval date; these will be confirmed/disputed from the radiocarbon dating. Investigating how rural settlement impacted on the environment has recently been put forward as a research priority by the medieval ScARF panel (ScARF 2012a), while the Neolithic ScARF panel (ScARF 2012b) has also called for evidence to show woodland management. Analysis of the

charcoal would aid in gaining more information on woodland character, resourcing and signs of management during these periods.

Table 1: **Kintore East**, Retent Sorting Results

Sample Number	Context Number	Trench	Feature	Sample Vol (l)	Retent Vol (l)	Building Materials	Stone	Cramp	Industrial Waste			Burnt bone	Unburnt bone	Charred plant remains	Charcoal		Material available for AMS Dating	Comments
						Concrete	Lithics		Fe slag	Mag res*	Other	Mammal	Mammal	Nutshell	Quantity	Max Size (cm)		
1	7/1	15	Charcoal deposit	4.5	0.6					++++		+	+		++++	2.3	Charcoal ++	Charcoal is non-oak and includes roundwood fragments. Unburnt bone ID uncertain.
2	10	19	Fill of fire pit with in-situ burning	4.0	0.6			+		++++					++++	3.6	Charcoal +++	Charcoal is non-oak and includes roundwood fragments.
3	48/2	31	Fill of pit, cut into hearth	2.5	0.3		++			++++		+			++	1.3	Charcoal +	Charcoal is non-oak. Lithics: 7 potentially worked quartz flakes, 1 flint fragment with percussion bulb
4	37	32	Probable destruction layer, possible part of roundhouse	4.0	0.9					++++					++++	1.0	Charcoal ++	Charcoal is non-oak. Burnt/iron-rich fragments present, making up half of matrix: 20% sample of this bagged for examination
5	42/2	36	Fuel debris from hearth, possibly related to metalworking	1.5	0.8						++++				++++	3.1	Charcoal ++	Charcoal is non-oak and includes roundwood fragments, it is also very mineralised. Slag-like material present that is non-magnetic.

6	69	46	Fill of pit, possibly related to metalwor king	4.0	1.0					++++		+		++	++++	7.2	Nutshell ++, Charcoal ++	Charcoal is non-oak and contains roundwood fragments; possible remains of wattle?
7	78/3	51	Fill of pit, possibly related to metalwor king	5.5	1.1	++?			++	++++		+			++++	2.5	Charcoal +++	Charcoal is non-oak.

Key (artefactual): + = rare (0-5), ++ = occasional (6-15), +++ = common (16-50) and ++++ = abundant (>50)
Key (environmental): + = rare (0-10), ++ = occasional (11-50), +++ = common (51-100) and ++++ = abundant (>100)

Table 2: Kintore East, Flotation Sample Results

Context Number	Sample Number	Feature	Total flot Vol (ml)	Cereal grain						Other plant remains	Charcoal		Material available for AMS	Comments
				Hordeum vulgare var nudum	*Hordeum vulgare*	*cf. Hordeum sp.*	*cf. Triticum dicoccum*	*cf. Avena sp.*	*Cerealia* indet.		Charcoal Quantity	Charcoal Max size (cm)		
7/1	1	Charcoal deposit	75	+		+	+	+		*Brassica/Sinapis* +, *Ranunculus* +	++++	2.2	Charcoal ++, Charred cereal grain +	Charcoal is non-oak and includes roundwood fragments, Burnt bone +
10	2	Fill of fire pit with in-situ burning	25						+		++++	0.7	-	Charcoal is non-oak, MWD +
48/2	3	Fill of pit, cut into hearth	10								++	0.6	-	Charcoal is non-oak
37	4	Probable destruction layer, possible part of roundhouse	10								+++	0.4	-	Charcoal is non-oak and includes root material

42/2	5	Fuel debris from hearth, possibly related to metalworking	3								+++	0.5	-	Charcoal is non-oak
69	6	Fill of pit, possibly related to metalworking	25		+					Culm fragments ++, *Spergula arvensis* ++, *Chenopodium* sp. +, *Raphanus raphinistrum* +, *Linum usitatissimum* ++	++++	1.9	Charcoal +, Charred cereal grain +, Charred flax seeds ++	Charcoal is non-oak
78/3	7	Fill of pit, possibly related to metalworking	10								++++	0.5	-	Charcoal is non-oak

Key: + = rare (1-10), ++ = occasional (11-50), +++ = common (51-100) and ++++ = abundant (>100)

NB charcoal over 0.5cm^3 is suitable for identification and AMS dating

Table 3: Kintore East, Aberdeenshire, material suitable for radiocarbon dating

Sample	Context	Long-lived material	Medium-lived material	Short-lived material
1	7/1		Non-oak Charcoal ++	Naked barley charred grain +
2	10		Non-oak Charcoal +++	
3	48/2		Non-oak Charcoal +	
4	37		Non-oak Charcoal ++	
5	42/2		Non-oak Charcoal ++	
6	69		Non-oak Charcoal ++	Hazel nutshell ++, Hulled barley charred grain +, Flax seeds ++
7	78/3		Non-oak Charcoal +++	

7. References

Bishop, R R, Church, M J & Rowley-Conwy, P A 2009 Cereals fruits and nuts in the Scottish Neolithic. *Proceedings of the Society of Antiquities of Scotland* 139 47-103.

Bond, J M and Hunter, J R 1987 Flax-growing in Orkney from the Norse period to the 18th century. *Proceedings of the Society of Antiquaries of Scotland* 117 175-181.

Cappers, R T J, Bekker, R M, & Jans, J E A 2006 *Digital seed atlas of the Netherlands*, Barkhuis Publishing and Groningen University Library: Groningen.

Fairweather, A D and Ralston, I B M 1993 The Neolithic timber hall at Balbridie, Grampian Region, Scotland: the building, the date, the plant macrofossils. *Antiquity* 67 313-323.

Hastie M. 2011 Charred plant remains. In Kirby, M. Lockerbie Academy: Neolithic and Early Historic timber halls, a Bronze Age cemetery, an undated enclosure and a post-medieval corn drying kiln in south-west Scotland. *Scottish Archaeology Internet Report* 46 20-22.

Kenward, H K, Hall, A R & Jones, A K G 1980 A tested set of techniques for the extraction of plant and animal macrofossils from waterlogged archaeological deposits. *Science and Archaeology* 22, 3–15.

ScARF 2012a Environmental factors, land-use and regionality. In Hall M and Price N (eds) *Medieval Panel Report* Scottish Archaeological Research Framework: Society of Antiquaries of Scotland, p 30-32. Available online at **http://tinyurl.com/bogzn5w**

ScARF 2012b Landscape, environment, climate. In Sheridan A and Brophy K (eds) *Neolithic Panel Report* Scottish Archaeological Research Framework: Society of Antiquaries of Scotland. Available online at **http://tinyurl.com/d73xkvn**

Schweingruber, F H 1978 *Microscopic Wood Anatomy: Structural Variability of Stems and Twigs in Recent and Subfossil Woods from Central Europe.* Kommissionsverlag Zücher AG, Zug

Schweingruber, F H 1990 *Microscopic wood anatomy* (3rd edition) Birmensdorf.

Timpany, S 2014 *The Archaeobotanical and Anthracological Analysis of Two Early Medieval (Pictish) Ditch Samples from Tullich Burial Ground Extension at Tullich, Ballatar, Aberdeenshire.* Unpublished Client Report for Murray Archaeological Services. ORCA Marine.

7 Radiocarbon dates

Seven samples were submitted to the Scottish Universities Environmental Research Centre (SUERC) for radiocarbon dating (see certificates below). The results are summarized in the following table.

On site Sample No	**Field**	**Trench**	**Context**	**Detail of context**	**SUERC No**	**Date (95.4% probability)**
1	3	15	7/1	Charcoal patch with small frags burnt bone and burnt flint (SF7-9)	SUERC-67866	749-403calBC
2	3	19	10	Charcoal fill of fire pit with in situ burning	SUERC-67867	66-223calAD
3	4	31	48/2	Charcoal fill of very small pit cut into a hearth, sealed by a heat-cracked stone- pottery SF 127 also sealed below stone	SUERC-67868	1611-1446calBC
4	4	32	37	Possible destruction layer- post dates features which may be part of round house	SUERC-67869	1686-1526calBC

5	4	36	42/2	Fuel debris around hearth related to probable metal working	SUERC-67870	1659-1507calBC
6	5	46	69	Charcoal from fill of pit related to group possible metal working areas	SUERC-67874	980-1151calAD
7	5	51	78/3	Charcoal from fill of pit related to group possible metal working areas	SUERC-67875	128-323calAD

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RADIOCARBON DATING CERTIFICATE

04 July 2016

Laboratory Code	SUERC-67866 (GU41193)
Submitter	Scott Timpany ORCA Marine Orkney College UHI East Road Kirkwall Orkney KW15 1LX
Site Reference	East Kintore
Context Reference	7_1
Sample Reference	1
Material	Charred Grain : Hordeum vulgare var nudum
$\delta^{13}C$ relative to VPDB	-24.1 ‰
Radiocarbon Age BP	2426 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

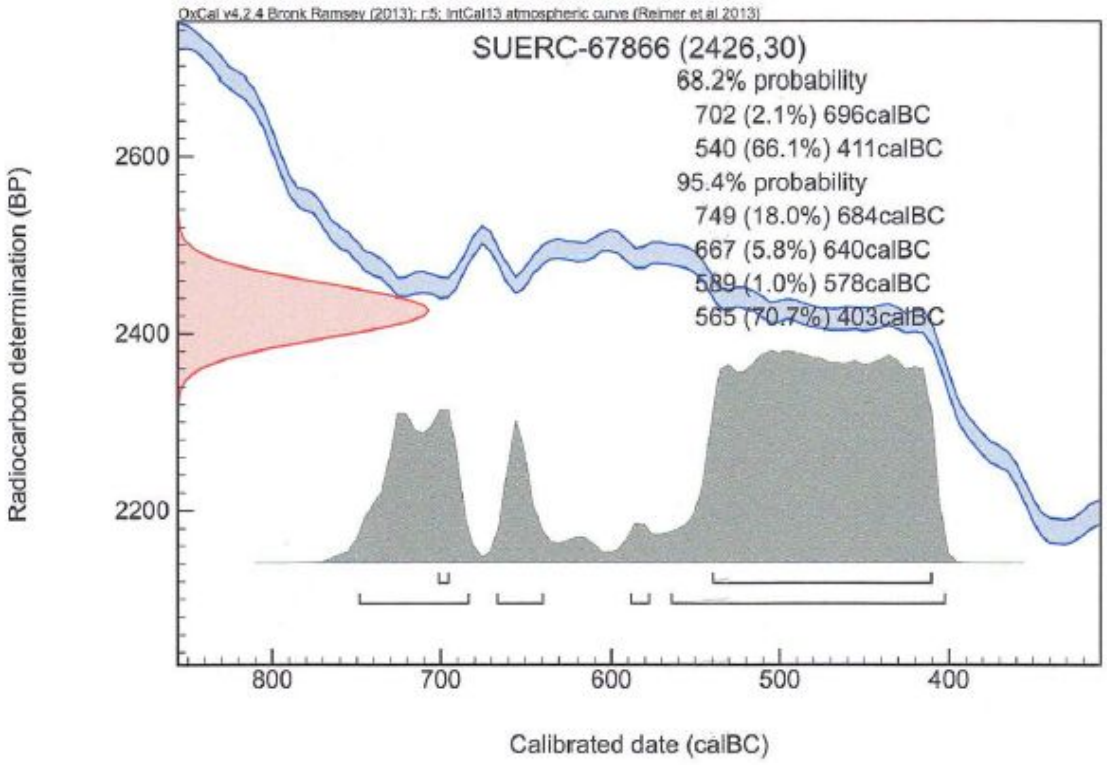
Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email Gordon.Cook@glasgow.ac.uk or telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- E. Dunbar Date :- 4/7/16

Checked and signed off by :- P. Naysmith Date :- 5-7-16

University of Glasgow

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

04 July 2016

Laboratory Code	SUERC-67867 (GU41194)
Submitter	Scott Timpany ORCA Marine Orkney College UHI East Road Kirkwall Orkney KW15 1LX
Site Reference	East Kintore
Context Reference	10
Sample Reference	2
Material	Charcoal : Corylus avellana
$\delta^{13}C$ relative to VPDB	-27.1 ‰
Radiocarbon Age BP	1879 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

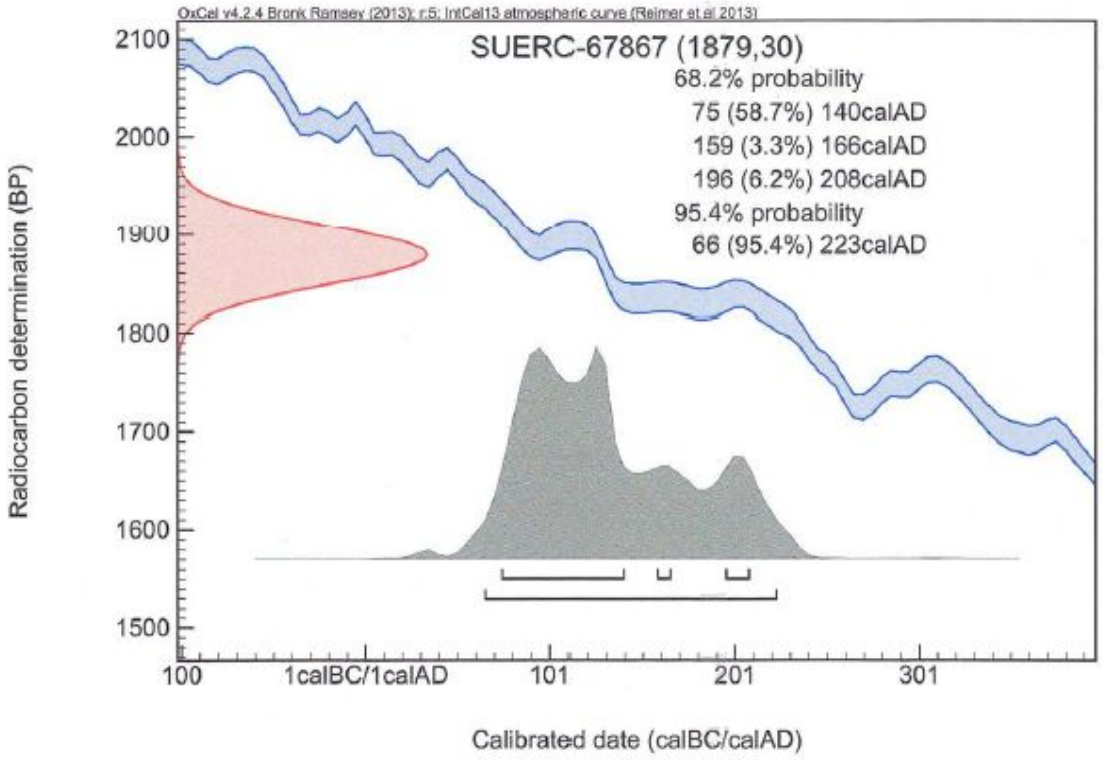
Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email Gordon.Cook@glasgow.ac.uk or telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- E Dunbar Date :- 4/7/16

Checked and signed off by :- P. Naysmith Date :- 5-7-16

University of Glasgow

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

04 July 2016

Laboratory Code	SUERC-67868 (GU41195)
Submitter	Scott Timpany ORCA Marine Orkney College UHI East Road Kirkwall Orkney KW15 1LX
Site Reference	East Kintore
Context Reference	48_2
Sample Reference	3
Material	Charcoal : Betula sp.
$\delta^{13}C$ relative to VPDB	-26.1 ‰
Radiocarbon Age BP	3244 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

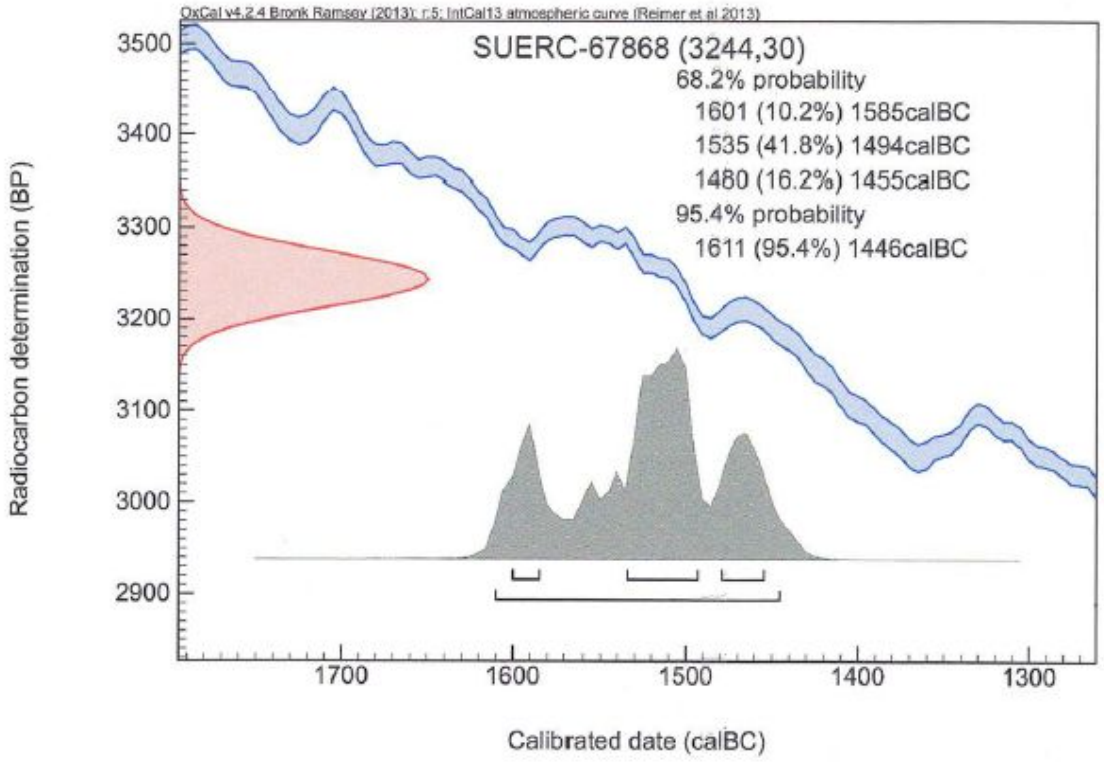
Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email Gordon.Cook@glasgow.ac.uk or telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- E Dunbar Date :- 4/7/16

Checked and signed off by :- P Naysmith Date :- 5-7-16

University of Glasgow

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

04 July 2016

Laboratory Code	SUERC-67869 (GU41196)
Submitter	Scott Timpany ORCA Marine Orkney College UHI East Road Kirkwall Orkney KW15 1LX
Site Reference	East Kintore
Context Reference	37
Sample Reference	4
Material	Charcoal : Salix sp.
$\delta^{13}C$ relative to VPDB	-25.6 ‰
Radiocarbon Age BP	3323 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

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Conventional age and calibration age ranges calculated by :- E Dunbar Date :- 4/7/16

Checked and signed off by :- P. Naysmith Date :- 5-7-16

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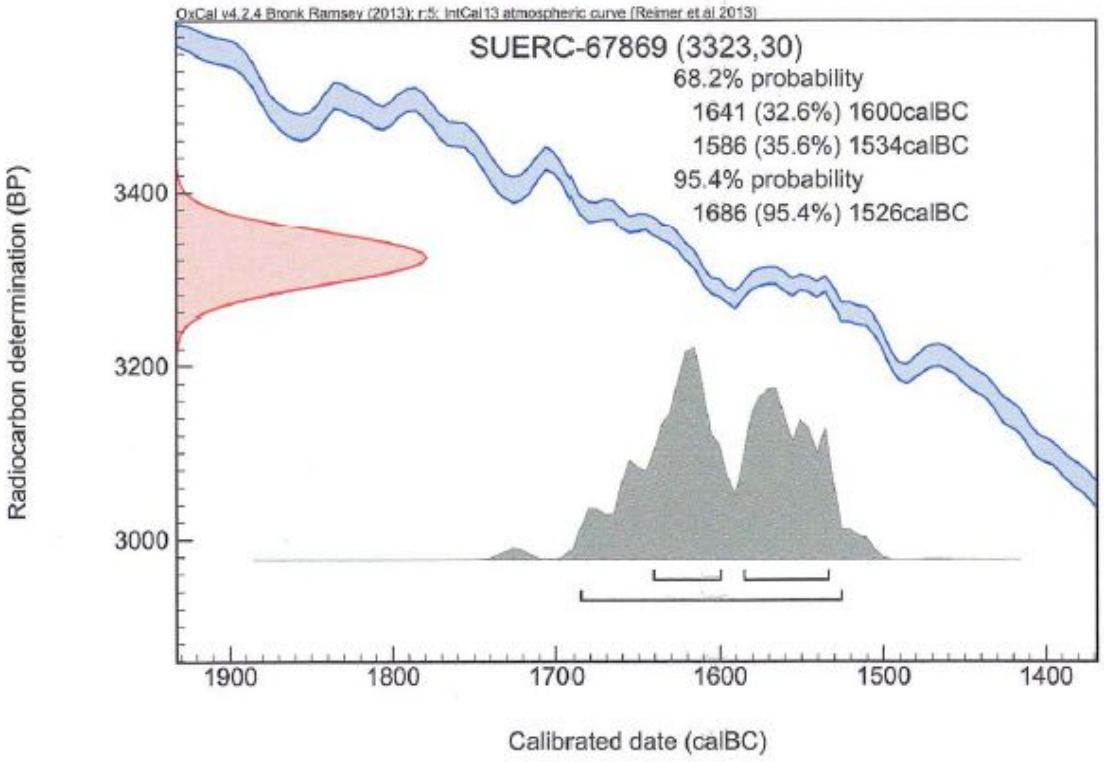
OxCal v4.2.4 Bronk Ramsey (2013); r:5; IntCal13 atmospheric curve (Reimer et al 2013)
SUERC-67869 (3323,30)
68.2% probability
1641 (32.6%) 1600calBC
1586 (35.6%) 1534calBC
95.4% probability
1686 (95.4%) 1526calBC
Radiocarbon determination (BP)
3400
3200
3000
1900
1800
1700
1600
1500
1400
Calibrated date (calBC)

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RADIOCARBON DATING CERTIFICATE

04 July 2016

Laboratory Code	SUERC-67870 (GU41197)
Submitter	Scott Timpany ORCA Marine Orkney College UHI East Road Kirkwall Orkney KW15 1LX
Site Reference	East Kintore
Context Reference	42_2
Sample Reference	5
Material	Charcoal : Alnus glutinosa
$\delta^{13}C$ relative to VPDB	-27.8 ‰
Radiocarbon Age BP	3306 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

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Conventional age and calibration age ranges calculated by :- E Dunbar Date :- 4/7/16

Checked and signed off by :- P. Naysmith Date :- 5-7-16

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The University of Edinburgh

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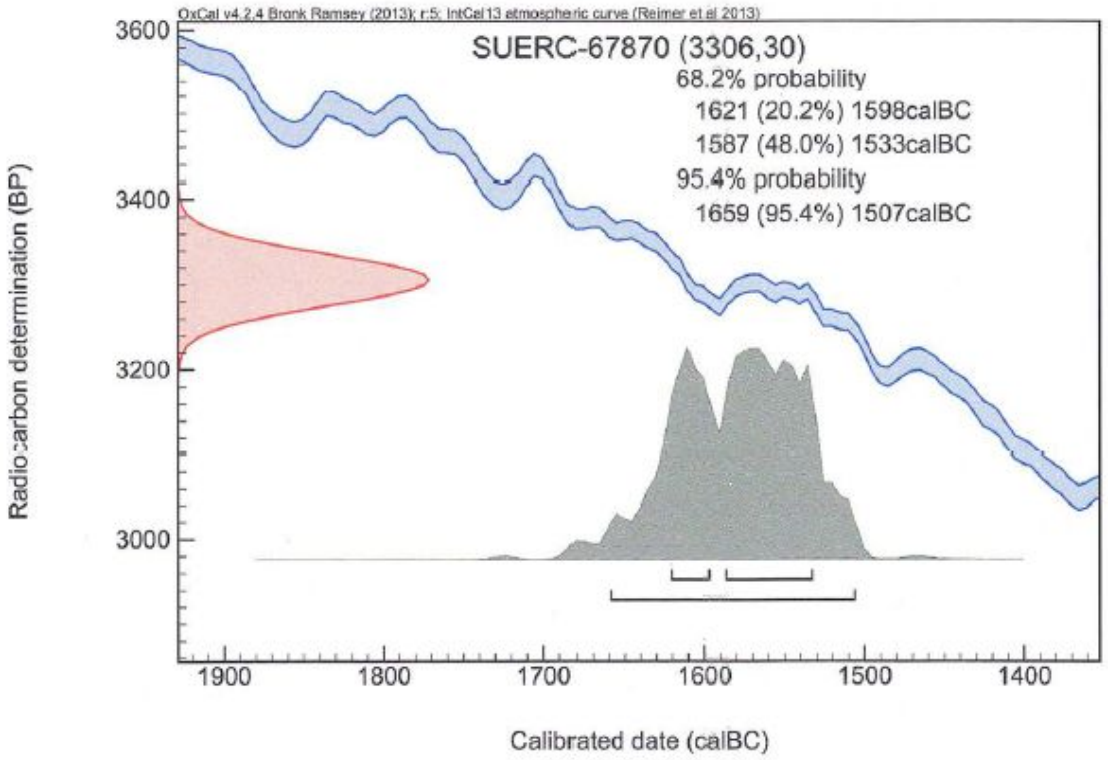
Calibration Plot



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RADIOCARBON DATING CERTIFICATE

04 July 2016

Laboratory Code	SUERC-67874 (GU41198)
Submitter	Scott Timpany ORCA Marine Orkney College UHI East Road Kirkwall Orkney KW15 1LX
Site Reference	East Kintore
Context Reference	69
Sample Reference	6
Material	Charred Grain : Hordeum vulgare
$\delta^{13}C$ relative to VPDB	-24.9 ‰
Radiocarbon Age BP	1004 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

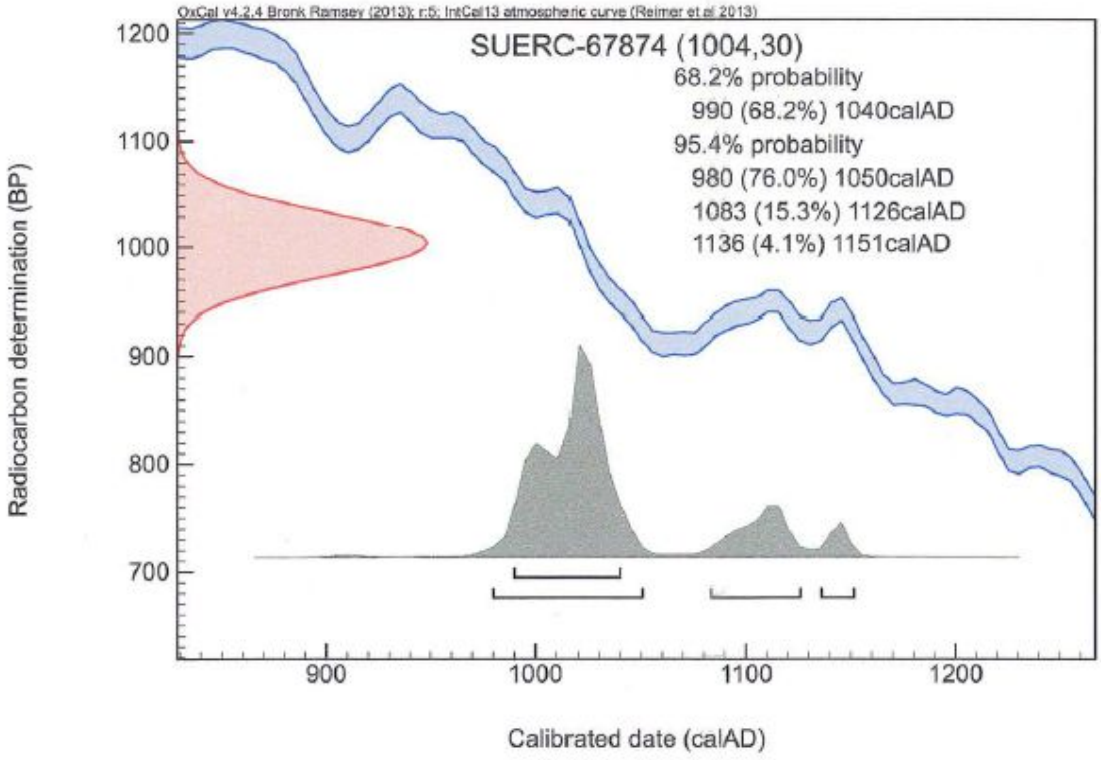
Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email Gordon.Cook@glasgow.ac.uk or telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- E Dunbar Date :- 4/7/16

Checked and signed off by :- P. Naysmith Date :- 5-7-16

University of Glasgow

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

04 July 2016

Laboratory Code	SUERC-67875 (GU41199)
Submitter	Scott Timpany ORCA Marine Orkney College UHI East Road Kirkwall Orkney KW15 1LX
Site Reference	East Kintore
Context Reference	78_3
Sample Reference	7
Material	Charcoal : Betula sp.
$\delta^{13}C$ relative to VPDB	-27.1 ‰
Radiocarbon Age BP	1809 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email Gordon.Cook@glasgow.ac.uk or telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- E Dunbar Date :- 4/7/16

Checked and signed off by :- P. Naysmith Date :- 5-7-16

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Calibration Plot