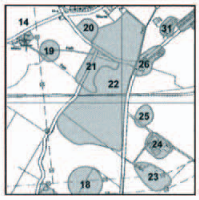





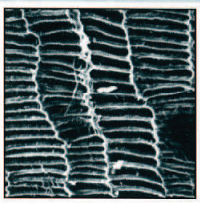


Date: October 2009
Client: Offaly County Council
Project code: NTB06

N52 Tullamore Bypass: Final Report on archaeological excavations at Mucklagh 1 E2845, in the townland of Mucklagh, Co. Offaly

By: John Twomey
Ministerial Direction No: A033
National Monuments Section Registration No: E2845
Director: Linda Hegarty
Chainage: 2750 - 2780
NGR: 23090 / 22290

HEADLAND ARCHAEOLOGY Ltd

Date: October 2009
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1 Summary

This report presents the results of archaeological investigations carried out on behalf of Offaly County Council as part of the Advance Archaeological Works Contract for the N52 Tullamore Bypass. The work was undertaken under Ministerial Direction A033 and under National Monuments Section Registration Number E2845 in the townland of Mucklagh, Co. Offaly. The Minister for the Environment, Heritage & Local Government, following consultation with the National Museum of Ireland, directed that Linda Hegarty of Headland Archaeology Ltd should proceed with archaeological resolution.

Archaeological testing carried out under National Monuments Section registration number E2493 and Ministerial Direction Number A033 on this site in 2006 identified one feature of archaeological significance. This consisted of a linear feature, running northeast-southwest, with slag and charcoal deposits along its length.

Full archaeological resolution was conducted on this site between January 22nd and February 1st 2007. This revealed the remains of a small wall, parallel to the linear feature at the northeast end. A large, modern landfill pit was located at the western side of the excavation area, and ran outside the site. A similar pit containing rocks and plastic refuse was identified within this field during Phase I Testing.

2 Introduction

The scheme involves the proposed construction of the N52 Tullamore Bypass, between the townlands of Cloghanbane and Ardan in Co. Offaly. The proposed scheme will consist of the construction of a bypass around the town of Tullamore. It is to consist of 11.5 km of standard single carriageway and 2.5 km of wide single carriageway road. It will also involve the construction of seven at-grade roundabout junctions, priority junctions and seven new major structures, including four river crossings, one canal crossing and one railway crossing. The project is funded by the Irish Government and the European Union, through Offaly County Council/National Roads Authority and under the National Development Plan 2000-2006. Headland Archaeology Ltd. was commissioned by Offaly County Council to undertake the works.

An Environmental Impact Statement was prepared in 2004, with the Cultural Heritage Assessment for the route contained within Section 3.8. The EIS was prepared by Babtie Pettit.

3 Site Description and Historical Background

Site E2845 was located approximately 3.5 km southwest of Tullamore at National Grid Reference 23090 / 22290 (see Figs 1 & 2). The land comprised of a level field with short cropped grass which was grazed at the time of excavation. Immediately southwest of the proposed road take is a church and graveyard. The study area was surrounded by pasture land with a slightly curved field boundary to the northwest. The excavation comprised an area of approximately 450 m².

The Ordnance Survey Name Books list the following alternate spellings for Mucklagh: Mucklow, Muchlough and Muckla. They list the Irish as *Muclach* meaning a place where pigs feed (a piggery). It is described as being on the road from Tullamore to Birr, one mile southwest from Charleville Castle. It is entirely in the parish of Lynally in the Barony of Ballycowan. Land use is described as either arable pasture or wood. There is a Roman Catholic chapel and a National School, both of which are visible on the first edition Ordnance Survey map as well. A corn and tuck mill is also located to the south of the main road through the townland.

The first edition Ordnance Survey map depicts all of these features, as well as additional structures. These buildings, however, are almost exclusively located along the road with the remainder being under pasture or wood. Griffiths Valuation lists a total of 370 acres 3 R 39 P with an annual valuation of £247 10s. The majority of the land is leased from Captain Thomas Bernard and many of the leases are for land only. The land on which the school sits was leased from the Church Education Society, but the land on which the church sits was leased from Captain Bernard.

The townland of Muchlagh contains no listed RMPs, nor are any to be found in the Archaeological Inventory of County Offaly. No previous excavations have occurred there.

4 Aims and methodology

The objective of the work was to preserve by record any archaeological features or deposits in advance of the proposed road's construction.

Topsoil stripping of the site was conducted using a 360° tracked machine fitted with a 1.9 m wide ditching (toothless) bucket under archaeological supervision. A total area of 450 m² was exposed. The resulting surface was cleaned and all potential features investigated and excavated by hand. Archaeological contexts were recorded by photograph and on *pro forma* record sheets. Plans and sections were drawn at an appropriate scale. Registers are provided in the Appendix. Ordnance Datum levels and feature locations were recorded using GPS. Environmental samples were taken on any deposits suitable for analysis or dating.

5 Excavation results

The linear feature identified during testing was fully exposed and the remains of a small, narrow wall were found at the northeast end, running parallel to it. A large modern field clearance pit was also identified. This continued beneath the western limit of excavation.

Linear feature

This feature (006) (Figs 3 & 4), measured 16.15 m in length, was oriented northeast-southwest, and had a maximum width of 1.15 m. It reached a maximum depth of 0.33 m at the northeast end and gradually became shallower moving southwest, until it terminated 16.15 m from the northeast baulk. It curved slightly to the east at the northeast end and continued outside the CPO; its full extent was therefore not ascertained. The break of slope at the top was imperceptible at the southwest end, becoming more gradual, then sharp progressing towards the northeast. Sides sloped gently at the southwest end, becoming gradual, then steep at the northeast end. The base was concave with imperceptible breaks of slope (Plates 1, 2).

The feature contained a total of six deposits. Deposit (007) appeared along the entire length of the feature. This was moderately-compacted, yellowish-brown silty-clay, and yielded a small amount of slag and very occasional flecks of charcoal and mollusc shell. A number of Post Mediaeval artefacts were also recovered from this layer, including fragments of clay tobacco pipe and iron objects (Appendix 3) Three deposits, (004), (005) and (008) were located towards the southwest end of the linear.

Deposit (005) was loosely-compacted brown silty-clay located at the very southwest end of the linear. It contained moderate inclusions of charcoal and slag, and occasional inclusions of unburnt animal bone and chert debris. Deposit (004) was 1.3 m to the northeast of (005). It consisted of loosely-compacted black clayey-sand, and contained moderate inclusions of charcoal and slag and occasional inclusions of chert debris.

Located 0.5 m northeast of (004) was (008), a loosely-compacted black sandy-clay. This too contained moderate inclusions of charcoal and slag, and occasional inclusions of burnt animal bone and charred seeds. The seeds were identified as being Fat Hen and Chickweed, both weeds found on and near cultivated ground. A single charred cereal grain was also recovered but it was impossible to identify this given its condition (Appendix 4). These deposits had a maximum depth of 0.06 m and a maximum length of 1 m southeast-northwest. All three consisted of shallow deposits above the main fill of the linear feature (007). They may represent material which had been dragged from the charcoal and slag rich deposits at the northeast end of (006).

The slag was mostly concentrated within two deposits, (009) and (010), at the northeast end of the linear. These were found above (007). Deposit (009) was loosely-compacted mid-blackish brown silty-clay, which contained frequent charcoal inclusions and slag, and occasional burnt and unburnt animal bone and mollusc shells. The deposit began 3.25 m from the northeast baulk, and extended 4.62 m along the linear having a maximum depth of 0.26 m. A fragment of alder charcoal was recovered from the environmental sample of deposit (009) and yielded a date range of 1720-1820 cal AD at two sigma, (UB-8280, see Appendix 4). A number of Post Mediaeval artefacts were also recovered from this layer, including fragments of clay tobacco pipe and an iron key (Appendix 3).

Deposit (009) was abutted by deposit (010) to the northeast. This was a moderately-compacted mid-greyish brown silty-clay which contained a high percentage of slag, occasional to moderate amounts of charcoal, a moderate amount of animal bone, and occasional mollusc shells. Post Mediaeval artefacts were recovered from (010), including a sherd of Blackware, fragments of glass bottle, iron objects and fragments of clay tobacco pipe (Appendices 3, and 11 -14). This deposit extended outside the CPO, consequently its full extent could not be ascertained. It had a maximum depth of 0.33 m. A fragment of alder charcoal was recovered from the environmental sample of deposit (010) and yielded a date range of 1866-1918 cal AD at two sigma (UB-8279 and Appendix 4).

A combined total of 310 litres of slag were recovered from all the contexts within the linear feature (006). A number of metal artefacts (including nails and fragments of a key) were also recovered from the fills of the linear (006). These artefacts were analysed and shown to date to the modern period (see Appendix 13).

Wall

The remains of a drystone wall were found running parallel to linear (006) at the northeast end. It measured 3.31 m in length, 0.25 m wide, and continued outside the CPO; therefore its full extent could not be ascertained (Plates 3 & 4).

The wall consisted of uncoursed, random rubble masonry, not surviving beyond its first level. The southeast face was largely intact, with an area of collapse 0.3 m in length, 1.7 m from the northeast baulk. The northwest face was mostly destroyed with a small amount of collapse scattered to the northwest. There was no evidence of a foundation cut for this wall.

A number of small iron nails were found in the subsoil surrounding the wall. These nails were similar in size to those recovered from deposits (009) and (010) within the linear (006). These have also been shown to be modern (see Appendix 13). Few stones were found between the linear and the wall, however, contexts (009) and (010) contained a moderate amount of sub-rounded stone inclusions. These may represent collapse from the wall.

6 Discussion

There are no historical records of industrial scale ironworking taking place in the Offaly region. The amount of slag recovered from the linear (006) (53.3 kg, see Appendix 5), would suggest that smaller scale metal working processes were being carried out in the surrounding environs. Bog ore would have been available in the Offaly region, and was also mined nearby at Mountrath, Co. Laois (Rynne, 2006). The slag recovered during the excavations may have been the by-product of bloomery smelting. This process would have been undertaken in a small clay furnace using charcoal as a fuel, and producing a bloom. This would have been hammered while still hot to consolidate the metal and expel slag, before being smithed again, or forged, to produce metal artefacts. The slag in linear (006) may be the waste product of such an operation and may have been deposited directly into the feature or later moved there during land improvements (Jones, 2006).

In his assessment of the metallurgical waste from Mucklagh 1, Tim Young notes that the slag represents the "late survival of essentially a medieval style of forge into the dawn of the industrial period, when cheap distribution of coal (initially by canal, which reached Tullamore in 1798) and of mass-produced iron tuyères led to standardisation of what is commonly thought of today as the "traditional" forge." (Young, 2008, p1, Appendix 16)

As the area of excavation was limited to the extent of the road corridor, the full potential of site E2845 could not be explored, and no other archaeological features relating to metal working were found on the site. The radiocarbon dates from the charcoal recovered place the activity on site firmly in the modern era. However there is no evidence in the 6" Ordnance Survey maps for any industrial activities in the land directly surrounding the site.

The wall found at the northeast end of the site, like the linear, continued outside the CPO. No associated features were found within the CPO, or are recorded on the 6" Ordnance Survey maps, so no obvious function can be attributed to this feature.

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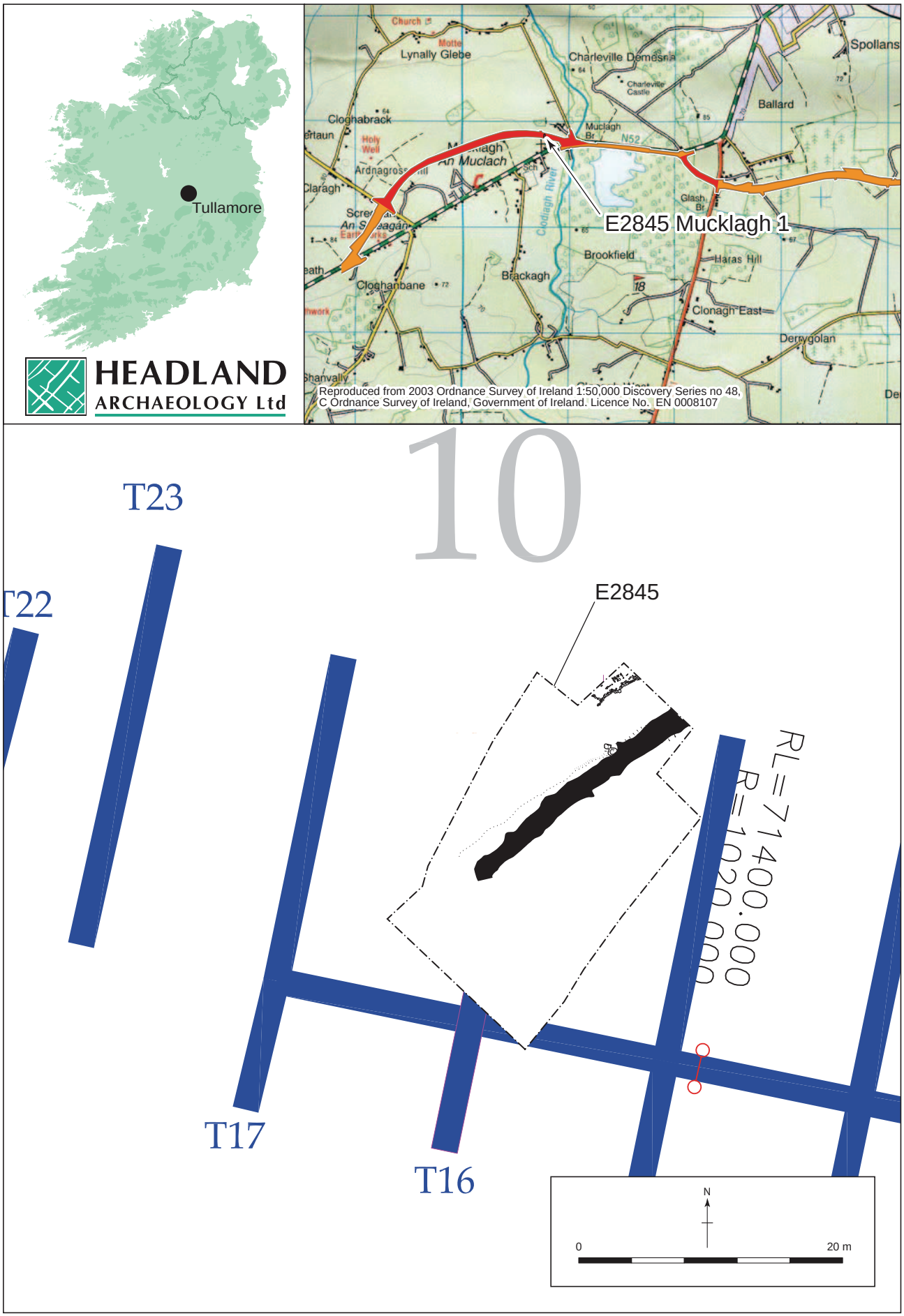


Figure 1 - N52 Tullamore Bypass: E2845 Mucklagh 1, Site location

Bypass route is shown broken due to warp of scanned RMP's, this represents a best-fit.

Figure 2 - N52 Tullamore Bypass: E2845 Mucklagh 1, RMP extract

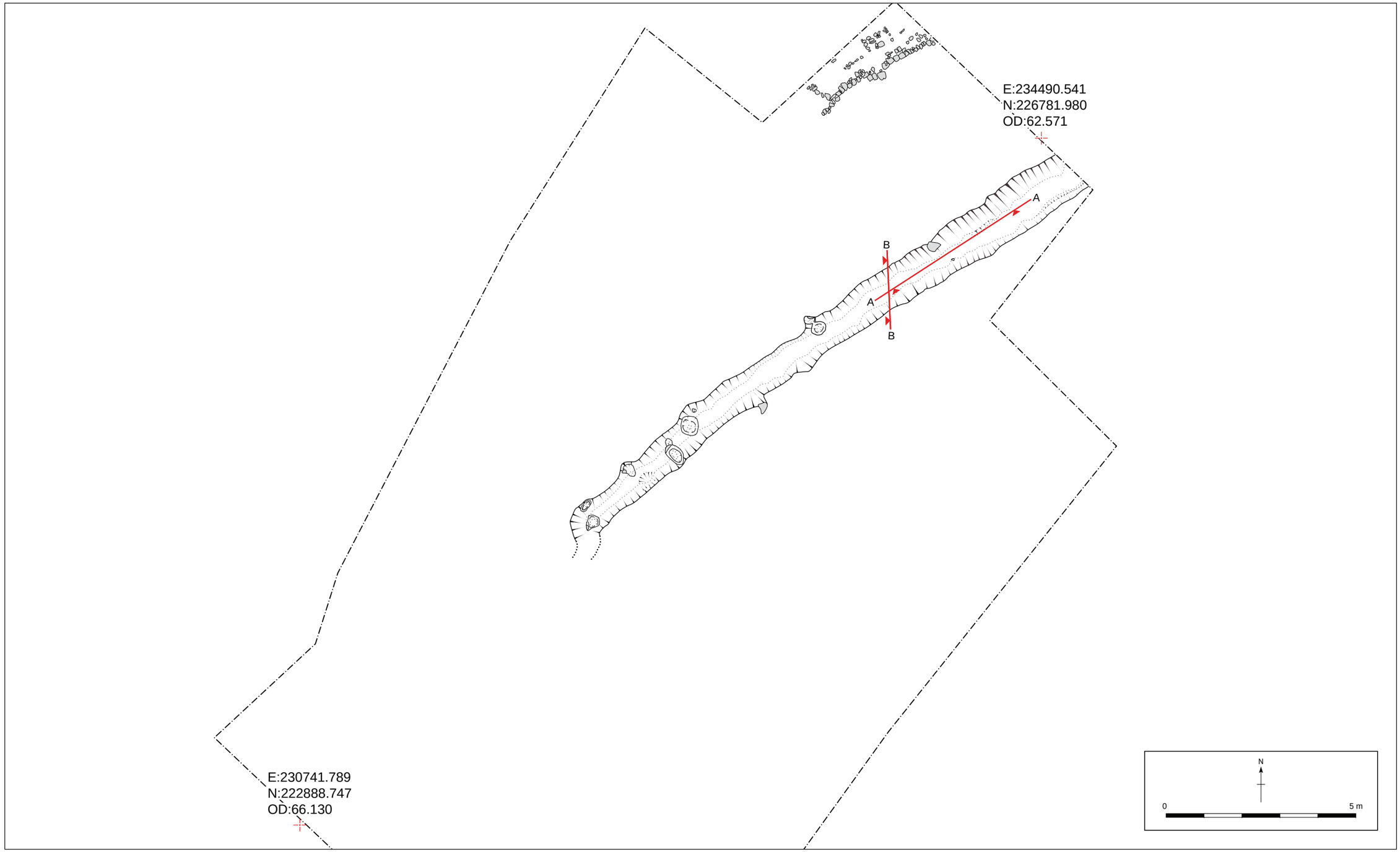


Figure 3 - N52 Tullamore Bypass: E2845 Mucklagh 1: Site plan

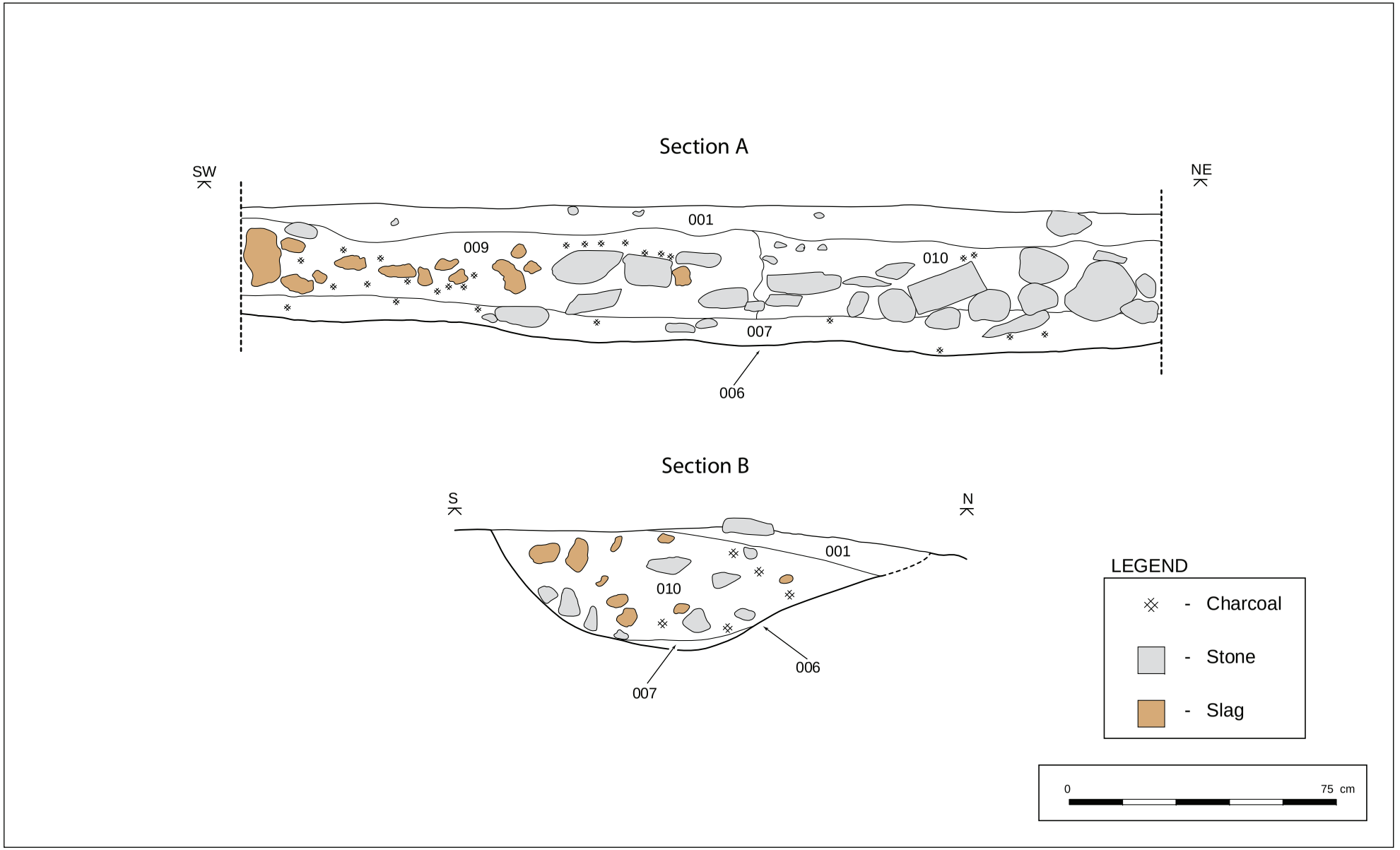


Figure 4 - N52 Tullamore Bypass: Mucklagh 1, E2845, Sections A and B from feature 006

Plate 1 - Pre excavation of Linear (006)

Plate 2 - Mid excavation of Linear (006)

Plate 3 - Wall (011)

Plate 4 - Post excavation of Wall (011) and Linear (006)

Appendix 1: Context Register

C	Type	Area	Fill Of	Filled By	D (m)	W (m)	L (m)	Description	Interpretation
001	Deposit		n/a	n/a	0.30 -0.40 max.	Site-wide	Site-wide	Moderately-compacted mid-brown clayey silt. Moderate inclusions of small angular and sub-angular stones. Frequent pebbles and occasional lumps of slag associated with (9) and (10).	Topsoil
002	Deposit		n/a	n/a	n/a	Site-wide	Site-wide	Moderately-compacted orangey-brown clayey silt, with occasional inclusions of small stones and pebbles, which occurred in patches throughout the site.	Subsoil
003	Deposit		n/a	n/a	n/a	Site-wide	Site-wide	Moderate - loosely-compacted grey gravel, with frequent inclusions of small stones and occasional large angular and sub-angular stones.	Natural
004	Deposit		006	n/a	0.50	0.35 NE-SW	1.00 NW-SE approx.	Loosely-compacted black clayey sand with an oval shape in plan. Inclusions of charcoal, slag and stones. Fill of (6) situated over (7).	Fill of linear (006)

C	Type	Area	Fill Of	Filled By	D (m)	W (m)	L (m)	Description	Interpretation
005	Deposit		006	n/a	0.60 max.	0.55 NE-SW	0.70 NW-SE approx.	Loosely-compacted brown silty clay with an oval shape in plan. Frequent charcoal and slag inclusions and occasional stones. Fill of (6) situated over (7).	Fill of linear (006)
006	Cut		n/a	004, 005, 007, 008, 009, 010	0.35 max.	1.15 max NW-SE	16.15 NE-SW	Linear with a NE-SW orientation, curving slightly towards the E at it NE end. Slightly angular corners at its SW end, but none evident at its NE as it extends under the baulk and outside CPO. Break of slope at top were imperceptible at the SW end, becoming gradual and then sharp progressing towards the NE. Sides were initially moderate becoming steep to the NE. Break of slope at base was imperceptible. Shape of base was flat. Situated under (4), (5), (7), (8), (9), and (10). Linear runs parallel with dry stone wall (11)	Linear ditch with NE-SW orientation

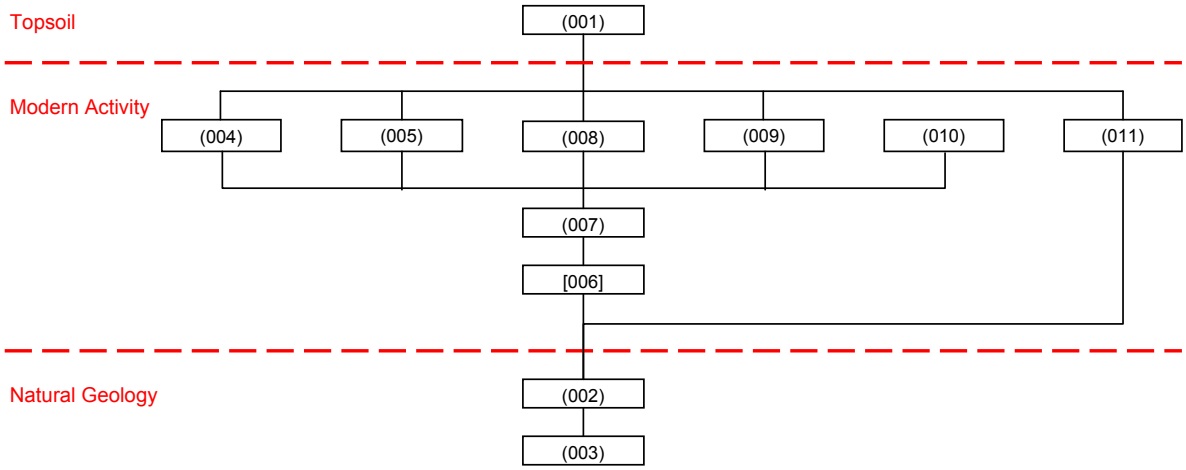
C	Type	Area	Fill Of	Filled By	D (m)	W (m)	L (m)	Description	Interpretation
								situated 1.30m to the N. No evidence for these features being associated.	
007	Deposit		006	n/a	0.19 max.	1.10 max. NW-SE	16.10 NE-SW	Firm - moderately-compacted, light to mid-yellowish/greyish brown silty clay. Linear shape in plan with a SW-NE orientation. Contained large amounts of mineral slag and large stones in concentrations throughout the deposit, with frequent charcoal and moderate shell inclusions. Fill of (6) situated under (4) and (8) at its SW end, and (9) and (10) at its NE end. Its % of the fill diminishes as the linear extends NE. (7) extends under baulk to NE and outside CPO.	Fill of linear (006)

C	Type	Area	Fill Of	Filled By	D (m)	W (m)	L (m)	Description	Interpretation
008	Deposit		006	n/a	0.05	0.40 NE-SW	0.70 NW-SE approx.	Loosely-compacted black sandy clay with an oval shape in plan and inclusions of charcoal, slag and stones. Fill of (6) situated over (7).	Fill of linear (006)
009	Deposit		006	n/a	0.26 max. 0.07 min.	0.89 NW-SE	4.62 NE-SW	Loosely-compacted mid-blackish brown silty clay. Contained frequent inclusions of mineral slag and charcoal and moderate amounts of large sub-rounded stones. The charcoal and slag occurred in concentrations throughout the deposit. Fill of (6) situated over (7). Abutted at its NE end by (10), interface unclear.	Fill of linear (006)
010	Deposit		006	n/a	0.33	1.10 NW-SE	3.25 NE-SW	Moderately-compacted mid-greyish brown silty clay. Contained frequent inclusions of slag and large sub-rounded stones, with a moderate amount of pebbles and occasional charcoal. Fill of (6) situated	Fill of linear (006)

C	Type	Area	Fill Of	Filled By	D (m)	W (m)	L (m)	Description	Interpretation
								over (7). Abutted at its SW end by (9), interface unclear. Extends under baulk to NE and outside CPO.	
011	Wall		n/a	n/a	0.19 max. ht.	0.68 NW-SE	3.31 NE-SW	Un-coursed random rubble dry stone wall with a NE-SW orientation. Only 1 course remained extant and there was no evidence for foundation having been dug into the natural. SE face was largely intact and was rough faced. NW face was largely destroyed with only occasional stones in situ. Subsoil was located between these two faces, as well as the stones themselves. The stones were mainly limestone with occasional sandstone and showed no signs of working. The smallest measured .07 x .08 x .10m and the largest .08 x .20 x .22 m. Wall ran roughly parallel with linear (6) situated	Dry stone wall

C	Type	Area	Fill Of	Filled By	D (m)	W (m)	L (m)	Description	Interpretation
								1.30m to the S. No evidence for these features being associated.	

Appendix 2 - Stratigraphic Matrix



Appendix 3: Finds Register

Context	001			
Find No.	**Material**	**NMI No.**	**Date**	**Description**
1	Metal	E2845:001:001	Post Medieval	Fragment of nail
2	Metal	E2845:001:002	Post Medieval	Iron object
3	Metal	E2845:001:003	Post Medieval	Iron object
4	Metal	E2845:001:004	Post Medieval	Iron object
5	Metal	E2845:001:005	Post Medieval	Iron object
6	Metal	E2845:001:006	Post Medieval	Iron object
7	Metal	E2845:001:007	Post Medieval	Iron object
8	Pottery	E2845:001:008	Medieval	Rim sherd
9	CTP	E2845:001:009	Post Medieval	Stem fragment
10	CTP	E2845:001:010	Post Medieval	Bowl fragment
11	Metal	E2845:001:011	Post Medieval	Iron Object
12	Bone	E2845:001:012	Post Medieval	Bone fragment - possibly worked
13	Glass	E2845:001:013	Post Medieval	Fragment of bottle base
14	Metal	E2845:001:014	Post Medieval	Fragment of nail
15	Metal	E2845:001:015	Post Medieval	Fragment of nail
16	CTP	E2845:001:016	Post Medieval	Stem fragment
17	Metal	E2845:001:017	Post Medieval	Fragment of nail

Context	002			
Find No.	**Material**	**NMI No.**	**Date**	**Description**
1	Pottery	E2845:002:001	Post Medieval	Body sherd - double sided dark orange glaze
2	Metal	E2845:002:002	Post Medieval	Nail
3	Metal	E2845:002:003	Post Medieval	Nail
4	Metal	E2845:002:004	Post Medieval	Nail
5	Metal	E2845:002:005	Post Medieval	Possible nail
6	Metal	E2845:002:006	Post Medieval	Possible nail
7	Metal	E2845:002:007	Post Medieval	Iron object
8	Metal	E2845:002:008	Post Medieval	Iron object

Context	007			
Find No.	**Material**	**NMI No.**	**Date**	**Description**
1	Metal	E2845:007:001	Post Medieval	Iron object - hollow
2	Metal	E2845:007:002	Post Medieval	Iron object
3	CTP	E2845:007:003	Post Medieval	Stem fragment
4	Metal	E2845:007:004	Post Medieval	Fragment of pipe
5	Shell	E2845:007:005	Unknown	Mollusc shell

Context	009			
Find No.	**Material**	**NMI No.**	**Date**	**Description**
1	CTP	E2845:009:001	Post Medieval	Stem fragment
2	CTP	E2845:009:002	Post Medieval	Stem fragment
3	CTP	E2845:009:003	Post Medieval	Stem fragment
4	Metal	E2845:009:004	Post Medieval	Fragment of key
5	Metal	E2845:009:005	Post Medieval	Fragment of key
6	Metal	E2845:009:006	Post Medieval	Fragment of key
7	CTP	E2845:009:007	Post Medieval	Stem fragment
8	CTP	E2845:009:008	Post Medieval	Stem fragment

Context	010			
Find No.	**Material**	**NMI No.**	**Date**	**Description**
1	CTP	E2845:010:001	Post Medieval	Stem fragment
2	CTP	E2845:010:002	Post Medieval	Stem fragment
3	CTP	E2845:010:003	Post Medieval	Stem fragment
4	Metal	E2845:010:004	Post Medieval	Fragment of nail
5	Metal	E2845:010:005	Post Medieval	Fragment of nail
6	Metal	E2845:010:006	Post Medieval	Fragment of nail
7	Metal	E2845:010:007	Post Medieval	Fragment of nail
8	Metal	E2845:010:008	Post Medieval	Iron object
9	Metal	E2845:010:009	Post Medieval	Iron object
10	CTP	E2845:010:010	Post Medieval	Stem fragment
11	Metal	E2845:010:011	Post Medieval	Iron object
12	Metal	E2845:010:012	Post Medieval	Fragment of nail
13	CTP	E2845:010:013	Post Medieval	Stem fragment
14	Metal	E2845:010:014	Post Medieval	Iron object
15	Metal	E2845:010:015	Post Medieval	Iron object
16	Metal	E2845:010:016	Post Medieval	Iron object (Big nail?)
17	Metal	E2845:010:017	Post Medieval	Iron object
18	Metal	E2845:010:018	Post Medieval	Iron object
19	Metal	E2845:010:019	Post Medieval	Fragment of nail
20	Metal	E2845:010:020	Post Medieval	Fragment of nail
21	CTP	E2845:010:021	Post Medieval	Stem fragment
22	CTP	E2845:010:022	Post Medieval	Stem fragment
23	Glass	E2845:010:023	Post Medieval	Fragment of bottle
24	Glass	E2845:010:024	Post Medieval	Fragment of bottle
25	Glass	E2845:010:025	Post Medieval	Fragment of bottle
26	Metal	E2845:010:026	Post Medieval	Fragment of nail
27	Pottery	E2845:010:027	Post Medieval	Rim sherd - Blackware

Appendix 4 - Sample Register

Sample	Context	Description
1	001	Slag from topsoil
2	007	Slag from fill (007) of linear [006]
3	004	Slag from deposit within linear [006]
4		Void
5	008	Slag from deposit within linear [006]
6	004	Charcoal rich clayey silt, deposit in linear [006]
7	008	Charcoal rich clayey silt, deposit in linear [006]
8	005	Charcoal rich clayey silt with slag, deposit in linear [006]
9	010	Bricks from deposit within linear [006]
10	010	Charcoal from deposit within linear [006]
11	010	Animal bone from deposit within linear [006]
12	010	Slag from deposit within linear [006]
13	007	Brick from deposit within linear [006]
14	009	Mid blackish brown silty clay with charcoal and slag from linear [006]
15	010	Mid greyish brown silty clay with charcoal from linear [006]
16	009	Slag from deposit within linear [006]
17	007	Mid-light brown clayey silt from deposit within linear [006]

Appendix 5 - Environmental Sample Assessment

Karen Stewart, Headland Archaeology

Introduction

Of the seventeen samples taken on site, nine have been processed and assessed for recovery and analysis of environmental remains, and the suitability of the environmental remains for radiocarbon dating.

Methods

Samples of approximately 10L were taken on site under the direction of environmental archaeologist Susan Lyons. Samples were processed in laboratory conditions using a standard flotation method (cf. Kenward *et al*, 1980). The floating debris (flot) was collected in a 250 μm sieve and, once dry, scanned using a binocular microscope. Any remaining material in the flotation tank (retent) was wet-sieved through a 1 mm mesh and air-dried. This was then sorted by eye and any material of archaeological significance removed. All plant macrofossil samples were analysed using a stereomicroscope at magnifications of x10 and up to x100 where necessary to aid identification. Identifications were confirmed using modern reference material and seed atlases including Cappers *et al* (2006).

Results

The results of the environmental assessment of the samples are presented below in Tables 1 (retent sample results) and 2 (flotation sample results).

Sample number	Context number	Retent vol. (L)	Wood charcoal		Carbonised cereal grain	Mammal bone		Marine shell	Metal working debris	Chert debris
			Qty	AMS		Burnt	Unburnt			
6	4	1l	++					+	+++	+
7	8	1l	+++	*	*	+		+	++++	
8	5	1l	++	*			+		+++	+
10	10	0.2l	++++	*						
12	10	0.5l	++	*				+	++++	
14	9	2l	++++	*		+	+	+	+++	
15	10	0.5l	++					++	+++	
16	9	0.5l	++	*				+	++++	
17	7	1l	+					+		

Table 1: Retent sample results

Context Number	Sample Number	Total flot Vol. (ml)	Cereal grain:	Other plant remains	Charcoal Quantity	AMS	Comments
6	4	5			+++		Mollusc shell ++
7	8	15	+	*Stellaria media*++, *Chenopodium album* +, *Lamium sp*+	++++	*	Mollusc shell ++
8	5	3			++	*	
10	10	100			++++	*	
12	10	15			++++	*	
14	9	100			++++	*	Mollusc shell ++
15	10	1			+		Mollusc shell ++
16	9	40			++++	*	Mollusc shell +
17	7	1			+		Mollusc shell +

Table 2: Flotation sample results

Key: + = rare, ++ = occasional, +++ = common and ++++ = abundant
* = sufficient sized charcoal for identification and AMS dating

Plant remains

All of the samples assessed contained charcoal in some quantity. Of these, samples 7, 8, 10, 12, 14 and 16, contained charcoal in sufficient quantities to enable wood identifications and Accelerated Mass Spectrometry (AMS) dating.

Sample 7 was the only sample to contain plant material other than charcoal. These were charred seeds of the wild plants Chickweed (*Stellaria media*), Fat Hen (*Chenopodium album*) and a species of *Lamium* that could not be identified to species, though it should be noted that most *Lamium* species are weeds of cultivated ground. Likewise Fat Hen and Chickweed are weeds of waste places and cultivated ground. This sample also contained a single charred cereal grain, though the grain was in such a condition that it was impossible to identify it to species.

Other finds

Samples 6, 7, 14, 15, 16 and 17 all contained mollusc shells. Samples 10 and 17 were the only samples not to contain metalworking debris. Lithic evidence, in the form of chert, was found in two of the samples – 6 and 8. Mammal bone was the other common non-plant find, being recovered burnt and unburned from samples 7, 8 and 14.

Radiocarbon dates

Radiocarbon dating was undertaken by Stephen Hoper, Queens University Belfast., after Stuiver, M. *et al* (2004).

Lab code	Sample ID	Material	δ13C	Radiocarbon age BP	Calibrated Age Ranges (2 σ)	Relative probability
UB 8279	context 10	alder charcoal	-34.8	41 +/-32	cal AD 1694- 1727	0.214
					cal AD 1812- 1854	0.198
					cal AD 1858- 1862	0.008
					cal AD 1866- 1918	0.519
					cal AD 1952- 1955*	0.061
UB-8280	context 9	alder charcoal	-24.3	175 +/- 35	cal AD 1652- 1700	0.196
					cal AD 1703- 1706	0.003
					cal AD 1720- 1819	0.518
					cal AD 1833- 1881	0.093
					cal AD 1915- 1953	0.189

Table 3: Calibrated Radiocarbon Data (after Reimer *et al*. 2004)

Discussion

All the processed samples came from fills of a single linear feature. All contained charcoal, although samples 10 and 14 were most abundant. Sample 14 was dated using AMS and the charcoal dated returned a date of 1720 - 1820 cal AD, placing it in the modern era. It is possible that the charcoal in these samples is the result of waste deposition within the feature. The metalworking waste found within all but one of the samples might support this idea. However, it should be noted that one of the samples with the greatest amount of charcoal – sample 10 – contained no metalworking waste at all. Charcoal from this sample was dated using AMS and has also returned a date in the modern era - 1866 - 1918 cal AD.

Sample 7 is the most interesting with regard to plant material as it contains both a cultivated grain and weeds of cultivated land. It is possible that the plant material in this sample is the result of burning the waste material of cultivation, or the result of accidental inclusion in a fire during cultivation activity nearby.

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Appendix 6: Metallurgical Sample Register

Sample No.	Context No.	Material	Type	Description	Weight (kgs)
1	1	Slag	Fe	Slag from topsoil	2
2	7	Slag	Fe	Slag from fill (007) of linear [006]	3
3	4	Slag	Fe	Slag from deposit within linear [006]	1.2
5	8	Slag	Fe	Slag from deposit within linear [006]	1.6
6	4	Slag	Fe	Slag fragments retrieved from fill of linear [006]	0.5
7	8	Slag	Fe	Slag fragments retrieved from fill of linear [006]	0.5
12	10	Slag	Fe	Slag from deposit within linear [006]	20
14	9	Slag	Fe	Slag fragments retrieved from fill of linear [006]	0.5
16	9	Slag	Fe	Slag from deposit within linear [006]	24
				Combined weight of slag samples (kgs)	**53.3**

Appendix 7: Photographic Register

Shot	Type	Facing	Description
1	Pre-ex	SW	Linear [006]
2	Pre-ex	SW	Linear [006]
3	Pre-ex	SW	Linear [006]
4	Pre-ex	SW	Linear [006]
5	Pre-ex	SW	Linear [006]
6	Pre-ex	SW	Linear [006]
7	Pre-ex	SW	Linear [006]
8	Pre-ex	SW	Linear [006]
9	- -	- -	Void
10	Pre-ex	NE	Linear [006]
11	Pre-ex	NE	Linear [006]
12	Pre-ex	NE	Linear [006]
13	Pre-ex	NE	Linear [006]
14	Pre-ex	V	Charcoal spread with slag (005) within linear [006]
15	Pre-ex	V	Charcoal spread with slag (005) within linear [006]
16	Pre-ex	V	Charcoal spread with slag (008) within linear [006]
17	Pre-ex	V	Charcoal spread with slag (004) within linear [006]
18	Pre-ex	V	Charcoal spreads with slag (004) (008) within linear [006]
19	Pre-ex	V	Charcoal spread with slag (009)) within linear [006]
20	Pre-ex	V	Charcoal spread with slag (009)) within linear [006]
21	Pre-ex	V	Charcoal spread with slag (009)) within linear [006]
22	Pre-ex	V	Charcoal spread with slag (009)) within linear [006]
23	Mid-ex	SW	NE-facing section [006] (004) (007) Dwg 3
24	Mid-ex	SW	NE-facing section [006] (004) (007) Dwg 3
25	Mid-ex	NE	SW-facing section [006] (007) (008) Dwg 4
26	Mid-ex	NE	SW-facing section [006] (007) (008) Dwg 4
27	Mid-ex	NE	SW-facing section [006] (007) (008) Dwg 4
28	Mid-ex	NE	SW-facing section of [006] (007) (009) Dwg 6
29	Mid-ex	SW	NE-facing section of [006] (007) (009) Dwg 7
30	Mid-ex	NE	SW-facing section of [006] (007) Dwg 5
31	Mid-ex	NE	SW-facing section of [006] (007) Dwg 5
32	Mid-ex	NE	SW-facing section of [006] (005) (007) Dwg 8
33	Mid-ex	NE	SW-facing section of [006] (005) (007) Dwg 8
34	- -	S	Working shot
35	- -	S	Working shot
36	Mid-ex	NE	SW-facing section of [006] (007) (010) Dwg
37	Mid-ex	NW	SE-facing section of [006] (007) (009) (010) Dwg 10
38	Mid-ex	NW	SE-facing section of [006] (007) (009) (010) Dwg 10
39	Mid-ex	NW	SE-facing section of [006] (007) (009) (010) Dwg 10
40	- -	- -	Field Boundary to NW and W of site
41	- -	- -	Field Boundary to NW and W of site
42	- -	- -	Field Boundary to NW and W of site
43	- -	- -	Field Boundary to NW and W of site
44	- -	- -	Field Boundary to NW and W of site
45	- -	- -	Field Boundary to NW and W of site

Shot	Type	Facing	Description
46	- -	- -	Field Boundary to NW and W of site
47	- -	- -	Field Boundary to NW and W of site
48	- -	- -	Field Boundary to NW and W of site
49	- -	- -	Field Boundary to NW and W of site
50	- -	- -	Field Boundary to NW and W of site
51	- -	- -	Field Boundary to NW and W of site
52	- -	- -	Field Boundary to NW and W of site
53	Post-ex	SW	Post-ex linear [006]
54	Post-ex	SW	Post-ex linear [006]
55	Post-ex	SW	Post-ex linear [006]
56	Pre-ex	SW	Wall (011)
57	Pre-ex	E	Wall (011)
58	Post-ex	NE	Linear [006]
59	Post-ex	NE	Linear [006]
60	- -	V	Slag from [006] (001) (004) (005) (007) (008) (009) (010)
61	Mid-ex	SW	Wall (011)
62	Mid-ex	SW	Wall (011)
63	Mid-ex	SW	Wall (011)
64	Mid-ex	SW	Wall (011)
65	Mid-ex	SW	Wall (011)
66	Mid-ex	SW	Wall (011)
67	Mid-ex	SW	Wall (011)
68	Mid-ex	NE	Section through wall (011)

Appendix 8: Drawing Register

Dwg	Type	Area	Scale	Description
1	Plan		1:50	Pre-ex of site
2	Plan		1:20	Pre-ex of linear [006]
3	Section		1:10	NE-facing section [006](007) (004)
4	Section		1:10	SW-facing section [006] (007) (008)
5	Section		1:10	SW-facing section [006] (007)
6	Section		1:10	SW-facing section [006] (007) (009)
7	Section		1:10	NE-facing section [006](007) (009)
8	Section		1:10	SW-facing section [006] (007) (005)
9	Section		1:10	NE-facing section [006] (007) (010)
10	Section		1:10	SE-facing long section [006] (007) (009) (010)
11	Plan		1:20	Post-ex of ditch [006]
12	Plan		1:20	Plan of drystone wall (011)

Appendix 9: Faunal Remains Analysis

Auli Tourunen, Headland Archaeology

Summary
A total of 26 specimens of animal bone were recovered from Mucklagh 1, Co. Offaly. The assemblage consisted of the disarticulated remains of animals. Domesticated animals are represented in the assemblage. The material is dominated by cattle, followed by sheep and horse. Due to the small size of the material, no detailed anatomical distribution, age or sex analysis was possible. Bone material from Mucklagh 1 is likely to represent the products of domestic waste.

Introduction
This report presents the results of the analysis of animal bones from excavation register no. E2845, Mucklagh, Co. Offaly. Full archaeological resolution was conducted on this site between January 22nd and February 1st 2007**.** This revealed the remains of a small wall, parallel to the linear at the north-east end. A large, modern landfill pit was located at the western side of the excavation area, and ran outside the site. A similar pit containing rocks and plastic refuse was identified within this field during Phase I Testing.

The land around site comprised of a level field with short cropped grass which was grazed at the time of resolution. Immediately south- west of the proposed road take is a church and graveyard. The study area was surrounded by pasture land with a slightly curved field boundary to the north- west.

The animal bone specimens were recovered by hand-picking and during the processing of the soil samples. The animal bones analysed for this report were recovered inside linear (006), from deposits 5, 8, 9 and 10. This feature contained a high percentage of slag, an occasional to moderate amount of charcoal and a moderate amount of animal bone. The deposit extended outside the CPO, consequently its full extent could not be ascertained.

Methodology
Each specimen was identified according to species and skeletal element where possible using animal bone reference collection, located in Headland Archaeology Ltd, Unit 1 Wallingstown Business Park, Little Island, Co Cork. "The York System", a bone database program was used for the recording (Harland et al. 2003). The category "large mammal" (lm) were used for cattle, horse and red deer specimens which could not be assigned to species.

Distinctions made between sheep and goat follow Boessneck (1969) for limb bones. For ages of tooth eruption and epiphyseal fusion Silver's (1969) figures were followed. Measurements were taken following von den Driesch (1976).

The material was quantified by using the number of identified specimens (NISP). For the study of anatomical distribution, specimens were divided into high and low utility elements, representing the body parts relating to primary and secondary butchery. High utility elements include spinal column and ribs and upper parts of the limbs. Low utility elements include the head, tail and lower parts of the limbs (appendix 1).

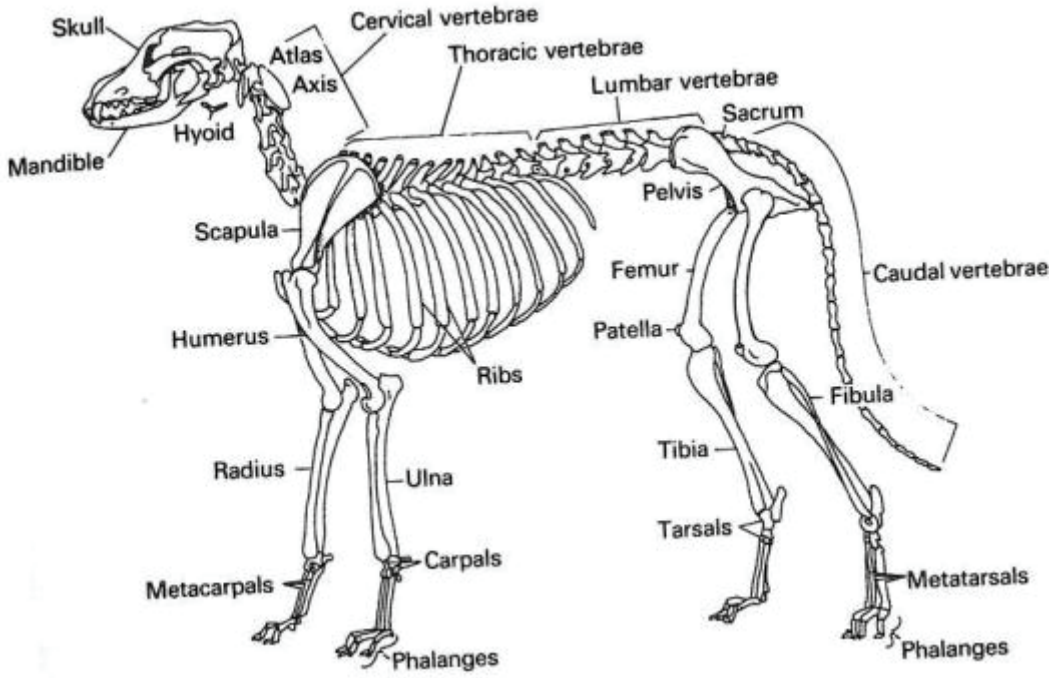

Fig. 1 Location on animal skeleton of terms referred to in text (Davis 1987, 54, in Reitz & Wing 1999).

During the analysis pathological changes, carnivore and rodent gnawing, signs of burning and butchery marks were recorded. All data is stored in digital and written form in Headland Archaeology Ltd, Unit 1 Wallingstown Business Park, Little Island, Co Cork.

Results

Species

A total of 26 bone specimens were analysed from the site (see Table 1). Thirteen specimens were recovered by hand picking and additional twenty-three specimens were found in soil samples. Fifteen percent of the hand-picked specimens were unidentified, which reflects the low fragmentation rate of the material. All identified specimens derive from domestic animals. All major domesticates (cattle, sheep and horse) are represented in the assemblage with pig being the sole exception.

Element	Cattle	Horse	Large Mammal	Sheep	Sheep/Goat	Unidentified	Total
skull	1					1	2
vert cerv			1				1
vert thor			1				1
radius					1		1
m/c	2	1					3
patella	1						1
tibia	1			1			2
m/p					2		2
phal 1	1						1
teeth	1						1
unidentifie d						11	11
Total	7	1	2	1	3	12	26

Table 1. Anatomical representation of sample (NISP)

The assemblage is dominated by cattle. Specimens categorised as large mammals are more likely to derive from cattle than horse. Horse and sheep are also represented in the sample.

Anatomical distribution

Anatomical distribution was studied in order to examine the past activities on the site. Even if the assemblage is small, the bone material proved to include remains from all stages of the processing of animal carcasses (see Table 1). The anatomical distribution exhibited no clear signs of professional activities such as tanning, slaughter or horn working: however, the horse metacarpal might relate to tanning or bone working. As a result, the assemblage is likely to represent domestic waste.

Preservation

The material proved to be only moderately well preserved. Some specimens were much abraded but the material was not very fragmented. No signs of carnivore or rodent gnawing or cut marks were present. However, the identification of the cut or gnawing marks may have been hampered by the poor preservation of the assemblage.

Size

Several measurements were taken from the bones to examine the size of the animals (see Table 2). The fragmented state of the bone material lowered the number of possible measurements taken.

		Bd	GL	GLl	SD	Bp
Cattle	tibia	50.6				
Sheep	tibia	29.0				
Horse	mc	45.3	213	212	30.4	46.5

Table 2. Measurements (mm)

One horse metacarpal could be used for withers heights estimation (Kiesewalter 1888). The bone derives from animal of withers height of approximately 136 cm.

Age
The best indicators for ageing mammal osteological material are usually obtained from an examination of the wear and eruption of mandibular teeth. Unfortunately no jaws were recovered from the site. The epiphyseal fusion evidence is scarce. One cattle metacarpal derives from an animal less than two and half years and one tibia from an animal older than two and half years. The fused tibia distal epiphysis of a sheep indicates an age at death of two years or more. One metapodial of a sheep or goat derives from an infant animal (the two halves of the bone shaft are not fused).

Discussion
The bone material from Mucklagh 1, Co Offaly is too small for conclusive comparison against other assemblages. However, some general observations can be made. The assemblage is principally representative of domestic animals. The assemblage was characteristic of domestic waste, consisting of both high and low utility skeletal elements (both butchery remains and food debris). However, the horse metacarpal may be indicative of some craft activity (bone working, tannery) on the site. Cattle were the dominant species, followed by sheep and horse.

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context	SAMPLENO	SPECIES	ELEMENT	COUNT	SIDE	GT50	PROXFUS	DISTFUS	AGE	NOTES	PERCENT	TEXTURE	BURNING	RECOVERY
005	008	sh/g	m/p	2	b				neo	two pieces of unfused shaft		2		1
005	008	unid	skull	1						bone from inner ear (cattle?)		2		1
008	007	unid	ui	6									cal	1
009	014	sh/g	rad	1	l	6789K						3		1
009	014	unid	ui	3						ext. tiny			cal	1
010	11	cow	isoteeth	1						max PM				hc
010	11	cow	m/c	1	r	3478		u		distal end charring in small area. Large, Bd 66.9 even as unfused		2	char	hc
010	11	cow	m/c	1	r	1256				most likely belongs to next one		2		hc
010	11	cow	pat	1							90	3		hc
010	11	cow	phal1	1	b	12	f					2		hc
010	11	cow	skull	1	l					fossa mand, pars petrosa		2		hc
010	11	cow	tib	1	l	56		f				3		hc
010	11	horse	m/c	1	r	12345678		f				2		hc
010	11	lm	cerv	1	b		f	f			90	2		hc
010	11	lm	thor	1	b					arcus	10	3		hc
010	11	sheep	tib	1	r	56A		f				2		hc
010	11	unid	ui	2								2		hc

Appendix 10: Mucklagh 1 Topographical Survey NGR 23090/22290 – Figure 4

A team of two surveyors carried out the survey at Mucklagh 1 A033/E2845 using a Leica TCR 405 Total Station and Penmap software. Topographical features were surveyed with spot levels in order to generate a contour plan. The frequency of spot levels taken for contouring was governed by the archaeological potential of the site, the nature of the natural topography, and the size of the survey area. Drawings were finished in AutoCad.

An east-west running field boundary, to the north of the farm of William George Foster, bends gradually to the south for c. 60 m before turning abruptly to the southeast. The boundary then bends to the southwest where it traverses the CPO for 42 m and terminates at the corner of the cemetery to the south. Within the CPO, the field boundary is distinctly curved suggesting that it originally might have constituted one half of a larger circular enclosed earthwork such as a ringfort. Upon closer examination, however, there is little evidence to suggest any such feature.

To the north the bank is poorly defined on its west side where the ground level is higher and is still very low where it is more discernible to the south. The bank appears more pronounced when viewed from the east, as the ground level is much lower, with a distinctive natural hollow at the centre of the CPO. Examination of the survey data reveals a more irregular shape in plan, than that of a ringfort.

There is no evidence for a ditch on the east side of the feature. On the west side, in the southern half of the bend there is a c. 8 m linear depression that gradually peters out to the southwest and abuts a bend in the bank to the north. The bank is mostly narrow (0.9 – 1m) and slightly curved in profile, but this is possibly due to disturbance by tree roots. The bank measures 2.3 - 3 m at its base. There is some evidence that stone may be a large component of the bank but this may be the result of a more casual attempt to consolidate the structure using stone from field clearance, rather than a more engineered use of stone throughout.

In conclusion it would appear that there is little evidence to suggest that the field boundary contains the remains of an earlier enclosing earthwork.

Appendix 11: Clay Tobacco Pipe Analysis
Alison Kyle, Headland Archaeology

Introduction

The Assemblage
This assemblage consisted of sixteen fragments of clay tobacco pipes; one bowl fragment and fifteen stem fragments.

Methodology
Analysis was carried out in hand-specimen with use of a hand-lens for more detailed analysis, and established typologies were used to provide dates where possible. Relevant parameters were recorded to create a catalogue of the assemblage using Microsoft Excel. This catalogue is based on the National Museum of Ireland's requirement that each individual find have an individual find number.

Clay Tobacco Pipes

2.1 Bowls
06E2845:001:010
The remains of one bowl was present in this assemblage. Around one third of the bowl survived (the lower front portion of the bowl), with none of the rim nor stem remaining, and no maker's mark nor decoration evident. The beginning of the spur/heel remains- but unfortunately not enough to positively identify it as one or the other. A scar on the internal surface of the bowl, opposite the borehole, was formed by the wire used to pierce the borehole through the stem. The walls of this long bowl are only slightly curved, and from its general appearance the overall form of this bowl may be dated between 1680-1710AD based on an established typology (Ayto 2002, 8).

2.2 Stems
06E2845:001:009, 016; 06E2845:007:003; 06E2845:009:001-003, 007, 008; 06E2845:010:001-003, 010, 013, 021, 022
Fifteen stem fragments were examined from four individual contexts. Some of the stems exhibit evidence for having been longitudinally trimmed to smooth the surfaces and/or remove mould marks (see Figure 1). In a number of cases, despite these efforts mould marks are still visible, with these marks indicating the use of a two-piece mould. The central bore-holes typically vary from being central to veering off-centre, and cross-sections vary from being near circular through to ovate, and in one instance oblate (06E2845:009:008).

One of the stems recovered from the fill of a linear feature (010) appeared to have been burnt and was covered in what appeared to traces of iron, or an iron-rich material (06E2845:010:001). This feature also contained a concentration of slag and charcoal (Corbett 2007, 3), and so the material on the pipe stem may represent waste material resulting from iron working. One small fleck of iron was also visible along the break of another stem fragment (06E2845:009:002); this derived from the fill (009) of a second linear feature which also contained a concentration of slag and charcoal (*ibid.)*.

It is generally difficult to date stem fragments (see 'Discussion' below). It should be noted that some differences were observed in the stems when examined according to context- those from context (009) were less fragmented than those from the other contexts, this may to some

extent reflect site formation processes. The absence of high fragmentation and the absence of abrasion could be taken to suggest these pipes were discarded and little disturbed thereafter, perhaps being used and discarded by those people associated with the ironworking being carried out in the immediate vicinity (see above).

Discussion

There are three means by which clay tobacco pipes may be dated- typologically, by makers' marks, or statistically. Typological dating generally relies on identification of the morphology of the bowl, or the presence of particular decoration on either the bowl or stem. Dating by means of makers' marks can be done where the marks may be attributed to known makers who operated within a known time range. And finally, in the absence of identifiable bowl morphology or makers' marks, pipes may be dated statistically- i.e. by bowl size or by the size of the stem bore diameters (Oswald 1975, 92); this is based on the observance that stem bore diameters steadily decreased from 1620-c1800AD (*ibid*). However, this latter technique may only be used where a large number of stems are present, and which are known to derive from contexts which predate c1800AD as the accuracy of the techniques significantly declines towards the end of the 18th century (*ibid.*). On the basis of the outlined dating techniques, the bowl has been dated typologically (see above and Figure 1), however, it is almost impossible to suggest dates for the stem fragments.

Radiocarbon dates were obtained for two of the contexts from which the discussed pipe fragments derived- the aforementioned linear features filled by (009) and (010), producing date ranges of 1652-1953 cal AD (2 sigma) and 1694-1955 cal AD (2 sigma) respectively- see Appendix 5, Table 3. These dates agree with the general post-medieval date of the clay tobacco pipes, but unfortunately our inability to date the majority of this assemblage hinders our ability to refine these date ranges. Other items from context (010) included one sherd of Blackware which was dated to between the 18th-20th centuries (Kyle 2008a), and fragments of a glass bottle which was dated to the late 19th century (Kyle 2008b).

In the absence of makers' marks or distinctive forms/decoration the origin of these pipes remains uncertain- both British and Dutch imports are known to occur in Ireland alongside local pipes. And although local variants in style are known, clay pipe morphology generally varied little from region to region. Furthermore, it has been noted that it is likely that "most makers' products only had a range of 20-30 miles" (Oswald 1975, 62).

Recommendations

No further analysis of this assemblage is recommended.

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Table 1: Summary of discussed Clay Tobacco Pipes

Context	Find Number	Material	Description	Min External Diameter (mm)	Max External Diameter (mm)	Bore Diameter (mm)	Form	Date
001	009	Pipe Clay (kaolin)	stem fragment	8.1	8.8	2.6	stem	
001	010	Pipe Clay (kaolin)	Bowl fragment- around one third of the bowl survived (the lower front portion of the bowl), with none of the rim nor stem remaining, and no maker's mark nor decoration evident. The beginning of the spur/heel remains- but unfortunately not enough to positively identify it as one or the other. A scar on the internal surface was formed by the wire used to create the borehole through the stem. The walls of this long bowl are only slightly curved, and from its general appearance the overall form of this bowl may be dated between 1680-1710AD.	n/a	n/a	n/a	bowl	1680-1710AD
001	016	Pipe Clay (kaolin)	stem fragment- appears to have been longitudinally smoothed	6.3	6.7	2.3	stem	
007	003	Pipe Clay (kaolin)	small stem fragment- surface is somewhat abraded	5.6	6.2	2.8	stem	
009	001	Pipe Clay (kaolin)	tapering stem fragment- appears to have been longitudinally smoothed, but mould marks still visible	8.5	9.8	2.7	stem	

Context	Find Number	Material	Description	Min External Diameter (mm)	Max External Diameter (mm)	Bore Diameter (mm)	Form	Date
009	002	Pipe Clay (kaolin)	stem fragment- appears to have been longitudinally smoothed	7.8	8.7	2.9	stem	
009	003	Pipe Clay (kaolin)	stem fragment- appears to have been longitudinally smoothed	8.6	9.7	2.9	stem	
009	007	Pipe Clay (kaolin)	stem fragment with *very* slight trace of bowl remaining- trimming of mould marks is evident but these marks are still visible; stem appears to have been polished	8.2	10.0	2.7	stem	
009	008	Pipe Clay (kaolin)	stem fragment- slightly oblate in cross-section, appears to have been longitudinally smoothed	7.6	9.7	3.0	stem	
010	001	Pipe Clay (kaolin)	stem fragment- appears to have been burnt, with significant amounts of iron/waste metal adhering to the surface- being similar in appearance to a black, iron-rich lead glaze	6.6	7.1	2.4	stem	
010	002	Pipe Clay (kaolin)	stem fragment- slight traces of iron on surface	8.1	8.2	3.0	stem	
010	003	Pipe Clay (kaolin)	fine stem fragment	5.7	5.8	n/a	stem	
010	010	Pipe Clay (kaolin)	stem fragment	6.7	7.1	2.7	stem	
010	013	Pipe Clay (kaolin)	stem fragment- appears to have been longitudinally smoothed	6.7	7.7	2.6	stem	

Context	Find Number	Material	Description	Min External Diameter (mm)	Max External Diameter (mm)	Bore Diameter (mm)	Form	Date
010	021	Pipe Clay (kaolin)	small stem fragment which has been longitudinally split	n/a	n/a	n/a	stem	
010	022	Pipe Clay (kaolin)	fine stem fragment	5.0	5.6	2.7	stem	

Appendix 12: Post-Medieval Pottery Analysis

Alison Kyle, Headland Archaeology

Introduction

The Assemblage
This assemblage consisted of 3 sherds of post-medieval pottery.

Methodology
Analysis was carried out in hand-specimen with use of a hand-lens to identify inclusions present, and thus provenance fabrics. Relevant parameters were recorded on a sherd-by-sherd basis to create a catalogue of the assemblage using Microsoft Excel. This catalogue is based on the National Museum of Ireland's requirement that each individual find have an individual find number.

The Pottery
The wares identified are discussed in turn below, and summarized in Figure 1.

Glazed Red Earthenware
E2845:002:001
One sherd of Glazed Red Earthenware was identified in this assemblage. Glazed Red Earthenware may also be referred to by the term 'Brownware'.

The fabric has been well fired- the sherd is completely oxidised. Inclusions present are all small, and not visible without the aid of magnification. Decoration existed in the form of the application of glaze on both the internal and external surfaces, and three parallel incised lines on the external surface. The glaze is orange in appearance; this colouration is due to the application of a clear lead glaze directly on to the surface of an orange fabric. Brown speckles in the fabric are caused by of iron, which may have been deliberately added to the glaze as filings, or may have been absorbed from the clay fabric.

The sherd does not exhibit evidence for sooting, residue, or use-wear which might otherwise indicate the function served by the vessel represented. The sherd was a small body sherd from which the overall vessel form could not be deduced. However, the fine nature of the vessel, and the presence of both internal and external glaze, suggests it functioned as tableware rather than the usual storage or cooking vessels which are usually associated with Glazed Red Earthenwares.

Glazed Red Earthenwares were produced from the 18th century and continued in use until the 20th century. These domestic wares were produced in both England and Ireland, with English examples frequently imported into Ireland; the discussed nature of the inclusions present, and the similarity on the range of forms produced in both countries, preclude more conclusive discussions of provenance.

Blackware
E2845:001:008; E2845:010:027
Two sherds of Blackware were identified in this assemblage. The fabrics of the two sherds were very similar, both were well fired, completely oxidised, and a similar orange-red colour. The inclusions present reached up to 53mm, with common clear-milky quartz grains present. Decoration existed in the form of black glaze, this was a lead glaze which was given its colour by the addition of iron. This glaze was present on the internal surface only of one sherd (E2845:001:008), while on the other sherd (E2845:010:027) the internal surface was only partially glazed while the external surface was completely glazed with the exception of the external basal surface.

It is suggested that the identifiable form represented is a bowl with a basal diameter of 14cm (base percent 19%)- see Figure 1.

Blackware was produced in both Britain and Ireland from the 18th century, with imports to Ireland from England commonplace. At present it is generally difficult to differentiate between those vessels produced in Britain and Ireland.

Discussion
The assemblage analysed from Mucklagh 1, Co. Offaly is composed of tablewares and domestic kitchenwares, ranging in date from the 18th-20th centuries. It is of interest that one of the sherds of Blackware, dated between the 18th-20th centuries, derived from context (010) which was dated between 1694-1955 cal AD (2 sigma)- see Appendix 5, Table 3 (UB 8279). Fragments of a glass bottle from this context were dated to the late 19th century (Kyle 2008).

The size of the assemblage precludes any use of statistical analysis. The wares represented in this assemblage are typical of those used in domestic contexts dating to this period.

Recommendations
No further analysis of this assemblage is recommended.

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Stewart, K. 2008. 'Palaeoenvironmental Samples Assessment Report – Site E2845 – Mucklagh 1'. Unpublished Report, Headland Archaeology Ltd, Cork.

Table 1: Summary of the pottery analysed

C	Find	Material	Description	Form	Date
001	008	Earthenware	Blackware- body sherd approaching an out-turning rim; black glaze on internal surface and possibly red slip on the external surface	undiagnostic body sherd	18th-20th C
002	001	Earthenware	Glazed Red Earthenware- very fine body sherd, glazed on both the internal and external surfaces, with two parallel incised lines on the external surface	?tableware	18th-20th C
010	027	Earthenware	Blackware- base sherd with a diameter of 14cm (base percentage 19%), traces of glaze on the internal basal surface, external surface completely glazed. Base has a slight foot	Bowl	18th-20th C

Appendix 13: Metal Artefact Analysis
Alison Kyle, Headland Archaeology

Introduction

The Assemblage
This assemblage consisted of thirty-eight metal objects.

Methodology
Analysis was carried out in hand-specimen with use of a hand-lens and pre-existing typologies to provide close dates following analysis. Relevant parameters were recorded to create a catalogue of the assemblage using Microsoft Excel. This catalogue is based on the National Museum of Ireland's requirement that each individual find have an individual find number.

Where possible, the measurements given (see Table 1) have been kept as straightforward as possible- i.e. length, width, and depth. These measurements have all been given in millimetres to one decimal place. Where 'n/o' is found in the catalogue in place of a measurement this means 'not obtainable' and was generally used where the object was so encrusted in corrosion products that accurate measurements of the original dimensions of the object could not be given.

Metal Objects
A total of thirty-eight metal finds (or forty prior to the identification of 'refits') were retrieved from Mucklagh 1 in County Offaly. These were all ferrous, with the exception of one item which was of composite construction- having both ferrous and copper-alloy components. The objects have been categorised, and are discussed in turn under the following headings: 'Structural Items', 'Domestic Items', and 'Miscellaneous'. The general level of conservation of these metal finds was poor, with many of the finds represented significantly covered in corrosion products. The relative modernity of the assemblage excused the need for x-ray and/or conservation of these objects, and as a result none was undertaken.

Structural Items
A total of 18 items were placed within this category, all of which were nails from three individual contexts. Although the nails are mostly incomplete, they appear to be of differing forms (see individual descriptions in the 'Structural Items' catalogue beneath).

Nail
E2845:001:001
Modern nail with washer attached by corrosion products; shank is circular in cross-section, and terminal is circular and domed.
L 69mm, Dia 8.8mm

Nail
E2845:001:014
Fragmented and heavily corroded nail shank, head is missing.
n/o

Nail
E2845:001:015
Fragmented and heavily corroded nail shank, head is missing.
n/o

Nail
E2845:001:017
Fragmented nail with a fine shank with rectangular cross-section and expanded terminal (similar to 06E2845:010:020).

Nail
E2845:002:002
Complete nail with square-sectioned shank; terminal is obscured by corrosion products, but appears to be a simple expanded, square-shaped terminal.
L 54.2mm, W 3.7mm, D 5.6mm

Nail
E2845:002:003
Complete nail with a fine rectangular-sectioned shank; terminal is expanded; tip is bent over.
L 30.6mm, W 5.2mm, D 3.6mm

Nail
E2845:002:004
Complete nail with a fine rectangular-sectioned shank; terminal is expanded.
L 30.1mm, W 6.5mm, D 4.2mm

Nail
E2845:002:005
Tapering wedge-shaped nail/peg; tip is missing.
L 39.7mm, W 13.2mm, D 8.6mm

Nail
E2845:002:006
Tip and shank of a large nail; rectangular in cross-section.
L 40.8mm, W 12.8mm, D 8.1mm

Nail
E2845:010:004
Badly corroded and fragmented nail shank which is square in cross-section and has traces of adhering mineralised wood; terminal is square, and tip is missing.
L 3.9mm, W 5.8mm, D 6.9mm

Nail
E2845:010:005
Badly corroded and fragmented nail shank which is square in cross-section and has traces of adhering mineralised wood; terminal is square, and tip is missing.
L c46.2mm, W 3.5mm, D 2.8mm

Nail
E2845:010:006
Shank is square-sectioned with adhering mineralised wood; square-sectioned, with possible 'L' shaped terminal.
L 40.3mm, W 3.8mm, D (not obtainable)

Nail
E2845:010:007
Nail shank with adhering mineralised wood; shape of the shank cross-section is uncertain; tip and terminal both missing.
n/o

Nail
E2845:010:012
Highly fragmented and corroded remains of a nail which has a square-sectioned shank and a square terminal.
L 31.6mm, W 5.9mm, D (not obtainable)

Nail
E2845:010:018
Square-sectioned shank of a large nail; terminal is square-headed; tip is missing.
L 36.1mm, W 10.6mm, D 6.7mm

Nail
E2845:010:019
Badly corroded and fragmented nail shank which is square in cross-section; tip and terminal both missing.
L 50.3mm, W 5.9mm, D 5.0mm

Nail
E2845:010:020
Fragmented and corroded fragment of a nail with a fine shank with rectangular cross-section and expanded terminal (similar to 06E2845:001:017).
L 30.1mm, W 5.4mm, D 3.6mm

Nail
E2845:010:026
Complete square-sectioned nail; terminal is obscured by adhering corrosion products.
L 50.5mm, W 4.4mm, D 3.5mm

Domestic Items
A total of three items have been placed within this category. These include two possible knives and one key. Both *possible* knives are badly corroded and one is incomplete (E2845:010:017). If E2845:010:014 is indeed a knife, its suggested early date, when compared to the radiocarbon dates (see Appendix 5, Figure 3) and other artifacts from this context, appears anomalous. It is therefore possible that this is an intrusive find.

Possible Knife
E2845:010:014
Badly corroded tanged object- possible knife with a curving blade back, straight blade edge, with a triangular cross-section. Under Laing's classification this may be broadly dated from the Iron Age to the Early Medieval period.
L 71.9mm, W 24.5mm, D 7.3mm

Possible Knife
E2845:010:017
Possible fragment of a whittle-tanged knife- badly corroded and incomplete.
L 56.7mm, W 15.4mm, D 10.5mm

Key
E2845:009:004
Key for a mounted lock- sub-circular wire bow which is made from rectangular-sectioned wire; circular-sectioned solid shank which projects past the bit but does not project into the bow; the bit is a hollow rectangle fashioned from wire rather than a solid sheet; no close parallel was found. Post-medieval.
L 130.4mm

Possible Weapon
A total of one item was placed within this category- a possible ferrule. Ferrules may be simply defined as conical spear tips. Such objects are paralleled from Early Medieval contexts, as at Lagore Crannog (Laing 2006, 95).

Possible Ferrule
E2845:007:001
Possible ferrule- socketed point, produced from sheet metal bent to form a conical shaped object.
L 100.2mm, max Diameter 23.4mm, sheet thickness 3.8mm

Miscellaneous
A total of fifteen objects were placed within this category. These were largely undateable as the majority could only be identified as a 'lump', 'strip', or 'unidentified'. As a result of their miscellaneous and undateable nature these objects provide limited insight into this site and the contexts from which they derived.

?Thumb latch
E2845:001:003
Possible door thumb latch- 'L'-shaped section of rectangular sectioned iron strip. Modern.
L 59.2mm, W 11.5mm, D 17.3mm

?Binding Strip
E2845:001:004
Possible binding strip- fragment of an iron strip.
L 72.6mm, W 30.6mm, D 7.7mm

Hollow Pipe
E2845:007:004
Fragment of a hollow pipe which is ovate in cross-section; produced from sheet metal. Modern.
Maximum external diameter 35.7mm; sheet thickness 2.7mm

Rod
E2845:010:016
Iron rod- badly corroded.
L 91.6mm, W 13.4mm, D 8.0mm

Sheet metal
E2845:001:007
Irregularly shaped fragment of sheet metal.
L 33.4mm, W 31.3mm, D 2.3mm

Sheet metal
E2845:002:008
Fragment of sheet metal.
L 31.0mm, W 21.3mm, D 6.8mm

Sheet metal
E2845:007:002
Fragment of sheet metal.
L 50.6mm, W 37.6mm, D 3.3mm

Sheet metal
E2845:010:008
Small fragment of sheet metal.
L 25.7mm, W 24.1mm, D 3.7mm

Sheet metal
E2845:010:011
Fragment of sheet metal which is slightly in-curved at the edges.
L 90.2mm, W 59.8mm, D 3.7mm

Lump
E2845:001:006
Corroded lump.
L 29.8mm, W 18.2mm, D 6.5mm

Lump
E2845:001:011
Corroded lump.
L 46.1mm, W 29.3mm, D 10.8mm

Lump
E2845:002:007
Corroded lump.
L 35.0mm, W 11.3mm, D 15.8mm

Lump
E2845:010:015
Corroded lump.
L 64.5mm, W 26.0mm, D 17.1mm

Unidentified
E2845:001:002
Possible mechanical element/component which consists of a central iron shaft with two copper alloy cogs housed within a hollow hemispherical case. Modern.
L 69.2mm, W 24.8mm, D 24.1mm

Unidentified
E2845:010:009
Semi-circular plate with projecting corroded shank/bolt.
L 80.5mm, W 31.9mm, D 5.8mm

Non-archaeological
Upon analysis of the assemblage, one item was found to be stone rather than a metal artifact. Furthermore, this object was unworked and did not possess any evidence of deliberate modification for human use.

Stone
E2845:001:005
Non-archaeological.

Discussion
While the artifacts from this assemblage were generally not closely datable, the general appearance of the assemblage is post-medieval in date. It is principally composed of both domestic and structural items. While there was evidence for metal working from this site, it is uncertain whether any of the iron objects examined were produced as a result of this process. Notably, the presence of mineralised wood on a small number of these nails from context 10 (E2845:010:004, 005, 007) indicates they were indeed used rather than being the unused products of a blacksmith operating in the immediate vicinity. Furthermore, the apparent diversity in nail forms may tentatively suggest non-contemporaneous production, or that they were produced by different blacksmiths.

Recommendations
It is recommended that no further analysis of this assemblage is required.

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Table 1: Summary of the artefacts analysed

C	Find	Material	Category	Description	Dimensions	Date
001	001	Fe	Structural Item	Modern nail with washer attached by corrosion products; shank is circular in cross-section, and terminal is circular and domed.	L 69mm, Dia 8.8mm	Modern
001	002	Fe/Cu-alloy composite object	Miscellaneous	?mechanical element/component- central iron shaft with two copper alloy cogs which are housed within a hollow hemispherical case.	L 69.2mm, W 24.8mm, D 24.1mm	modern
001	003	Fe	Miscellaneous	?modern door thumb latch- 'L'-shaped section of rectangular sectioned iron strip.	L 59.2mm, W 11.5mm, D 17.3mm	modern
001	004	Fe	Miscellaneous	?Binding strip- fragment of an iron strip.	L 72.6mm, W 30.6mm, D 7.7mm	
001	005	Non-Archaeological		Stone	n/a	
001	006	Fe	Miscellaneous	Corroded lump.	L 29.8mm, W 18.2mm, D 6.5mm	
001	007	Fe	Miscellaneous	Irregularly shaped fragment of sheet metal.	L 33.4mm, W 31.3mm, D 2.3mm	
001	011	Fe	Miscellaneous	Corroded lump.	L 46.1mm, W 29.3mm, D 10.8mm	
001	014	Fe	Structural Item	Fragmented and heavily corroded nail shank, head is missing.	not obtainable	
001	015	Fe	Structural Item	Fragmented and heavily corroded nail shank, head is missing.	not obtainable	
001	017	Fe	Structural Item	Fragmented nail with a fine shank with rectangular cross-section and expanded terminal (similar to 06E2845:010:020)	L 69mm, Dia 8.8mm	post-medieval
002	002	Fe	Structural Item	Complete nail with square-sectioned shank; terminal is obscured by corrosion products, but appears to be a simple expanded, square-shaped terminal.	L 54.2mm, W 3.7mm, D 5.6mm	post-medieval
002	003	Fe	Structural Item	Complete nail with a fine rectangular-sectioned shank; terminal is expanded; tip is bent over.	L 30.6mm, W 5.2mm, D 3.6mm	post-medieval
002	004	Fe	Structural Item	Complete nail with a fine rectangular-sectioned shank; terminal is expanded.	L 30.1mm, W 6.5mm, D 4.2mm	post-medieval
002	005	Fe	Structural Item	Tapering wedge-shaped nail/peg; tip is missing.	L 39.7mm, W 13.2mm, D 8.6mm	

C	Find	Material	Category	Description	Dimensions	Date
002	006	Fe	Structural Item	Tip and shank of a large nail; rectangular in cross-section.	L 40.8mm, W 12.8mm, D 8.1mm	
002	007	Fe	Miscellaneous	Corroded lump.	L 35.0mm, W 11.3mm, D 15.8mm	
002	008	Fe	Miscellaneous	Fragment of sheet metal.	L 31.0mm, W 21.3mm, D 6.8mm	
007	001	Fe	?Weaponry	Possible ferrule- socketed point, produced from sheet metal bent to form a conical shaped object.	L 100.2mm, max Diameter 23.4mm, sheet thickness 3.8mm	
007	002	Fe	Miscellaneous	Fragment of sheet metal.	L 50.6mm, W 37.6mm, D 3.3mm	
007	004	Fe	Miscellaneous	Fragment of a hollow pipe which is ovate in cross-section; produced from sheet metal.	Maximum external diameter 35.7mm; sheet thickness 2.7mm	modern
009	004	Fe	Domestic Items	Key for a mounted lock- sub-circular wire bow which is made from rectangular-sectioned wire; circular-sectioned solid shank which projects past the bit but does not project into the bow; the bit is a hollow rectangle fashioned from wire rather than a solid sheet; no close parallel was found.	L 130.4mm	Post-medieval
009	005	Fe	refit- see E2845:009:004	n/a	n/a	
009	006	Fe	refit- see E2845:009:004	n/a	n/a	
010	004	Fe	Structural Item	Badly corroded and fragmented nail shank which is square in cross-section and has traces of adhering mineralised wood; terminal is square, and tip is missing.	L 3.9mm, W 5.8mm, D 6.9mm	post-medieval
010	005	Fe	Structural Item	Badly corroded and fragmented nail shank which is square in cross-section and has traces of adhering mineralised wood; terminal is square, and tip is missing.	L c46.2mm, W 3.5mm, D 2.8mm	post-medieval

C	Find	Material	Category	Description	Dimensions	Date
010	006	Fe	Structural Item	Nail- shank is square-sectioned with adhering mineralised wood; square-sectioned, with possible 'L' shaped terminal.	L 40.3mm, W 3.8mm	post-medieval
010	007	Fe	Structural Item	Nail shank with adhering mineralised wood; shape of the shank cross-section is uncertain; tip and terminal both missing.	not obtainable	post-medieval
010	008	Fe	Miscellaneous	Small fragment of sheet metal.	L 25.7mm, W 24.1mm, D 3.7mm	
010	009	Fe	Miscellaneous	Semi-circular plate with projecting shank/nail.	L 80.5mm, W 31.9mm, D 5.8mm	
010	011	Fe	Miscellaneous	Fragment of sheet metal which is slightly in-curved at the edges.	L 90.2mm, W 59.8mm, D 3.7mm	
010	012	Fe	Structural Item	Highly fragmented and corroded remains of a nail which has a square-sectioned shank and a square terminal.	L 31.6mm, W 5.9mm, D (not obtainable)	post-medieval
010	014	Fe	Domestic	Badly corroded tanged object- possible knife with a curving blade back, straight blade edge, with a triangular cross-section. Under Laing's classification this may be broadly dated from the Iron Age to the Early Medieval period.	L 71.9mm, W 24.5mm, D 7.3mm	
010	015	Fe	Miscellaneous	Corroded lump.	L 64.5mm, W 26.0mm, D 17.1mm	
010	016	Fe	Miscellaneous	Iron rod- badly corroded.	L 91.6mm, W 13.4mm, D 8.0mm	
010	017	Fe	Domestic	Possible fragment of a whittle-tanged knife- badly corroded and incomplete.	L 56.7mm, W 15.4mm, D 10.5mm	
010	018	Fe	Structural Item	Square-sectioned shank of a large nail; terminal is square-headed; tip is missing.	L 36.1mm, W 10.6mm, D 6.7mm	
010	019	Fe	Structural Item	Badly corroded and fragmented nail shank which is square in cross-section; tip and terminal both missing.	L 50.3mm, W 5.9mm, D 5.0mm	post-medieval
010	020	Fe	Structural Item	Fragmented and corroded fragment of a nail with a fine shank with rectangular cross-section and expanded terminal (similar to 06E2845:001:017).	L 30.1mm, W 5.4mm, D 3.6mm	post-medieval

C	Find	Material	Category	Description	Dimensions	Date
010	026	Fe	Structural Item	Complete square-sectioned nail; terminal is obscured by adhering corrosion products.	L 50.5mm, W 4.4mm, D 3.5mm	

Appendix 14: Glass Analysis

Alison Kyle, Headland Archaeology

Introduction

The Assemblage
This assemblage consisted of 4 shards of post-medieval glass.

Methodology
Analysis was carried out in hand-specimen with use of a hand-lens. Relevant parameters were recorded on a shard-by-shard basis to create a catalogue of the assemblage using Microsoft Excel. This catalogue is based on the National Museum of Ireland's requirement that each individual find have an individual find number.

The Glass
06E2845:001:013; 06E02845:010:023-035
Four shards of glass were present in this assemblage, these were retrieved from two individual contexts, one of which being topsoil.

Free-blown bottle
06E2845:001:013
The base sherd of a wine bottle was present in the topsoil (06E2845:001:013). The body slightly expands outwards from the base, giving the bottle a slightly globular appearance; the basal edge is rounded. From what remains of the body the form appears to be transitional- a progression from the globular 'Onion' wine bottle towards the later cylindrical bodied wine bottles. The upwards kick in the base (which is a universal design feature intended to prevent any remaining pontil mark on the base from destabilizing the bottle) is not exaggerated, and exhibits what appears to be the remains of a 'disc' pontil mark.

The bottle has been 'free-blown', without the use of a mould, thus resulting in a typically irregular appearance, which is subrounded in plan. The green glass from which this wine bottle is composed is entirely obscured by a series of opaque iridescent layers which are the result of post-depositional decomposition or devitrification of the glass. This process of devitrification occurs through hydration of the glass, specifically resulting from "the selective loss of potash and/or soda to create a series of fragile silica rich layers sitting on top of the residual glass core", with the opacity resulting from manganese ions in the depositional environment infusing into the glass (Watkinson and Neal 2001, 60).

The wine bottle from which this shard derives may be dated to the second half of the 18th century, and may perhaps be more closely dated to between 1721-1731 AD (based on I. N. Hume's typology- 1969, 63-68).

Mould-blown bottle
06E02845:010:023-035
A further three shards of glass (06E02845:010:023-035) were found to refit to form the remaining section of the neck of a wine bottle. Regularly spaced debossed lines run longitudinally along the neck- indicating the bottle was made in a mould, although no mould lines are present on this remaining section of the bottle. The green glass is also completely obscured by the opaque, iridescent material resulting from devitrification as discussed above. In the absence of diagnostic features such as the bottle lip and the full circumference of the bottle- which would definitively indicate either the

presence or absence of mould marks- we are lacking definitive evidence relating to the method of manufacture and therefore dating of this bottle.

On the available evidence it is possible to suggest this bottle was produced in a mould, thus facilitating the debossed decoration. Embossed decoration was facilitated by the use of moulds which were introduced in the 18th century and grew in use through the 19th century (BUFAU, Section 3.5). By the late 19th century it has been noted that an estimated 75% of all glass bottles were embossed (Stockton 1981, 33), with embossing falling out of use shortly afterwards as the use of paper labels became increasingly popular (BUFAU, 3.5). It is therefore possible to say this bottle most likely dates to the late 19th century.

Discussion
The late 19th century date for the mould-blown bottle from context 010 concurs with radiocarbon dates which have been obtained for this feature- a linear feature (010) which contained a concentration of slag and charcoal (Corbett 2007, 3). This context has been dated to between 1694-1955 cal AD (0.519 relative probability at 2 sigma)- see Appendix 5, Figure 3 (UB 8279). Other artefacts which derived from this context include metal finds, clay tobacco pipe stems, and pottery; it was not possible to closely date the pipe stems, however the pottery was identified as Blackware and dated to between the 18th-20th centuries (Kyle 2008).

Recommendations
No further analysis of this assemblage is recommended.

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Table 1: Summary of the glass analysed

C	Find	Material	Description	Form	Date
001	013	Glass	Base sherd from a wine bottle- the form of the body appears to be a transitional form, lying between globular and cylindrical, with the body expanding outwards from the base, with rounded basal edge; upward kick is not exaggerated, and exhibits what appears to be the remains of a 'disc pontil'; the bottle has been 'free-blown' resulting in its irregular appearance which is subrounded in plan; the green glass is entirely obscured by a series of opaque iridescent layers which are the result of post-depositional decomposition or devitrification of the glass.	appears to be a transitional form- between 'Onion' wine bottle and cylindrical bodied wine bottles	second quarter of the 18th century, possibly dating between 1721-1731 AD (based on I. N. Hume's typology)
010	023	Glass	Remains of the tapering neck of a wine bottle made from green bottle glass; debossed longitudinal lines are present on the neck, at evenly spaced intervals.	wine bottle	late 19th century
010	024	Glass	refit with 06E2845:010:023, 025- see 06E2845:010:023	n/a	n/a
010	025	Glass	refit with 06E2845:010:023, 024- see 06E2845:010:023	n/a	n/a

Appendix 15: Ecofacts Analysis

Alison Kyle, Headland Archaeology

Introduction

One piece of animal bone and one shell were recovered as artefacts during excavations at Mucklagh 1, Co. Offaly; these are discussed in turn below.

Animal Bone

06E2845:001:012

One piece of animal bone found during excavations at Mucklagh 1, Co. Offaly was suggested to have been worked. Specialist analysis by the present author, and consultation with faunal remains specialist Dr. Auli Tourunen has confirmed this bone has not been subject to deliberate modification for human use.

Shell

06E2845:007:005

One Oyster shell was recovered during excavation and included in the artefactual assemblage. This shell has not been modified for human use, and as such should be classed as an ecofact rather than an artefact.

Discussion and Recommendations

The items discussed in this report were not artefacts, but rather ecofacts. The animal bone does not require inclusion in the faunal remains report as it was derived from a topsoil context.

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Report 2008/07

Evaluation of archaeometallurgical residues from Mucklagh, Co. Offaly NTB06, A033/E2845

Dr Tim Young
6th June 2008

Evaluation of metallurgical residues from Mucklagh, Co. Offaly NTB06, A033/E2845

Dr T.P. Young

Abstract

This site has yielded a total archaeometallurgical residue of approximately 41kg The majority of the assemblage (33kg) derives from just two contexts (009 and 010), which appear to be later post-medieval in age.

The residues are dominated by smithing hearth cakes (SHCs; 26.2kg of the assemblage is certain SHC material, and much of the indeterminate material is likely to be small fragments of SHCs). The 66 measurable SHCs show a size range from 98g to 1206g, with a mean of 373g. Such a size distribution is typical of residues deriving from a blacksmith's smithy, rather than from the refining of raw iron. Such SHCs will only form in hearths where there is a ready supply of slag-forming silicate material from the melting of the ceramic surrounding the air inlet of a side-blast hearth. The air inlet in this instance appears to be a large-diameter ceramic tuyère. The fuel employed was charcoal. Several of the SHCs show a gravelly basal layer – suggesting the hearth was floored with gravelly material, or perhaps more likely a floor-level hearth dug into gravel deposits.

The assemblage is thus extremely conservative in the use of charcoal, ceramic tuyères and possibly a floor-level hearth; features which are typically replaced by coal, cast iron tuyères and a waist level hearth respectively by the 19th and 20th centuries (waist-level hearths and the use of coal may appear much earlier in some areas). The dating evidence for Mucklagh is imprecise, artefactual evidence suggesting 18th-19th centuries and ^{14}C only indicating the deposits are post-late 17th century. This appears to be an example of the late survival of essentially a medieval style of forge into the dawn of the industrial period, when cheap distribution of coal (initially by canal, which reached Tullamore in 1798) and of mass-produced iron tuyères led to standardisation of what is commonly thought of today as the "traditional" forge.

A similar example of late survival of this technology has been recorded at Ballykilmore, Co. Westmeath, less than 20km NE of Mucklagh, where the use of floor- level hearths, ceramic tuyères and charcoal fuel is also attested in a post-medieval context, although there also associated with bloomery iron smelting.

Contents

Methods

All materials were examined visually, using a low-powered binocular microscope where necessary. All significant materials were weighed and recorded to a database (Table 1).

As an evaluation, the materials were not subjected to any high-magnification optical inspection, nor to any other form of instrumental analysis. The identifications of materials in this report are therefore necessarily limited and must be regarded as provisional.

Results

The catalogue is presented in Table 1. The materials are all either certainly from iron-working (smithing) or compatible with that origin. There are no materials in the collection which can be attributed with any high degree of likelihood to an origin in any other activity.

The residues are dominantly macroresidues, although some of the sample retents do include a very small proportion of microresidues. None of the micro-residues contains significant proportions of hammerscale. This suggests that micro- and macro-residues became separated by the disposal process. This is a common observation and is usually taken as an indication that the smithy might be swept clean of micro-residues (which tend therefore not to move far from the point of origin) , whereas the macro-residues (slags) would be removed from the forge hearth and disposed of by carrying or throwing to a suitable location, and thus tend to be further removed from the smithy.

The most interesting microresidues are those from C005. This retent assemblage contained abundant small slag droplets, which were consistent with those formed within the charcoal bed of a smithing hearth (compare the assemblage from Coolamurry described in Young 2008a).

The slags are dominantly smithing hearth cakes (or fragments thereof), there appear to be few other unconsolidated hearth slags, and there are relatively few pieces of hearth ceramic or wall-bound slags.

The collection of 66 complete, or almost complete, SHCs constitutes about 60% of the total assemblage by weight. Much of the remainder of the collection is formed by slag fragments, which although indeterminate, are probably SHC fragments.

Vitrified lining and lining slags contribute less than 2kg of the assemblage (<5% by weight). The form of the tuyères is largely evidenced by the shape of slag pieces broken from the tuyère face; there are no good tuyère fragments providing direct evidence for their shape. The slag attachment scars provide evidence for low-curvature tuyère margins, in one case in C009 suggesting a radius of about 90mm, but in others (e.g. C010) there is almost no curvature. This perhaps suggests that the tuyères might have been similar to the large oval ones at Ballykilmore (Young 2006).

Many of the SHCs show inclusions of small pebbles on their bases. This suggests that the hearth base was either a very pebbly ceramic, or that that the hearths were excavated into a gravelly deposit.

Interpretation

This assemblage forms a coherent group of iron working (blacksmithing residues), of a style fairly well-known from sites ranging in age from the earlier Iron Age to the medieval period, but, perhaps surprisingly, not very well documented from the post-medieval period.

Between the 16th and 20th centuries there were a variety of technological changes within blacksmithing in Ireland, and broadly similar changes can observed elsewhere, although the precise timing of different changes varies by location.

The changes include:

1. the shift from floor-level to waist-level hearths

2. the change from charcoal to coal or coke as fuel

3. the adoption of cast iron tuyères (or tuy irons as blacksmiths call them), usually with water-cooling, in replacement of earlier ceramic tuyères and blowholes.

4. the change from paired bellows to the double-action great bellows (or in the 20th century to squirrel-cage blowers and powered blowers).

These changes will have appeared at various times in different places and the details are very poorly known. Indeed change (4) is not currently detected in the archaeological record.

It is likely that change (1) may have occurred earlier in urban settings or in areas of strong Anglo-Norman influence.

Change (2) will have occurred earlier in areas where coal occurs or in areas with easy trading with the coal-producing areas (particularly sites on the east coast). In the context of Mucklagh, the arrival of the canal in Tullamore in 1798 is likely to have led rapidly to cheap coal becoming available. However, even in areas where coal was plentiful individual smiths may have continued using charcoal through preference (there are anecdotal accounts of some smiths working in the South Wales coal mines using charcoal well into the mid-20th century!).

Change (3) will have occurred when cheap mass produced castings became widely available in the 19th century. It is likely that the use of a waist level hearth would be a prerequisite for adoption of an iron tuyère. The nature of the blowhole in forge hearths immediately before the adoption of the iron tuyère is unknown. It is assumed that ceramic tuyères continued to be used in Ireland, and limited archaeological evidence suggests these are large objects compared with the smaller medieval varieties.

The Mucklagh assemblage shows clear evidence that changes (2) and (3) had not been adopted and evidence that suggests change (1) had not either.

The significance of the Mucklagh assemblage therefore hinges on its age. The artefactual evidence appears to push the assemblage (if in-situ) into the 19th century on the evidence of a few sherds of glass bottle. The ^{14}C evidence is also not especially helpful; the two data samples have curves that markedly different from each other, but which broadly indicate a post-late 17th century date. However, a age bracket of 18th-19th century places this assemblage very late in the history of a style of iron working which has its roots back in the early Iron Age.

Persistence of early styles of iron-working and iron-production in this area are also being evidenced by on-going investigations at Ballykilmore, Co. Westmeath, less than 20km NE of Mucklagh. This site shows a late phase of iron-production largely within the upper fills of a ditch surrounding an Early Christian and medieval cemetery and church. The iron working here is interpreted (Young 2006) as representing iron production, with both bloomery iron smelting and the subsequent bloom refining being undertaken on the site. The age is currently uncertain, but appears to be in the bracket of 16th – 19th century, and it is to be hoped that this will be refined before publication.

The Mucklagh slags occur mainly in a linear feature (gully), towards the SW end of which there are some discrete, smaller, charcoal-rich deposits. (C004, 005, 008). C005, and to a lesser extent C008, yielded a good microresidue assemblage, indicative of within-

hearth residues. These three oval deposits may represent discrete deposits dumped during cleaning out of a smithy hearth. Alternatively, it is not impossible that they actually represent hearths themselves. The amount of heat transfer onto the very base of a smithing hearth may be very limited, and scorching limited to the upper part of the side near the tuyère. Metalworking hearths and furnaces are not uncommon in the butt ends of ditches. Unfortunately, the residue assemblages by themselves cannot indicate whether a charcoal deposit is *in-situ* in a hearth, or dumped.

Evaluation of potential

This assemblage is significant for being the residues from what must have been an extremely widespread activity, but which has remained largely obscured in the archaeological record.

Further investigation of the chemical composition of the slags would be interesting; partially to establish baseline data for material of this age and partly to determine whether any significant differences exist between this late material and earlier residues in the same tradition.

The value of any further work is however somewhat limited by the lack of clear association with metallurgical structures, and by the considerable uncertainty over the age of the assemblage. Thus although the detailed analysis of these slags would be of interest and would further archaeometallurgical knowledge, it would be unlikely to impact on the immediate understanding of this site in a significant manner.

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NTB06 A033/E2845

context	sample	label	weight	notes	dimensions
001	001	slag	1206	large SHC broken in 2, spoon shaped, crust to 15mm, thin granular fill in bowl	175x140x60
			186	small protrusion below blowhole, semicircular rear hints at tuyère but no real sides, non-wetted surface of slag below horizontal lip which must have jutted 40 mm below blow hole	
			314	curious SHC which has basal contact, blebby/lumpy/gravelly top - and apparently a hole blown in side with smooth maroon surfaces, low density	
			215	2 pieces of flat slabby dense crust	
004	003	slag	383	curious extremely dense SHC with red smooth top, dense body and microprilly base	95x90x40
			159	lump of limestone - natural	
			294	probably >75% of SHC with glassy top, vesicular body and dense lower crust	115x(75)x40
			143	incomplete thin SHC, dense base, glassy top - similar to tongue below but denser	
			249	semi-circular slab of lining-dominated material - low-density SHC or tongue, top pale green glass with shallow dimples, internally very vesicular, base has some rusty lobes	90x130x45
004	006		178	c40 small slag pieces	
004	006	metallic debris	24	small slag fragments mainly low density lining related materials	
005	003	prill	10	bag of slag droplets, 2mm regular to 10mm irregular, c60 droplets	
005	003	whole retent of metallic debris	224	mixture of smooth dense blebs and rusty granular slags rich in very fine charcoal	
005	008	1 of 1	298	possible folded SHC - now rounded lump	
			617	c45 slag pieces	
005	008	metallic debris	36	fine slag detritus	
			139	tiny rusty SHC, deepest at one end,	70x65x50
007	002	slag	830	large irregular SHC, probably slightly incomplete, has very dense lower crust and some prills inside the bowl	145x115x55
			425	irregular slightly low density SHC with glassy top	120x110x45
			546	most of SHC with glassy top and dense bowl, edges missing, but probably >90%	130x(85)x45
			121	fragment from margin of small conventional SHC	
			449	dust and 9 pieces of mainly low density slag	
007	002	metallic debris	30	a bag of mainly prilly and blebby slags, one piece probably from SHC basal crust, but others free slags from bed	

008	005		237	possible SHC, biconvex, rusty	80x75x35
			574	15 pieces of slag	
008	007	metallic debris	84	bag of slag debris - mainly fragments	
008	007	slag	396	bag of sub-50mm slag pieces, some ash covered lobes and prills but lots of broken fragments of rather blebby/lumpy slag	
009	016	1 of 4	36	bag of small slag fragments and blebs - mainly the granular/lumpy components of the SHCs	
			612	large SHC broken in 3, bowl 30mm deep, lots of gravel towards the top, well formed dense but vesicular plano-convex shape, bowl smooth externally	140x95x55
			188	irregular smooth top dense SHC with smooth base and irregular blebby projections around edges	100x75x40
			215	irregular smooth top dense SHC with smooth base and irregular blebby projections around edges	105x70x30
			212	about half a dense well-formed SHC, lumpy base, top variable smooth and friable	95x(50)x40
			83	curved irregular sheet of gravelly lining slag	80x60x35
			16	45mm long nail with folded end	
			260	irregularly shaped mass of SHC-like slag - but shape odd - could be deformed?	95x70x50
			161	slab of dense slag	80x65x30
			49	2 pieces of vitrified lining	
			1338	54 pieces of slag	
			109	attachment of friable slag to blowhole or to tuyère - but difficult to orientate	
009	016	2 of 4	437	curved mass of failed lining slag sitting on base of wall	130x115x50
			798	sub-conical dense SHC, lower bowl to 35mm deep, top wedge to 35mm on proximal side, 15mm distally	110x95x70
			422	slabby dense SHC, straight proximal contact, plano-convex form	115x95x40
			343	biconvex friable lining-rich SHC, mainly void space inside	115x90x60
			234	SHC with thickest part proximally, base dimpled/lobate. Top glassy and covered in large pebbles	115x90x35
			283	lining slag showing tuyère contact, slag dimpled, tuyère margin curved, suggesting radius of maybe 90mm	100x80x65
			199	small dense SHC with glassy lining lag top	75x80x35
			155	curved slab of dense crust - not clear what the original cake size would have been	
			124	small slag lump probably from tuyère front	
			104	small moderately dense SHC with glassy top	75x65x25
			238	3 slabs of vitrified lining	
			698	28 pieces of slag and lining	
009	016	3 of 4	381	dense but hollow SHC with contact on end, rusty base, charcoal dimples on top	95x85x50
			134	small flat SHC dense, dimpled top	75x60x25
			402	SHC with glassy top sheet, slightly lobed base, smooth inclined ceramic contact proximally	115x85x50
			162	low density SHC with many rock clasts	90x60x40
			166	broken SHC, estimated to be 70% of original, many rock clasts	90x(60)x40
			164	low density SHC with much gravel, granular appearance	65x90x45

			98	low density friable SHC	70x60x35
			171	low density SHC with flat dimpled top	80x60x45
			175	dense semi-circular slab, probably a SHC	90x60x25
			138	dense slab not certainly SHC	
			153	dense slab not certainly SHC	
			913	35 pieces of low density slags like the SHCs above	
			285	3 slabs of vitrified lining	
009	016	4 of 4	381	triangular low density SHC, deepest proximally, glassy gravelly top, very friable	105x105x60
			808	friable SHC. Has tuyère contact at one end, smooth in front, then beyond that appears very granular and lumpy for distal half, lower surface dimpled distally, but is smooth below tuyère contact	160x110x65
			271	friable slabby SHC, top dark glass, pale friable below	100x80x45
			238	dish shaped irregular SHC, dark glassy top	100x100x30
			274	friable lumpy/granular SHC with crudely triangular shape, deepest proximally	100x75x45
			118	thin dense SHC, very iron-rich slag with charcoal as impressions and embedded on top, bottom very slightly dimpled	90x60x20
			124	low density lump/granular SHC	90x70x30
			299	dense flat-topped conical SHC deepest proximally	90x75x40
			159	irregular vesicular low-density lining-rich biconvex SHC	85x75x35
			280	moderately dense SHC, slightly irregular, granular base	90x80x50
			130	2 pieces of slagged lining	
			914	20 pieces of slag	
009	014	slag removed from sample	193	neat oval SHC, dense, granular appearing (not pebbly)	80x80x25
			189	rubbly small protrusion attached below 23mm diameter blow hole, not a real SHC	90x105x55
			1364	large collection of up to 50mm pieces of slag - mainly in hearth blebs and prills and lining slag lumps	
009	014	metallic debris	142	small slag fragments and blebs - mostly pale lining related materials	
010	012	1 of 4	929	20 pieces of slag	
			572	10 pieces of vitrified lining - one of which is hood from above blowhole, another shows a dense slag lip possibly on base of very large diameter (almost) straight tuyère	
			460	neat shallow SHC, probably formed on hearth base. Glassy top with pebbles, well formed basal crust	145x90x45
			321	low density plano-convex SHC with glassy top, large gravelly pebbles and lots of voids	110x95x45
			211	irregular lump of dimpled slag, has attachment of oxidised lining locally	
			296	irregularly developed SHC with lining rich top, prills and flows from distal base	
			172	part of a dense SHC with a well-developed basal crust	
			177	part of small neat dense SHC- probably less than half here	
			160	block forming part of small dense nub-like SHC with large charcoal inclusions	
010	012	2 of 4	1194	30 pieces of slag	
			908	large conventional SHC - possibly 85%, vesicular dense bowl, smooth blown top with adhering gravel, also gravel in parts of bowl	110x130x65
			505	very deep dense bowl, incomplete top	(80)x80x50

			273	very low density gravelly SHC	90x100x55
			339	dense deep small SHC with very gravelly glassy top	90x80x50
			462	dense conventional SHC, small part missing, very dense, glassy top	80x100x45
			110	very strange piece of lining slag - has attachment to "wall" with well marked edge - possibly tuyère edge, but also non-wetted surface at right angles - could it have had another material below tuyère in the wall?	60x85x50
			139	very irregular possible SHC, contains charcoal but also one dense piece which might be mineral coal	80x70x40
			145	small irregular SHC with granular base and locally smoothish top	80x60x30
			155	possible small irregular SHC, rusty, might be part of something bigger	90x60x45
			113	thin tongue-like slab, smoothish top lobate base - all low density lining material	80x75x25
			145	3 pieces of vitrified lining	
010	012	3 of 4	11	bag of small slag fragments	
			748	11 pieces of slag of indeterminate form	
			165	small SHC, fairly well formed and dense, bowl has slightly biconvex form	80x65x40
			744	well formed SHC with lobate margins and a glassy top - which has large gravelly lump proximally, base granular hard dense	125x110x50
			247	small vesicular but dense SHC, deepest proximally, oval in plan	90x70x40
			200	irregular small friable SHC, with deep concave bowl	90x70x30
			645	dense SHC with irregular top and possibly microprilly base	120x105x55
			375	2 pieces 60%? of SHC with maroon smooth blown top to slabby form, base granular	130x100x40
			196	part of small SHC with fairly well-develop basal crust	100x75x25
			231	low density slight irregular SHC with lots of rusting around its granular top,	105x70x40
			170	attachment area of dense slag onto wall/tuyère - no clear evidence which - it is an arcuate piece - but not clearly a made edge	
			207	2 slabs of vitrified lining	
010	012	4 of 4	196	15 pieces of slag	
			1001	dense SHC with well-formed dense bowl and dense top slab, base rusty granular, top smooth	130x125x65
			522	slabby irregular SHC attached to good straight length of wall 105mm wide	120x105x60
			744	double layer SHC with deep dense bowl and raised dense slabby top (burger), granular between	105x80x65
			558	incomplete low-density SHC with enormous internal voids lined with delicate platy olivine, probably little missing weight	120x(100)x80
			492	lowish density SHC attached to straight wall (as with other one this slopes up from wall!), attachment 110 wide	90x115x75
			655	strange SHC with dense Fe-rich slabby flat base, granular centre then raised deeply dimpled gravelly top	130x90x80
			321	thin SHC rich in gravel	110x90x35
010	015	metallic debris	53	small slag fragments - few fines compare to other retents	

	Mucklagh	Prior Park Cricklade -130	Prior Park Cricklade -128	Prior Park Cricklade total	Marsh Leys Farm	Carmarthen	Worcester Deansway (period 8)	Worcester Deansway (period 9)	Burton Dassett	Ballykilmore
	C18-C19?	11th – 13th	13th-15th		Roman	Roman	11th – 13th	13th-15th	14th- 15th	
count	66	10	7	17	30	136	61	32	60	43
min	98	156	172	156		100	168	144	130	80
max	1206	794	436	794	824	820	1490	1800	1670	4033
average	373	329	277	329	333	227	492	499	550	898
<500	77%	70%	100%	82%	77%	94%				51%
<1000	95%	100%	100%	100%	100%	100%				74%
>1000	5%	0%	0%	0%	0%	0%				26%
>3000	0%	0%	0%	0%	0%	0%				7%
Modal class	100-200									400-500

Table 2: Comparison of the Mucklagh SHC assemblage with other British and Irish blacksmithing SHC assemblages. Burton Dassett from McDonnell 1992; Marsh Leys Farm from Young 2005; Carmarthen from Crew 2003; Prior Park, Cricklade from Young 2008b; Worcester Deansway from McDonnell & Swiss 2004.

GeoArch

geoarchaeological, archaeometallurgical & geophysical investigations

54 Heol y Cadno,
Thornhill,
Cardiff,
CF14 9DY.

Mobile: 07802 413704
Fax: 08700 547366
E-Mail: Tim.Young@GeoArch.co.uk
Web: www.GeoArch.co.uk

Appendix 17 Charcoal Species Identification

Sample number	Context number	Material	*Taxon*	Common name	Weight (g)
6	4	Charcoal	*Quercus* sp.	oak	0.3
8	5	Charcoal	*Alnus glutinosa*	alder	0.1
7	8	Charcoal	*Pomoideaea*	apple/pear/hawthorn	0.6
14	9	Charcoal	*Alnus glutinosa*	alder	0.4
10	10	Charcoal	*Alnus glutinosa*	alder	0.2
15	10	Charcoal	*Quercus* sp.	oak	0.2

Appendix 18: All Sites Excavated on Scheme

Ardan 1	E2847
Ardan 2	E2846
Ardan 3	E2493*
Ballynasrah	E2493*
Cloncollog 1	E2849
Cloncollog 2	E2850
Clonminch	E2851
Mucklagh 1	E2845
Mucklagh 2	E2844
Puttaghan	E2493*
Screggan 2	E2848

*Fully excavated during Centreline Testing under Ministerial Direction A033 and NMS Registration No. E2493