N9/N10 KILCULLEN TO WATERFORD SCHEME, PHASE 4 – KNOCKTOPHER TO POWERSTOWN

Ministerial Direction Scheme Reference No.	A032
Registration No.	E3610
Site Name	AR067, Stonecarthy West 1
Townland	Stonecarthy West
County	Kilkenny
Excavation Director	James Kyle
NGR	251538 140023
Chainage	27800–27875

FINAL REPORT

ON BEHALF OF KILKENNY COUNTY COUNCIL

OCTOBER 2012

IAC Irish Archaeological Consultancy

PROJECT DETAILS

Project	N9/N10 Kilcullen to Waterford Scheme, Phase 4 – Knocktopher to Powerstown
Ministerial Direction Reference No.	A032
Excavation Registration Number	E3610
Excavation Director	James Kyle
Senior Archaeologist	Tim Coughlan
Consultant	Irish Archaeological Consultancy Ltd, 120b Greenpark Road, Bray, Co. Wicklow
Client	Kilkenny County Council
Site Name	AR067, Stonecarthy West 1
Site Type	Burnt mound activity
Townland(s)	Stonecarthy West
Parish	Stonecarthy
County	Kilkenny
NGR (easting)	251538
NGR (northing)	140023
Chainage	27800–27875
Height OD (m)	93
RMP No.	N/A
Excavation Dates	26 July–16 August 2007
Project Duration	20 March 2007–18 April 2008
Report Type	Final
Report Date	October 2012
Report By	James Kyle and Tim Coughlan
Report Reference	Kyle, J. and Coughlan, T. 2012 E3610 Stonecarthy West 1 Final Report. Unpublished Final Report. National Monument Service. Department of the Environment, Heritage and Local Government, Dublin.

ACKNOWLEDGEMENTS

This final report has been prepared by Irish Archaeological Consultancy Ltd in compliance with the directions issued to Kilkenny County Council by the Minister for Environment, Heritage and Local Government under Section 14A (2) of the National Monuments Acts 1930–2004 and the terms of the Contract between Kilkenny County Council and Irish Archaeological Consultancy Ltd.

CONSULTING ENGINEERS – N9/N10 KILKENNY CONSULT

James Eogan (NRA Senior Archaeologist), Ed Danaher (NRA Archaeologist) and Bernice Kelly (NRA Assistant Archaeologist)

Project Liaison Officer, Kilkenny Co. Council – Joe Gannon and Lisa Mulcahy

NATIONAL MONUMENTS, DOEHLG

Archaeologist – Martin Reid

IRISH ANTIQUITIES DIVISION, NATIONAL MUSEUM OF IRELAND

Assistant Keeper – Nessa O'Connor

ABSTRACT

Irish Archaeological Consultancy Ltd (IAC), funded by the National Roads Authority (NRA) through Kilkenny County Council, undertook an excavation at the site of AR067, Stonecarthy West 1 along the proposed N9/N10 Kilcullen to Waterford Scheme, Phase 4 – Knocktopher to Powerstown (Figure 1). The following report describes the results of archaeological excavation at that site. The area was fully excavated by James Kyle under Ministerial Direction A032 and Excavation Registration Number E3610 issued by the DOEHLG in consultation with the National Museum of Ireland for IAC. The fieldwork took place between the 26 July and 16 August 2007.

The excavation at Stonecarthy West 1 has identified burnt mound activity dated to the middle Bronze Age and early Iron Age. Undated metallurgical activity in the form of a bowl furnace was also recorded.

The earliest phase of occupation at the site was an early-middle Bronze Age structure consisting of a slot trench and trough. This probably originally enclosed an oval area before later disturbance from a field drain on the east side. A possible entrance was noted on the north side. The stone packing within the slot-trench comprised long, narrow, stones (C68) which suggests it supported narrow vertical plank walls. It is possible, given the size of the structure (3m x 2m), that these walls would have supported a light roof. Within the area enclosed by the slot trench was a possible shallow oval trough (C75). Four stakeholes were located at the west end of the trough but it is not clear if these had a structural or other function. It is felt that this trough could have been filled with water which could have then been heated creating a sweathouse within the confines of the slot-trench wall. The possibility that it was a small house-type structure unrelated to burnt mound activity must also be considered based on evidence from Curraghatoor, Co. Tipperary, where similarly sized circular structures with slot-trench foundations were recorded (Doody, 2000).

Subsequent activity focussed on a large pit that may have functioned as a well or waterhole that was dated to the middle Bronze Age. It is possible that the construction of the well/waterhole feature was contemporary with the slot-trench structure and continued in use during the subsequent phase of activity as no other significant contemporary features were identified in proximity to the well. It is felt that the well was used as a water storage facility as there are no obvious water sources in the vicinity to facilitate the filling of an earlier trough and the site is not in a low-lying or marginal location which would have been prone to flooding. Near the well, and cutting the earlier slot-trench structure was an early Iron Age sub-rectangular trough which had been impacted by a relatively modern drainage channel. A single posthole was identified in each of the three surviving corners of the trough suggesting that the trough originally had a timber lining.

A large spread of burnt mound material consisting of heat shattered stones and blackened soil sealed the possible sweathouse, well, and the later trough as well as a number of other irregular shaped pits of unknown date and function. It is likely that this large deposit of burnt mound material related to a number of different phases of activity on the site. Further pits identified to the east of the main burnt mound spread were not sealed by the mound but contained burnt mound material in their fill suggesting they may have been pot-boilers or oven roasters rather than troughs, although they may just have been waste pits.

In the south-west corner of the site a bowl furnace with slag rich fills was recorded. This feature was undated but it could be contemporary with the Iron Age activity on

the site or with early medieval activity at Knockadrina 2 to the north and Tinvaun 3 to the south. Other pits scattered across the south of the site may have been related to this industrial type of activity as many had oxidised bases indicating that they had been subjected to *in situ* burning but no diagnostic material was found.

The excavation at Stonecarthy West 1 has identified a burnt mound complex dating from the early-middle Bronze Age to the early Iron Age as well as undated metallurgical activity and pits. The site is important locally as it represents the first record of prehistoric activity from the above periods in the immediate locality. It is however also of regional and national significance based on the nature of the burnt mound activity identified at the site. A number of potential sweathouses and bathing sites have been confirmed from recent excavations of burnt mounds across the country and the results of the Stonecarthy West 1 excavation will significantly add to the further study, analysis and understanding of the varied function and form of burnt mound sites. The morphology of the small slot-trench structure enclosing a shallow depression or possible trough is also an important addition to the study of houses and structures in the first half of the Bronze Age.

CONTENTS

List of Figures

List of Plates

1 INTRODUCTION

1.1 General

This report presents the results of the archaeological excavation of Stonecarthy West 1, AR067 (Figure 1), in the townland of Stonecarthy West undertaken by James Kyle of IAC, on behalf of Kilkenny County Council and the NRA, in accordance with the Code of Practice between the NRA and the Minister for Arts, Heritage, Gaeltacht and the Islands. It was carried out as part of the archaeological mitigation programme of the N9/N10 Kilcullen to Waterford Road Scheme, Phase 4, which extends between Knocktopher in Co. Kilkenny to Powerstown in Co. Carlow. The excavation was undertaken to offset the adverse impact of road construction on known and potential subsoil archaeological remains in order to preserve the site by record.

The site measured 8624m^2 and was first identified during testing carried out between 30 January and 31 March 2006 by Bernice Molloy (E2811) for Margaret Gowen & Co. Ltd. on behalf of the National Roads Authority. Stonecarthy West 1 was excavated between 26 July and 16 August 2007 with a team of one director, one supervisor and 20 assistant archaeologists.

1.2 The Development

For the purposes of construction, the N9/N10 Kilcullen to Waterford Road Scheme has been divided into separate sections, known as Phases 1–4. Phase 2 of the scheme extends from the tie-in to the Waterford City Bypass at Dunkitt, to Knocktopher in Co. Kilkenny (Ch. 2+000–Ch. 25+400). Phase 4 continues from Knocktopher to Powerstown in Co. Carlow (Ch. 25+400–Ch. 76+000) and includes the Kilkenny Link Road.

The roadway of the entire scheme includes approximately 64km of mainline high quality dual carriageway and 6.2km of the Kilkenny Link Road, which will connect the road development to the Kilkenny Ring Road Extension. The road development requires the realignment and modification of existing national, regional and local roads where the mainline intersects them. It requires the acquisition of 305 hectares of land for its construction. A further link road will connect the scheme to Paulstown in County Kilkenny, while six new grade separated junctions and three roundabouts are part of the road development.

1.3 Archaeological Requirements

The archaeological requirements for the N9/N10 Kilcullen to Waterford Road Scheme, Phase 4: Knocktopher to Powerstown, are outlined in the Archaeological Directions issued to Kilkenny County Council by the Minister for Environment, Heritage and Local Government under Section 14A (2) of the National Monuments Acts 1930–2004 and in the terms of the contract between Kilkenny County Council and Irish Archaeological Consultancy Ltd. These instructions form the basis of all archaeological works undertaken for this development. The archaeological excavation works under this contract are located between the townlands of Knocktopher, Co. Kilkenny, and Powerstown, Co. Carlow.

The proposed N9/N10 was subjected to an Environmental Impact Assessment, the archaeology and cultural history section of which was carried out by Valerie J. Keeley Ltd and published in February 2005. The Record of Monuments and Places, the Site Monument Record, Topographical files, aerial photography, the Kilkenny and Carlow County Archaeological Urban Survey, and literary sources were all consulted. Two phases of geophysical survey were also conducted by Target (post-EIS geophysics carried out by ArchaeoPhysica) and an aerial survey was carried out by Margaret Gowen & Co. Ltd. As a result of the paper survey, field inspections and geophysical

survey, 35 sites were recorded in proximity to this section of the overall route alignment.

A previous archaeological assessment of Phase 2 of the scheme (test trenching conducted by Margaret Gowen & Co. Ltd. in 2006) extended into the lands acquired for Phase 4 to a point at Ch. 37+100 in the townland of Rathclogh, Co. Kilkenny. Thirty-four archaeological sites were identified within this area between Knocktopher and Rathclogh and subsequently excavated by Irish Archaeological Consultancy Ltd. as part of this archaeological contract.

Advance archaeological testing of the area between Rathclogh (Ch. 37+100) and Powerstown (Ch. 76+000) was completed by IAC during March–May 2007 and excavation of the sites identified during this process was also conducted by IAC between August 2007 and April 2008.

1.4 Methodology

The methodology adopted was in accordance with the approved Method Statement. The topsoil was removed to the interface between natural and topsoil using a 20 tonne mechanical excavator equipped with a flat toothless bucket under strict archaeological supervision. The remaining topsoil was removed by the archaeological team with the use of shovels, hoes and trowels in order to expose and identify the archaeological remains. A site grid was set up at 10m intervals and was subsequently calibrated to the national grid using GPS survey equipment.

All archaeological features were fully excavated by hand and recorded on *pro forma* record sheets using a single context recording system best suited to rural environment, with multi context plans and sections being recorded at a scale of 1:50, 1:20 or 1:10 as appropriate.

A complete photographic record was maintained throughout the excavation. Digital photographs were taken of all features and of work in progress. These photographs were supplemented by specialist aerial photography.

An environmental strategy was devised at the beginning of the excavation based on IAC in-house post-excavation and site methodologies and guidelines. Features exhibiting large amounts of carbonised material were the primary targets. Features containing metallurgical waste were fully sampled for analysis.

All artefacts uncovered on site were dealt with in accordance with the guidelines as issued by the NMI and where warranted in consultation with the relevant specialists. All archive is currently stored in IAC's facility in Lismore, Co Waterford and will ultimately be deposited with the National Museum of Ireland.

All dating of samples from the site was carried out by means of AMS (Accelerator Mass Spectrometry) Radiocarbon Dating of identified and recommended wood charcoal samples. All calibrated radiocarbon dates in this report are quoted to two Sigma.

All excavation and post excavation works were carried out in accordance with the relevant approvals and in consultation and agreement with the National Roads Authority (NRA) Project Archaeologist, the National Monuments Section of the DoEHLG and the National Museum of Ireland. Where necessary licences to alter and export archaeological objects were sought from the National Museum of Ireland.

References to other sites excavated as part of the N9/N10 Phase 4: Knocktopher to Powerstown are referenced throughout this report only by their site name e.g. Paulstown 1. A list of these sites and details including director's name and National Monuments Excavation Reference Number can be referenced in Appendix 4.

Final Report Date Ranges

The following date ranges for Irish prehistory and medieval periods are used for all final reports for the N9/N10 Phase 4: Knocktopher to Powerstown excavations.

Mesolithic: 7000–4000BC
Neolithic: 4000–2500BC
Early Bronze Age: 2500–1700BC
Middle Bronze Age: 1700–1200BC
Late Bronze Age: 1200–800BC
Iron Age: 800BC–AD500
Early medieval period: AD500–1100
Medieval period: AD1100–1600
Post-medieval: AD1600–1800

Source:
Carlin, N., Clarke, L. & Walsh, F. 2008 *The M4 Kinnegad-Enfield-Kilcock Motorway: The Archaeology of Life and Death on the Boyne Floodplain*. NRA Monograph Series No. 2, Wordwell, Bray.

2 EXCAVATION RESULTS

The site was located in a field under pasture on a slight westerly slope at the base of Knockadrina Hill. At the southern limit of the site the land slopes southward towards Tinvaun 4 (which is not visible). To the north the terrain rises slightly, however it continues to slope generally westwards. Hills are visible in the distance on the south-western horizon. Hills are also visible on the southern horizon. Tinvaun 4 is located *c.* 50m to the SSW and Knockadrina 2 is located *c.* 200m to the NNE. The site of a hermits cave (KK027-051) is located *c.* 500m to the south-west and there is a round tower and church site (KK027-044) located *c.* 1.5km to the west.

2.1 PHASE 1 Natural Drift Geology

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C2	N/A	N/A	N/A	N/A	Yellowish brown sandy clay	Natural geology

The natural geology on this site consisted of mid yellowish brown sandy clay, largely stone free and homogenous across the site, and cut or sealed by all subsequent archaeological activity.

2.2 PHASE 2 Early-Middle Bronze Age Activity

2.2.1 Slot Trench C65 and Trough C75

Slot Trench C65

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C65	N/A	6	0.23	0.36	Horseshoe shaped	Slot-trench
C66	C65	6	0.23	0.22	Dark grey silty sand	Upper fill of slot-trench
C67	C65	2.82	0.14	0.14	Light grey silty sand	Basal fill of slot-trench
C68	C65	2.82	0.2	0.36	Stone packing	Stone packing of slot
C69	C65	4	0.13	0.17	Mid grey silty sand	Basal fill of slot-trench
C81	C65	0.3	2.82	0.06	Light orange grey silty sand	Mid fill of slot-trench
C82	N/A	0.47	0.34	0.18	Oval	Pit
C87	C82	0.47	0.34	0.18	Dark blackish grey clayey silt	Primary fill of pit

Trough C75

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C75	N/A	2.4	1.5	0.28	Oval	Trough
C77	C75	2.4	1.5	0.28	Dark grey clayey silt	Fill of trough
C124	N/A	0.1	0.1	-	Soft, dark grey clayey silt with occ. charcoal.	Stakehole cut and fill
C125	N/A	0.12	0.12	-	Soft, dark grey clayey silt with occ. charcoal.	Stakehole cut and fill
C126	N/A	0.18	0.17	-	Soft, dark grey clayey silt with occ. charcoal.	Stakehole cut and fill
C127	N/A	0.15	0.14	-	Soft, dark grey clayey silt with occ. charcoal.	Stakehole cut and fill

Finds: None

Trough C75 and Slot trench C65 were directly related and consisted of two elements of a structure that may have functioned as a small dwelling, or given the nature of the surrounding burnt mound activity it may have been a sweathouse associated with a burnt mound (Figures 4–6, Plates 2-3). The excavated slot trench was horseshoe shaped, although it is probable that it was originally oval but had been truncated on its east side by a later drain. A small pit, C82, to the east of the drain may represent part of the east end of the slot trench. Two possible terminals were identified on the north side effectively creating an entrance 0.60m wide, roughly centrally on the north wall. The enclosed area was approximately 3.00m east–west by 2.00m north–south. The slot-trench had no postholes at its base but had narrow and tall stone packing

(C68) in its fill which suggests it could have supported narrow vertical planks (Plate 8). The depth of the slot trench and the relatively small size of the enclosed area would have probably enabled the structure to support a light roof, possibly of wattle covered with leaf-litter or skins. Where the slot trench was truncated by a later trough C93 no visible remains of the packing stones was evident.

A possible oval trough, C75, was enclosed by the slot trench (Plates 2-3). Four stakeholes were located at the west end of the trough but it is not clear if these had a structural or other function. Other stakeholes may have existed at the east end of the structure but this area had been substantially disturbed by a later drain. It is felt that this trough could have been filled with water which could have then been heated creating a sweathouse within the confines of the slot-trench wall. If the slot-trench structure was unrelated to burnt mound activity the C75 "trough" area may represent a slightly sunken internal floor space.

The primary fill of the slot-trench consisted of a silty sand with occasional charcoal but no other noticeable inclusions and has provided a secure date for the structure in the early-middle Bronze Age (see below). Upper fills of the slot trench and the trough consisted of blackened soil with heat-shattered stone inclusions. While these were clearly deposited post-abandonment of the structure, it is possible that they represent adjacent and contemporary burnt-mound material that sealed the structure when it went out of use. It is impossible however to conclusively associate the possible structure with burnt mound activity.

Charcoal was retrieved from slot-trench fill C69 during post-excavation flotation. A sample of this charcoal was subsequently identified to species by Ellen O'Carroll for the purposes of radiocarbon dating. A sub-sample of hazel (*Corylus avellana*) was identified. This sample was not included in original detailed charcoal analysis by Lyons (Appendix 2.4).

Stones retrieved from C69, fill of C65, were analysed and found to be very course grained, quartz rich, red sandstone. Course grained sandstone is typical of *fulacht fiadh* material. The sample is clearly a shattered cobble, indicating a secondary source, such as in the glacial tills / river cobbles. It is therefore possible that these rocks were sourced locally. It is significant that sandstone is the predominant rock type given that, due to the differing underlying bedrock, it would not be the most abundant rock type available, either in outcrop or in the overlying tills. This indicates that sandstones were deliberately being selected for use in preference to the more abundant finer grained rock types in the area (Mandal, Appendix 2.7).

A small fragment (0.43g) of hazel charcoal from a sample of fill C69 was chosen for AMS dating and returned a result of 3395±30 (SUERC 40336). The 2 Sigma calibrated result for this was 1757–1616BC (SUERC, Appendix 2.9) dating this feature to the early-middle Iron Age.

2.3.3 Pit C59

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C59	N/A	0.62	0.54	0.09	Oval	Pit
C60	C59	0.62	0.54	0.9	Dark grey silty sand	Primary fill of pit

Finds: None

A small pit C59 was located immediately to the south of the C65 slot trench/C82 pit and may have been related. It contained nothing diagnostic to suggest a date or function.

2.3 PHASE 3 Middle Bronze Age Burnt Mound Activity

2.3.1 Well C58

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C58	N/A	7	4.6	3	Sub-circular large deep cut	Well
C94	C58	3.18	0.6	1.6	Grey sandy silt	Fill of well
C95	C123	2	1.3	0.44	Greyish brown silty clay	Fill of well re-cut
C96	C123	3.18	2.9	0.8	Yellowish grey clayey silt	Fill of well re-cut
C97	C123	3	2.6	0.75	Yellowish brown silty clay	Fill of well re-cut
C98	C58	3.18	1.5	3.05	Black stony silt	Fill of well
C99	C123	3	2.4	0.64	Yellowish brown silty clay	Fill of well re-cut
C100	C123	3	2.6	0.92	Brownish yellow silty clay	Fill of well re-cut
C101	C123	3	1.45	0.26	Dark brown silty clay	Fill of well re-cut
C102	C123	3	2.05	0.75	Mid brown silty clay	Fill of well re-cut
C103	C123	0.6	0.6	0.31	Mid to dark brown silty clay	Fill of well re-cut
C110	C58	2	1.3	0.25	Light yellow grey silty clay	Fill of well
C111	C58	–	0.9	2.1	Mid to light grey silty clay	Fill of well
C112	C58	–	1.41	0.3	Mid grey silt	Fill of well
C113	C58	–	0.4	0.25	Mottled grey silt	Fill of well
C114	C58	1.2	0.43	0.08	Dark brownish grey silt	Fill of well
C115	C123	2	0.9	0.35	Mid to dark grey silty clay	Fill of well re-cut
C116	C123	2.3	1.05	0.7	Light to mid greyish brown silty clay	Fill of well re-cut
C117	C123	0.4	0.3	0.08	Mottled light to mid grey silty clay	Fill of well re-cut
C118	C123	-	0.95	0.5	Dark grey/black silt clay, frequent charcoal, occasional burnt stones	Fill of well re-cut
C119	C123	-	1.4	0.5	Dark grey/black silt clay, frequent charcoal	Fill of well re-cut
C120	C123	-	1.55	0.4	Dark grey/black silt clay, frequent charcoal, occasional burnt stones	Fill of well re-cut
C121	C123	-	1.5	0.25	Dark grey/black silt clay, frequent charcoal	Fill of well re-cut
C122	C123	-	1.2	0.75	Dark grey/black silt clay, frequent charcoal	Fill of well re-cut
C123	N/A	3	2.8	2.4	Circular, steep sides, rounded base	Re-cut of Well C58

Finds: None

C58 was a large conical pit, 3m deep, that has been interpreted as a well or reservoir (Plates 1 and 4–7, Figures 4–5 and 7). This pit was recut. The fills of the original well were greyish silts or silt clays while the recut of the well, C123, was filled with predominantly brown and dark grey/black silt clays, some of which contained charcoal and burnt stones. These burnt mound materials deposited/slumped into the pit suggest that it was a possible source of water for the burnt mound activity in the area, with the overall funnel or cone shape making this feature well suited for water collection. No relationship was recorded between this feature and pit C70. The primary fill of the pit/well, C114, has been dated to the middle Bronze Age (see below). This can not be taken as a definitive date for the construction of the pit as there may have been re-cuts or the pit may have been cleaned out at intervals, but it provides a *terminus ante quem* date, indicating that the pit was not dug after the middle Bronze Age date produced from the radiocarbon process.

Charcoal was retrieved from well fill C114 during post-excavation flotation. This was subsequently identified to species. The majority of the fragments were identified as alder (*Alnus glutinous*) charcoal with smaller amounts of pomaceous woods (*Pomoideae*) charcoal, willow (*Salix* sp.) charcoal and oak (*Quercus* sp.) charcoal identified. A mixed wood assemblage such as this from features containing burnt mound material is not unusual on these site types as the material would have

become re-deposited across the site entering and mixing with other deposits and fills (Lyons, Appendix 2.4).

Stone retrieved from C114 (fill of well C58) was analysed and found to be very course grained, quartz rich, red sandstone. Course grained sandstone is typical of *fulacht fiadh* material. The sample is clearly a shattered cobble, indicating a secondary source, such as in the glacial tills / river cobbles. It is therefore possible that these rocks were sourced locally. It is significant that sandstone is the predominant rock type given that, due to the differing underlying bedrock, it would not be the most abundant rock type available, either in outcrop or in the overlying tills. This indicates that sandstones were deliberately being selected for use in preference to the more abundant finer grained rock types in the area (Mandal, Appendix 2.7).

A small fragment (0.47g) of pomaceous fruitwood from C114 was chosen for AMS dating and returned a result of 3116±24 (UBA 12175). The 2 Sigma calibrated result for this was 1440–1315BC (QUB, Appendix 2.9) dating well C58 to the middle Bronze Age.

2.3.2 Pits Adjacent to the Well

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C70	N/A	3.1	1.72	0.37	Sub-oval	Pit
C78	C70	1.15	1.36	0.42	Friable, dark black silty sand with stones	Basal fill of pit
C79	C70	2.05	1.5	0.42	Friable, mid to dark orange brown sandy silt	Upper fill of pit
C80	C70	0.41	0.6	0.16	Friable, dark grey sandy silt with stones	Basal fill of pit
C88	N/A	0.65	0.82	0.21	Oval.	Pit
C89	C88	0.41	0.82	0.13	Dark grey silty sand	Upper fill of pit
C90	C88	0.57	0.82	0.06	Light grey silty sand	Basal fill of pit

Finds: None

These two pits were located adjacent to the Well C58 and are possibly associated with it. C70 was an irregular oblong pit which possibly drained into the west side of Well C58. No stratigraphic relationship was established between these features. Pit C88 was a small oval pit located to the south of the Well. The precise function or date of both features is not known.

2.4 PHASE 4 Iron Age Activity

2.4.1 Trough C93

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C76	C93	3.45	0.46	0.2	Dark blackish grey silty clay	Fill of trough
C93	N/A	2.45	1.44	0.2	Sub rectangular cut	Trough
C128	N/A	0.22	0.1	0.2	Sub oval, sharp sides, rounded base	Cut of posthole
C129	N/A	0.22	0.15	0.15	Sub oval, sharp sides, rounded base	Cut of posthole
C130	N/A	0.15	0.14	0.15	Sub circular, sharp sides, flat base	Cut of posthole
C131	C128	0.22	0.1	0.2	Dark grey charcoal rich silt	Fill of posthole
C132	C129	0.22	0.15	0.15	Dark grey charcoal rich silt	Fill of posthole
C133	C130	0.15	0.14	0.15	Dark grey charcoal rich silt	Fill of posthole

Finds: None

Pit C93 (Figures 4–6, Plates 2 & 3) was interpreted as a trough that would have been used to heat water because of its shape, size and burnt mound fill. It would originally have been sub-rectangular in plan but as the trough cut through the earlier, backfilled trough, C75, the southern and eastern sides of C93 were difficult to discern during the

excavation. Three postholes had been cut into the base of trough C93. Posthole C128 was towards the north-west corner of the trough, posthole C129 was towards the north-east corner and posthole C130 was towards the south-west corner. All three postholes were filled by dark grey charcoal rich silts. The posts they held are believed to have supported a wooden trough lining. A further posthole in the south-east of the trough may have been destroyed by modern field drain C49, or did not survive in the archaeological record due to the nature of the underlying fill material associated with the earlier C75 trough.

Charcoal was retrieved from trough fill C76 during post-excavation flotation. This was subsequently identified to species. Fragments of alder (*Alnus glutinous*) charcoal, ash (*Fraxinus excelsior*) charcoal and pomaceous woods (*Pomoideae spp.*) charcoal were identified. A mixed wood assemblage such as this from features containing burnt mound material is not an unusual occurrence on these site types and would have become re-deposited across the site entering and mixing with other deposits and fills (Lyons, Appendix 2.4).

Six fragments of burnt animal bone were retrieved from the trough fill C76, they were too small and fragmentary to identify to species (McCarthy Appendix 2.6).

Stones retrieved from C76 were analysed and found to be very course grained, quartz rich, red sandstone. Course grained sandstone is typical of *fulacht fiadh* material. The sample is clearly a shattered cobble, indicating a secondary source, such as in the glacial tills / river cobbles. It is therefore possible that these rocks were sourced locally. It is significant that sandstone is the predominant rock type given that, due to the differing underlying bedrock, it would not be the most abundant rock type available, either in outcrop or in the overlying tills. This indicates that sandstones were deliberately being selected for use in preference to the more abundant finer grained rock types in the area (Mandal, Appendix 2.7).

A small fragment (0.43g) of ash from a sample of fill C76 was chosen for AMS dating and returned a result of 2498±22 (UBA 12174). The 2 Sigma calibrated result for this was 771–539BC (QUB, Appendix 2.9) dating this feature to the early Iron Age.

2.5 PHASE 5 Undated Activity Associated with the Burnt Mound

2.5.1 Pits beneath the Burnt Mound

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C61	N/A	1.5	0.93	0.38	Oval	Pit
C62	N/A	2.25	0.9	0.28	Oval	Pit
C63	C62	0.9	0.64	0.25	Mid brown silty clay	Basal fill of pit
C64	C62	1.4	0.9	0.28	Black silty clay	Upper fill of pit
C72	N/A	1.12	0.85	0.25	Sub-oval	Pit
C73	C72	1.12	0.85	0.13	Black silty clay	Upper fill of pit
C74	C72	1.12	0.85	0.13	Greyish brown silty sand	Basal fill of pit
C83	N/A	5.3	2.8	0.68	Irregular in plan	Pit
C84	C83	1.36	1.7	0.46	Black silty clay	Primary fill of pit
C85	C83	1.76	2.25	0.68	Black mottled yellow brown silty sand	Fill of pit
C86	C83	2.79	2.6	0.26	Black grey silty sand	Upper fill of pit
C91	C61	1.5	0.93	0.2	Mid to dark brownish grey sandy clay	Upper fill of pit
C92	C61	0.9	0.93	0.15	Yellowish brown gravelly sandy silt	Basal fill of pit
C104	N/A	2	1.3	0.6	Oval	Pit
C105	C104	2	1.3	0.18	Black silt with charcoal	Basal fill of pit
C106	C104	2	1.3	0.3	Mid grey clayey silt	Mid fill of pit
C107	C104	–	0.77	0.17	Light brownish grey clayey silt	Mid fill of pit

Finds: None

Five pits, C61, C62, C72, C83, C104, were scattered over a 15m x 13m area. They were generally irregular in shape and were filled with burnt mound material (Figures 4–6). They may have been waste pits associated with the burnt mound activity on the site.

Pit C104 was the most northerly of these features. It was oval in plan with steep sides and a flat base. The most westerly of the group, C61 was also oval in plan with gradual sides and a flat base. Pit C72 to the east of this was sub oval in plan with steep sides and an irregular base. Pit C62, the most southern of this group of features was oval in plan with gradual sides and a flat irregular base. Pit C83, at the centre of the group, was irregular in plan with steep sides and a rounded base. Pit C83 contained three fills, the primary fill, black silt clay C84, was covered by black mottled yellow brown silt sand C85 which was in turn under C86, a black grey silt sand which filled the southern end of the feature.

Stones retrieved from C84 and C105 were analysed and found to be very course grained, quartz rich, red sandstone. Course grained sandstone is typical of *fulacht fiadh* material. The sample is clearly a shattered cobble, indicating a secondary source, such as in the glacial tills / river cobbles. It is therefore possible that these rocks were sourced locally. It is significant that sandstone is the predominant rock type given that, due to the differing underlying bedrock, it would not be the most abundant rock type available, either in outcrop or in the overlying tills. This indicates that sandstones were deliberately being selected for use in preference to the more abundant finer grained rock types in the area (Mandal, Appendix 2.7).

2.5.2 Pits East of the Burnt Mound

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C5	N/A	1.54	1.17	0.25	Oval	Pit
C8	N/A	2.03	1.4	0.55	Oval	Pit
C9	N/A	2	1.24	0.6	Oval	Pit
C15	N/A	1.76	1.74	0.21	Circular	Pit
C18	N/A	1.1	1.05	0.2	Circular	Pit
C22	C18	1.1	1.05	0.2	Dark brown silty sand	Fill of pit
C26	C15	1.74	1.61	0.17	Dark grey silty sand	Basal fill of pit
C27	C15	1.74	0.82	0.09	Mid brown silty sand	Upper fill of pit
C28	C5	1.54	1.17	0.25	Dark brown black silty sand	Primary fill of pit
C37	C8	2.03	1.4	0.28	Dark greyish black clayey silt	Upper fill of pit
C38	C8	1.56	0.9	0.22	Mid grey sandy clay	Mid fill of pit
C39	C8	1.48	0.9	0.18	Dark greyish black clayey silt	Basal fill of pit
C43	C9	1.2	0.93	0.28	Dark brown sandy silt	Upper fill of pit
C44	C9	1.6	1.14	0.38	Dark grey sandy silt	Mid fill of pit
C45	C9	1.98	0.7	0.4	Dark black sandy silt	Mid fill of pit

Finds: None

Five medium sized pits were located 40m upslope to the east of the burnt spread. They were filled with burnt mound material and were therefore probably related to the main focus of the site despite the distance. These pits appeared to be related to the burnt mound activity to their north-west and may have served as small troughs, as pot-boilers or oven roasters of some description (Figures 4 and 6).

Stones retrieved from pit C5, from C26 (fill of C15) and from C45 (fill of C9) were analysed and found to be very course grained, quartz-rich, red sandstone. Course grained sandstone is typical of *fulacht fiadh* material. The sample is clearly a shattered cobble, indicating a secondary source, such as in the glacial tills / river cobbles. It is therefore possible that these rocks were sourced locally. It is significant that sandstone is the predominant rock type given that, due to the differing underlying bedrock, it would not be the most abundant rock type available, either in outcrop or in the overlying tills. This indicates that sandstones were deliberately being selected for use in preference to the more abundant finer grained rock types in the area (Mandal, Appendix 2.7).

2.5.3 Burnt Mound Material

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C51	N/A	40	25	0.18	Dark brownish black sandy silt	Mound material
C52	N/A	12	5	0.16	Black sandy silt	Mound material
C53	N/A	40	2	0.22	Mid brown sandy clay	Mound material

Finds

Context	Find number	Material	Period	Description
C51	E3610:051:1	Metal	Post-medieval	Piece of knife blade
C52	E3610:052:1	Ceramic	Post-medieval	Rim sherd
C53	E3610:053:1	Glass	Post-medieval	Piece of glass
C53	E3610:053:2	Stone	Late Neolithic/BA	Sandstone rubbing stone
C53	E3610:053:3	Metal	Post-medieval	Nail
C53	E3610:053:4	Ceramic	Post-medieval	Body sherd
C53	E3610:053:5	Ceramic	Post-medieval	Body sherd
C53	E3610:053:6	Ceramic	Post-medieval	Body sherd
C53	E3610:053:7	Ceramic	Post-medieval	Body sherd

The burnt spread was a very mixed mid to dark-brownish-black sandy silt with copious amounts of small burnt, heat-shattered stones and charcoal. More concentrated pockets of the burnt material present throughout the spread possibly suggested that this had once been a mound or deeper spread which had been spread by human action, fluvial action, or both. It was undated and given the potential for early-middle Bronze Age, middle Bronze Age, and early Iron Age activity on the site it is interpreted that the mound material was probably generated by activity associated with numerous phases. The post-medieval pottery and glass is evidence of the later disturbance and levelling of the burnt mound deposit.

One lithic was retrieved from C53. The lithic has been identified as a possible sandstone rubbing stone which most likely dates to the late Neolithic period or Bronze Age (Sternke, Appendix 2.2). No Neolithic activity was identified on the site, although Neolithic activity was recorded on the nearby site of Knockadrina 2 and perhaps this find represents a stray find associated with this site.

One pottery sherd was recovered from C52 during excavation. It has been identified as a rim sherd of Porcelain and dates to the 18th century. Four body sherds of pottery were recovered from C53 and three have been identified as glazed red earthenware. The remaining sherd is Pearlware. Glazed red earthenware and Pearlware both date to the 18/19th centuries (McCutcheon, Appendix 2.1).

One piece of glass was recovered from C53, a body sherd from a free-blown wine bottle. It is now covered in a patina and the surface of the glass has crizzled leading to a network of fine lines over the face of the glass. This sherd probably dates from the eighteenth or nineteenth century (Scully, Appendix 2.3).

Metallurgical waste was retrieved from mound material C53. An isolated piece of drippy type slag (14.5g) is not dated but is associated with modern glass and pottery, a nail and possible medieval knife blade. It is likely that this slag is disturbed material originally from a bowl furnace, C29 (Wallace, Appendix 2.8).

2.6 PHASE 6 Undated Metallurgical Activity

2.6.1 Bowl furnace C29

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C29	N/A	0.54	0.46	0.13	Circular	Bowl Furnace
C40	C29	0.38	0.32	0.1	Brownish grey sand	Fill of bowl furnace
C41	C29	0.52	0.42	0.1	Brownish black silty clay	Fill of bowl furnace

Finds: None

Pit C29 was interpreted as a bowl furnace due to its shape and slag-rich fills (Figure 4, Plate 9). It was located at the south-west of the site and was the only feature of its type. It contained frequent amounts of ferrous slag and charcoal in its fills.

Charcoal was retrieved from bowl furnace fill C41 during post-excavation flotation. This was subsequently identified to species. The majority of the fragments were identified as oak (*Quercus* sp.) charcoal with smaller amounts of alder (*Alnus glutinous*) charcoal identified. The higher occurrence of oak from this context may be associated with specialized activities, like metalworking (Lyons, Appendix 2.4).

Eight kilogrammes of metallurgical waste came from C40, the upper fill of C29, and 176.6g came from C41 the basal fill of C29; many of the slags from possible smelting pit C29 have the characteristic appearance of iron smelting slags with a drippy type morphology and a smooth surface. A large proportion of the slags do not have this morphology and appear to be conglomerates of several different types of material, some have baked clay and small iron fragments combined with slag; this type of morphology may be indicative of a poor smelting process being carried out and may suggest the furnace is quite early (Wallace, Appendix 2.8). Stonecarthy West 1 is geographically very close to Tinvaun 2 (AR064) located to the south, which had a smelting and possible ore roasting pit, smelting pit was dated to 39BC–AD64 (2 sigma). It is also quite close to Knockadrina 2 (AR068) where a pit associated with some slag was dated to Cal AD650–766 (2 sigma).

2.6.2 Pits and Hearths

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C6	N/A	0.6	0.3	0.04	Oval	Possible fire pit
C7	N/A	1.2	0.9	0.07	Oval	Pit
C10	N/A	0.3	0.28	0.15	Circular	Pit
C11	C10	0.3	0.28	0.25	Mid greyish brown silty clay	Primary fill of pit
C12	N/A	0.28	0.28	0.14	Circular	Pit
C13	C12	0.28	0.28	0.04	Dark brown silty clay	Upper fill of pit
C14	C12	0.28	0.28	0.10	Mid greyish brown silty clay	Basal fill of pit
C16	C7	1.1	0.57	0.07	Dark grey silty clay	Primary fill of pit
C19	C6	0.6	0.3	0.04	Reddish brown silty clay	Oxidized base fire pit
C20	N/A	0.27	0.15	0.11	Orange red sandy clay	Oxidized natural / pit
C21	C7	1.2	0.9	0.05	Orange red sandy clay	Oxidised base of pit
C23	N/A	2.1	1.65	0.1	Oval	Possible fire pit
C24	C23	2.1	1.65	0.1	Dark brown silty clay	Primary fill of fire pit
C25	C23	2.1	1.65	0.02	Reddish brown silty clay	Oxidized base fire pit

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C30	N/A	2.4	1.26	0.27	Sub-oval	Possible fire pit
C31	N/A	0.74	0.66	0.35	Circular	Pit
C32	C30	2.4	1.26	0.3	Light brown silty sand	Primary fill of pit
C33	N/A	0.57	0.57	0.12	Circular	Pit
C34	C31	0.3	0.3	0.07	Dark brown clayey sand	Lens fill of pit
C35	C31	0.74	0.66	0.3	Mid brown silty sand	Primary fill of pit
C36	C33	0.57	0.57	0.12	Yellowish brown silty sand	Primary fill of pit
C42	N/A	1.42	0.87	0.12	Oval	Possible fire pit
C47	C42	1.07	0.87	0.11	Dark grey silty sand	Basal fill of hearth
C48	C42	0.44	0.33	0.12	Mid brown silty sand	Upper fill of hearth

Finds: None

A series of 10 pits were excavated across the southern extent of the site. These varied considerably in shape and size (Figure 4). The majority had some form of oxidization at the base. These pits were dispersed, and apart from speculating that they may have functioned as fire pits or hearths, little can be added to the interpretation of their function. Given the scorched nature of the base of many of the features, they may have been related in some way to the bowl furnace C29 although no further metallurgical waste was identified. Cereal grains in Pit C23 may indicate that it was used as a cereal drying kiln, although substantially more grains would normally be identified from these kilns, and, as is outlined below by Johnston, it is difficult to discuss the relevant importance of such a small assemblage.

A sample taken from the fill of possible fire pit C23, C25 produced evidence for plant remains. The sample contained small amounts of hazelnut shell fragments (*Corylus avellana* L.), some barley grains (*Hordeum vulgare* L.) and some wheat grains (*Triticum* L. species). The plant remains assemblage from the site is so small it is not possible to use this material to discuss relative importance of cereal types and other plant food items from the site (Johnston, Appendix 2.5).

2.7 PHASE 7 Post-medieval Activity

2.7.1 Drain C49 and Furrow C108

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C49	N/A	-	1.2	0.35	Linear	Modern field drain
C50	C49	-	0.5	0.35	Mid greyish brown sandy silt with stones	Basal fill of field drain
C71	C49	-	0.7	0.45	Mid orangey brown sandy silt	Upper fill of field drain
C108	N/A	2	0.4	0.1	Linear, E-W orientated	Cut of Furrow
C109	C108	2	0.4	0.1	Mid brown sandy silt	Fill of Furrow

Finds: None

A field drain C49 ran north-south through the site and truncated the burnt spread and the slot-trench (Figure 5). Its cut and straight form, combined with its fill of well-sorted loosely compacted stones, suggest that it was post-medieval in date. A linear furrow ran east–west through the site and truncated pit C104. Both features represented post-medieval agricultural activity in the area.

2.8 PHASE 8 Topsoil

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C1	N/A	N/A	N/A	0.5	Mid brown sandy silt	Topsoil

Finds

Context	Find number	Material	Period	Description
C1	E3610:001:1	Ceramic	Post-medieval	Pottery sherd

The topsoil covering the site consisted of mid brown sandy silt with occasional roots and pebbles.

One sherd of pottery was recovered from topsoil during excavation and has been identified as a body sherd of Spongeware that dates to the 18/19th centuries (McCutcheon, Appendix 2.1).

3 SYNTHESIS

The synthesis presents the combined results of all of the archaeological analysis carried out at Stonecarthy West 1. This includes the analysis of the physical and archaeological landscape, the compilation of information gathered during research into the site type, date, and function, and the results of the excavation and specialist analysis of samples taken during the course of on-site works.

At Stonecarthy West 1 an area of *c.* 98m x 88m (Plate 1, Figure 2) was investigated to reveal archaeological features interpreted as prehistoric activity in the form of a shallow burnt mound/spread, a large possible well, associated troughs, a curvilinear slot-trench, and several possible waste pits of varying size. A series of undated hearths and one bowl furnace were also uncovered.

3.1 Landscape Setting

3.1.1 The General Landscape – compiled by Michelle Brick

The topography of the region through which the route passes is generally flat with an average height of 70m O.D. The southern periphery of the route is bordered by Kilmacoliver (261m) and Carricktriss Gorse (314m), with Slievenamon (721m) further west. The Slieveardagh hills (340m) are visible on the western horizon in the south of the route and with the exception of Knockadrina Hill (140m), the enclosed landscape is made up of minor undulations. In the centre of the route Freestone Hill (130m) and Knocknagappoge (334m) further north are the significant uplands. A number of hills and mountains are visible in the distance to the east and west of this area of the landscape but the topography remains generally flat. To the north the Castlecomer Plateau influences a rise in the overall topography of the region. This expanse of terrain stretches along the north-east margins of Kilkenny, crosses the county border into Carlow and stretches northwards into Laois. This plateau consists of a variety of hills and peaks including Mountnugent Upper (334m), Baunreagh (310m), Knockbaun (296m), Brennan's Hill (326m) and Fossy Mountain (330m). These hills contain seams of anthracite coal as a result of millions of years of compression, and consequently Shales and Sandstones were formed which are evident throughout the plateau. Mining in the region began in the 17th century, continued for over 300 years and it is for what Castlecomer is best known. According to the Environmental Protection Agency soil maps of Ireland, the underlying bedrock of the entire region primarily consists of Carboniferous Limestone. However there is also a small amount of surface bedrock, sands, gravels, shales and sandstone Tills present along the route. The soil cover of the region is primarily composed of Grey Brown Podzolics, Renzinas and Lithosols. Additional soil types also present along the route include Brown Earths, surface Water Gleys and Ground Water Gleys.

The prevailing water courses within the landscape of the N9/N10 Phase 4 are the Rivers Nore and Barrow. The River Nore rises on the east slopes of the Devil's Bit in Co. Tipperary and flows eastwards through Borris-in-Ossory and then south through Co. Kilkenny, passing through the towns of Durrow (Laois), Ballyragget, Kilkenny, Bennettsbridge and Thomastown to join the River Barrow upstream of New Ross, Co. Wexford. It is 140km long and drains a total catchment of 1572 square kilometres and runs through the central and southern sections of the route. In the south of the route three main tributaries of the River Nore are evident. The Kings River flows east through Callan and Kells. It is joined by the River Glory which meanders on a north-south axis towards the western margins of the route landscape and the Little Arrigle River flows along the southern fringes. These rivers are flanked by low-lying valleys that are characterised by wet, marshy land. The condition of the soil improves further north beyond the King's River where the influence of these waterways declines. In the

northern area of the route the River Dinin is a tributary of the River Nore flowing south-west from Brennan's Hill through the Castlecomer Plateau. The Plateau is the tableland that is the watershed between the Rivers Nore and Barrow (Lyng 1984). The River Barrow is the second longest river (193 kilometres) in Ireland after the River Shannon. It rises in the Slieve Bloom Mountains in Co Laois and flows east across bogs and lowlands and then turns south into the lowland immediately east of the Castlecomer Plateau. It passes through Portarlington, Athy, Carlow, and Graiguenamanagh and runs through the northern section of the route. It is joined by the River Nore at New Ross. The Maudlin River is the notable tributary of the River Barrow within the landscape of the route and flows east from Old Leighlin, with minor tributaries of it flowing through Bannagagole. There are also streams and minor watercourses present throughout the entire landscape and these waterways would have been a valuable resource to past communities and would also have had a major influence on settlement and the surrounding land use.

The physical landscape through which the N9/N10 Phase 4 passes can be divided into three principal areas defined by the main rivers and their catchments. The southern area is located in the undulating landscape on the western flanks of the Nore Valley. The central area is dominated by the fertile watershed between the Barrow and Nore systems in the hinterland of Kilkenny City. The northern area is located on the western flanks of the Barrow Valley overlooked by uplands to the north and west. Stonecarthy West 1 is located in the southern landscape area.

3.1.2 The Southern Landscape

This landscape stretches northwards along the valleys of the Little Arrigle and Nore rivers and encompasses the lower reaches of the King's River and the River Glory and principally lies between 60m and 80m OD. It includes 23 sites discovered during the Phase 4 excavations stretching from Baysrath 2 (Baysrath 1 was excavated under a separate archaeological contract) northwards to Ennisnag 2. The Slieveardagh hills (340m) are visible on the horizon along the north-west boundary and with the exception of Knockadrina hill (140m) which is positioned in the centre of the region, the enclosed topography is made up of minor undulations. According to the EPA soil maps of Ireland, the underlying bedrock of the region primarily consists of Carboniferous Limestone although there is some surface bedrock present in the Rathduff (Bayley) and Knockadrina townlands. The soil cover of the region is primarily composed of Grey Brown Podzolics, but in areas where surface bedrock is present the soil is also made up of Renzinas and Lithosols. Within the Nore catchment the terrain remains predominantly wet and soft and the sand and gravel deposits along the river are categorised as a major aquifer in the Kilkenny Groundwater Protection Scheme. Carboniferous limestones, most notably of the Ballysteen formation, dominate and have facilitated the development of the slightly rolling topography. The extensive dolomitisation of parts of the geological formations in this area of the N9/N10 has resulted in the increased permeability of local rocks. The water is discharged via a number of springs, which emerge close to the channels of the Nore and Kings Rivers.

Of note in the south of this landscape is the Danganbeg wetland which encompasses an area of *c.* 6.21km^2 and comprises a young wetland, fed by highly mineralised water through the groundwater and also through seepage springs which are concentrated along a contour range of 62–65m OD. Much of the Danganbeg wetland has been subject to drainage and this has significantly de-mineralised the western sections, where the wetland is flanked by the new N9/N10 road. An area of alkaline fen and swamp flora is present and the ground is soft. The terrain rises to Knockadrina Hill (140m) which is, and as it probably was in prehistory and during the medieval period, an important local reference point and scenic focus. Its vegetation

comprises broadleaf woodland including mature beech as well as ash, sycamore, hawthorn, and holly, and there is a pond at the base of the woodland, to the south along with a small spring. The adjacent townland of Stonecarthy consists predominantly of wet grassland, scattered pools, and scrub with areas of improved grassland. The land then slopes down through small copses of mature trees and broadleaf woodland before reaching the Kings River at 50m OD.. From the Kings River the topography varies little and does not rise above 80m again. The quality of the land is high in this area as the glacial characteristics are dominated by the Butlersgrove formation (a grey, well-bedded muddy limestone interbedded with calcareous shales) which also extends into the hinterland of Kilkenny City. In this area the glacial drift comprised sandy (60–80%) gravelly clays of low plasticity and a natural moisture content of 7–15%. The Ennisnag Stream Valley provides an extra water source while the townland of Croan, wherein a pond with silty substrates supports rushes and aquatic species, indicates the potentially wet nature of the area.

3.1.3 Site Specific Landscape

The site was located in a field under pasture on a slight westerly slope at the base of Knockadrina Hill. The site lies on a slope that rolls gently westward. At the southern limit of the site the land slopes southward towards Tinvaun 4 (which is not visible). To the north the terrain rises slightly, however it continues to slope generally westwards. Hills are visible in the distance on the south-western horizon. Hills are also visible on the southern horizon. Tinvaun 4 is located *c.* 50m to the SSW and Knockadrina 2 is located *c.* 200m to the NNE. Immediately to the NNE there is a possible feature uphill from the site. The site of a hermits cave (KK027-051) is located *c.* 500m to the south-west and there is a round tower and church site (KK027-044) located *c.* 1.5km to the west.

3.2 The Archaeological Landscape

As part of the general research relating to sites along the scheme and the specific research relating to Stonecarthy West 1, the known archaeology within the surrounding landscape was assessed in order to establish the level and type of activity in the surrounding area in the past. This included a review of information from the Record of Monuments and Places, previous excavations and other relevant documentary sources including mapping and other sites excavated as part of the N9/N10 Phase 4 scheme. The excavated archaeology at Stonecarthy West 1 has been identified as being Bronze Age and Iron Age in date.

3.2.1 The General Bronze Age Landscape of the Scheme – compiled by Michelle Brick

The archaeological record implies that the Irish Bronze Age (2500–800BC) population dramatically increased from that of the Neolithic and the evidence for permanent settlements with considerable longevity becomes much more substantial. In addition, a wide range of ritual and funerary activity associated with this settlement is apparent. The overall environmental record for Ireland suggests that there was a general climatic deterioration in the Bronze Age, bringing wetter, colder conditions; during this period there was also accelerated forest clearance with more intensive habitation in the drier lowlands. As a result of extensive development-led projects across the country, understanding of settlement and burial patterns from the early Bronze Age has greatly developed. The distribution of the prehistoric evidence shows that the Rivers Nore and Barrow provided a focus for settlement. In the central part of the current portion of the N9/N10 Phase 4, the fertile Kilkenny lowlands have produced some Bronze Age archaeology, particularly in Danesfort and Ennisnag townlands. In the northern part of the Phase 4 intense settlement is indicated by both burnt mounds and barrows existing on the uplands of the Castlecomer Plateau and the flanking valleys of the Nore and Suir. Hillforts appear to be positioned to overlook the

settlement activity, as well as the route of the Nore, the lower saddle to the north of the Slieveardagh Hills, and to the south of the spur surmounted by Clonmantagh. A considerable number of ringditches, cremation and inhumation burials (single and grouped), burnt mound sites, structures and domestic settlement evidence, have been recorded as part of the Bronze Age on of the N9/N10 Phase 4.

In the southern landscape the exposure of domestic Bronze Age settlement was less forthcoming than that of the northern landscape. There was little direct evidence for structures in the southern and central landscapes with the exception of a cluster of structures in the Danesfort area. Instead most of the settlement activity that fell within the roadtake was noted in the northern landscape, further to the north of Kilkenny and in Carlow. Ritual and burial is a dominant feature of the Bronze Age in Kilkenny and Carlow as indicated by the presence of flat cemeteries, burial cairns, ringditches, mounds, barrows and hillforts throughout these counties. Freestone Hill (KK020-018) situated in Coolgrange, Co. Kilkenny, in the centre of the present landscape is just one example of these sites. Along the lower part of the Nore Valley, and concentrated in the Foulksrath (KK010-055001–10) and Jenkinstown (KK014-005001–06 and KK014-006001–07) areas, the landscape is dominated by barrows (in this case more specifically ringditches). The contrasting locations of these site types most probably relate to differential landscape exploitation by the same communities with some activities, possibly associated with the seasonal use of upland pasture, confined to higher terrain and settlement and funerary activity taking place in the more sheltered lowlands.

The significant number of burnt mound sites discovered due to the N9/N10 excavations, combined with the previously known examples in the RMP reinforces the concept that Bronze Age activity in Kilkenny and Carlow was considerable. A total of 36 sites with evidence for burnt mound activity were uncovered during the N9/N10 excavations, with an additional example discovered, and preserved outside the roadtake. The burnt mounds are focussed in the upland areas, especially along the river and stream valleys, such as at Clashduff, Coan West and Muckalee on the Dinin and Douglas Rivers, and in the upland hinterland of Freestone Hill.

The Southern Landscape: Funerary and Ritual Activty

There was no evidence for formal Bronze Age funerary activity recorded as part of the N9/N10 excavations within the southern landscape; perhaps this was due to the rather wet and swampy topography which was more suitable for burnt mound activity than to the interment of the dead. The previously known RMP burial sites, especially those most likely dating to the earlier prehistoric periods, were situated on the higher ground, away from the roadtake. Additionally, there is a flat cemetery at Coolmore to the south of Knocktopher which comprised of four burial cairns that contained several cremations (KK031-041). Numerous cairn burials were also discovered in the Columbkille townland (KK028-086002, KK028-086006), located east of the present landscape close to Thomastown. There are also some recorded finds from the Danesfort area, in particular a lidded food vessel urn that was found in the 19th century (Graves 1860). Other Bronze Age activity in the region is indicated by barrows at Kilbine (KK024-061), Woolengrange (KK24-078), Cotterellsbooley (KK027-036), Ballycoam (KK027-035) and Mallardstown (KK026-015), and a ringditch at Jerpoint West (KK028-03702). Collectively this evidence points to significant Bronze Age settlement along the Nore Valley and probably a route-way along the Little Arrigle tributary. Extensive funerary activity was identified in the townland of Danesfort within the central landscape directly north of this southern landscape. Combined, this evidence represents the remains of activity on the edges of a much more intensively used Bronze Age landscape, which would have been

located outside these low-lying and damp areas that were suitable for peripheral and burnt mound activity on the edges of the permanent settlement zone.

The Southern Landscape: Burnt mounds

Ten sites with evidence of burnt mound activity were identified in the southern landscape along the N9/N10 Phase 4, and one additional example was discovered outside the roadtake during construction works. These sites extend the distribution of burnt mounds which had been clustered in the lower slopes of the Slievenamon range to the south at Catstown (KK035-066, KK035-067, KK035-068, KK035-161) and Kilkeasy (KK035-104, KK035-105). From these N9/N10 sites the view of Knockadrina Hill was prominent within the landscape. Much of the wetland nature of this area is caused not only by its proximity to the River Nore but also by the permeability of the local rocks. This combination allowed water to be discharged via a number of springs in areas around the channels of the Nore and King's Rivers which would perhaps have been an important factor when the exact location of these sites was decided. At 93m OD and 77.7m OD, Stonecarthy West 1 and Knockadrina 1 were situated a little higher than the range of the springs in the area which was concentrated at a height of 62–65m OD. Indeed, all of the burnt mound sites from this section were discovered south of the King's River, where the land is characterised by its wet nature. The six sites of Baysrath 3 and 4, Danganbeg 1, Knockadrina 1, Stonecarthy West 1, and Tinvaun 1 were all located within a 4.25km linear stretch and could therefore be described as a cluster of burnt mound sites, while the five Rathduff sites (Rathduff 1, Rathduff Upper 1 and 3, Rathduff Bayley 1) and one unexcavated site outside the roadtake (Rathduff Upper 2) constituted a second cluster located in relative isolation, further to the north. With the exception of Stonecarthy West 1 and Knockadrina 1, the burnt mound sites in this landscape were located in low-lying terrain either in a relatively flat area or in one with gently rolling slopes. Stonecarthy West 1 was adjacent to Knockadrina Hill and approximately 250m south from the site at Knockadrina 2 where a possible prehistoric hut site was identified. Baysrath 3 and 4 occurred in now-marginal land and were surrounded by boggy terrain to the north (the Danganbeg wetlands) and also, in the case of Baysrath 4, to the east and south. The Baysrath burnt mounds were *c.* 400m north of a large, multi-period settlement and cemetery at Baysrath 1 (Channing 2007). The sites at Danganbeg 1 and Knockadrina 1 were also close to boggy and marshy land. Further north, and in relative isolation, the three burnt mound sites of Rathduff 1 and Rathduff Upper 1 and 3, were situated along the western side of a stream in low-lying area and the large burnt mound spread at Rathduff Bayley 1 was located on the southern bank of the King's River.

The Southern Landscape: Route–ways and Communications

It is evident that the Nore, Dinin (and its tributary the Douglas) provided the links within the extensive late Bronze Age settlement distribution to the north of Kilkenny extending from the lowlands up into the uplands of the Castlecomer Plateau. However, beyond this the Nore also leads to the lowland zone in mid-Laois with its core of prehistoric activity, as well as to the sources of the Suir and contact with other major settlement cores at, for example, Cahir and Cashel. To the south the King's River, rising in the Slieveardagh Hills, also provides access to the Suir Valley. Although it might seem that the lower Nore and Barrow Rivers, and particularly southwards beyond their confluence at New Ross, provided communication with the south-east and the coast beyond, the pattern of prehistoric distribution suggests that it was the narrow valleys through the Slievenamon Range to the south-west that proved attractive. Settlement in this area is, from the early Neolithic, focussed along the upland fringes and on the edges of the meandering valleys that lead through to the lower Suir. The Slievenamon area, with its Neolithic beginnings indicated by both

megalithic tombs and occupation sites and the upper Nore valley which only emerged during the early Bronze Age represent clusters of this settlement.

The Southern Landscape: Conclusions
The fringes of the southern uplands of the Slievenamon range between the Suir and Nore Valleys, a core area in the Neolithic, continued to be an important focus of settlement. Some Bronze Age expansion into similar terrain on the west side of the Nore in the area around its confluence with the Barrow is indicated by burnt mounds. In contrast with the northern area there are few recorded burial sites although there are a few barrows on the lower flanks of the King's River. The clustering of burnt mounds in this area is particularly revealing as most of the sites are located along the narrow winding valley that leads through the Slievenamon hills to the Suir valley.

3.2.2 The General Iron Age Landscape of the Scheme – compiled by Michelle Brick

As with wider settlement patterns in Ireland, direct evidence for Iron Age (800BC–AD500) domestic habitation was not identified, although several furnaces, kilns and ringditches date to this period and attest to an Iron Age presence in the area. It is possible that some smaller Iron Age ringditches were in fact structural, rather than funerary. Evidence for Iron Age domestic settlement activity remains indirect and peripheral in Kilkenny and Carlow, and in Ireland as a whole.

The Southern Landscape
Direct evidence of Iron Age activity in the southern landscape of the N9/N10 Phase 4 is limited. There is a marked absence of hillforts from south Kilkenny but this does not necessarily infer absence of settlement (Gibbons 1990, 20). A small number of features produced Iron Age dates in this landscape as a result of the N9/N10 Phase 4 excavations. A posthole dating to this period (165BC–AD16; UBA 10984) was excavated at Baysrath 2, and belongs to a possible structure indicating potential domestic settlement in the region. At Tinvaun 2 a possible hut structure was identified which consisted of four truncated slot-trench-like pits, a posthole and a shallow, roughly central pit in the interior of the area. Dates returned for this possible structure have indicated that it was in use during the Iron Age period (AD5–124; UBA 12169). There was also some metalworking activity on site and this structure may have been associated with it. Further to this, a posthole and a hearth excavated at Danganbeg 1 also dated to the Iron Age (762–416BC and 41BC–AD 55; UBA 14025 and UBA 14024 respectively). No funerary features belonging to the Iron Age were excavated as part of the present Phase 4 in the southern landscape. However, some metal working activity in the form of slag pits/furnaces and funerary activity in the form of a ringditch has been excavated at Baysrath directly to the south of the present excavations and have been dated to the Iron Age period (Channing 2007). Three circular structures excavated at this site have also been dated to this period (AD60–131, AD25–128 and 88BC–AD53; UBA 10684, UBA 10685 and UBA 10691 respectively) indicating a strong Iron Age presence in this area (*ibid.).* A ditch dating to the Iron Age (39BC–AD74; UBA 10993) was excavated at Tinvaun 1; burnt mound activity associated with the Bronze Age was also excavated at this site and this ditch relates to a later phase of activity at the site. At Knockadrina 2 (51BC–AD78; UBA 12178) an Iron Age furnace was excavated and at Stonecarthy West 1 a possible trough also yielded an Iron Age date (771–539BC; UBA 12174), however other features associated with a burnt mound on the site returned Bronze Age dates.

The Central Landscape
As with the southern landscape there is no direct evidence for Iron Age settlement although there are many early medieval RMP sites in this area, the majority of which are ringforts and enclosure sites, such as the ringforts recorded at Woolengrange

(KK024-079 and KK024-082) and the enclosures at Carran (KK024-021001, 2) . Iron Age activity in the county is represented by the Hillfort at Freestone Hill where a defensive hillfort and inner enclosure (KK020-018002) was built encircling the hill-top (Gibbons 1990, 18), re-using the site of an earlier burial cairn (KK020-018001). The site was then re-occupied *c.* AD300 (Raftery 1969). Another possible Iron Age hillfort is located at Cotterallsrath located to the west of the southern end of this central landscape. Directly to the north-east of this site and located four miles south of Kilkenny City are the remains of a linear earthwork at Grevine West (Gibbons 1990, 20), also indicating an Iron Age presence in the region. Additionally, excavations were carried out at two ringforts in the townland of Dunbell; Dunbell 6 in 1972 and Dunbell 5 (KK024-010) in 1990 (Foley 1974; 2006; Cassidy 1991). The ringfort settlement at Dunbell 5 in particular produced dates from the Bronze Age to the eighth–10th centuries AD including evidence of Iron Age occupation.

Two clusters of Iron Age activity were noted from the N9/N10 excavations within the central landscape, at Danesfort and at Kilree and Holdenstown. These sites exhibited evidence for funerary activity and no evidence for domestic settlement was uncovered within this central landscape. At Danesfort 13 the primary fill of a ringditch returned a radiocarbon date of 503–384BC (UBA 10999) and was considered to be associated with two similar ringditches excavated at the neighbouring site of Danesfort 12. A fine glass bead found within a pit at Danesfort 13 also indicated that Iron Age activity continued in the Danesfort area, confirming the longevity of Danesfort as a focus for prehistoric funerary activity and although the area continued to be occupied in the early medieval period the focus then shifted towards settlement. Iron Age activity was excavated at Kilree 4, a site which contained a probable token cremation burial within a double ringditch (171BC–AD4), which was located on flat, gravely ground that overlooked the River Nore and its floodplain. At Holdenstown 1, three ringditches of possible Iron Age date were excavated. The largest was penannular in plan and had an undug, east-facing causeway. The two best preserved ringditches had evidence of re-cutting which may have been a symbolic act of redefining the burial monument. The primary phase has been interpreted as representing funerary feasting while the secondary phase consisted of burial possibly dating to the late Iron Age. Both ringditches were subsequently re-cut and were backfilled with material which included burnt bone, charcoal, seeds, and animal bone. The quantity of cremated bone is indicative of token cremation mixed with pyre debris. Although Ringditch 3 was heavily truncated, it also contained evidence of token cremation. The evidence thus far is indicative of burial potentially in the Iron Age and the site was later re-used as an inhumation cemetery known as a *ferta*, during the early medieval period. A shallow, northeast–southwest linear ditch spanned the entire width of the site at Holdenstown 1. The precise function of this ditch is unknown; however, its length and the fact that no return was identified suggest that it may have been a boundary ditch. It is possible that it is broadly contemporary with the burials within Ringditch 2, as these burials followed the same alignment of this ditch and there was no truncation. The ditch has been dated to the Iron Age period (168–3BC; UBA 13108). It is then possible that the burials associated with Ringditch 2 and with this ditch were placed either inside or outside the boundary; both of which suggests a significant symbolism.

In Danesfort 12 a furnace had evidence of reddened sides and a burnt and blackened rim but the base was not scorched. The fills contained large quantities of charcoal and slag. It is possible that this activity was contemporary with the Iron Age funerary activity recorded on site. Metallurgical activity was also recorded at Danesfort 13 and included two smelting furnace pits, a metalled surface, three waste pits, and an occupation deposit. This activity may also have been contemporary with Iron Age funerary activity also recorded on site. At the multi-period site of Danesfort 5 a

metalworking area was identified and included several pits and deposits. Of these pits one returned an Iron Age date of 786–543BC (UBA12192). A kiln excavated at Danesfort 5 also produced Iron Age dates ranging between 169BC and AD50, (UBA 12189–91). Other features at this site were dated to the late Bronze Age period and the Iron Age activity may indicate a continuity of settlement at the site. At Holdenstown 2 a total of five kilns were identified with one dating to AD21–203 (UBA 13111). Both Danesfort 2 and Holdenstown 4 returned Iron Age dates from features associated with burnt mound activity (744–407BC, UBA 11000; 765–420BC; UBA 13114).

The Northern Landscape

The northern landscape of the N9/N10 Phase 4 also contained Iron Age evidence. The aforementioned Freestone Hill (KK020-018) is located directly to the south of this landscape and two additional hillforts can also be located in the north of the county. Clomantagh (KK008-124002) overlooks Johnstown in north-west Kilkenny and similar to Freestone Hill, the site was originally used in the Bronze Age as a funerary complex (Gibbons 1990, 18). A linear earthwork has also been recorded at Woodsgift (Gibbons 1990, 20) and is located directly to the south of this site. The other possible hillfort in the region is recorded at Tooremore or Carndubh to the east (*ibid.*). This hillfort which is not shown on the Ordnance Survey maps is situated on Corrandhu Hill, two miles east of Ballyragget, straddling the townland boundary between Toore More and Donaghmore (Condit and Gibbons 1988, 49). Further to these, located along the Kilkenny-Carlow border is a linear earthwork known as the Rathduff Trench (KK026-006). It ran for over three miles from the River Barrow at Duninga, in a north westerly direction to the foothills of the Castlecomer plateau above Shankill (Gibbons 1990, 20). A portion of this linear earthwork was excavated at Shankill 1 and consisted of a U shaped bank with a ditch.

Excavations in the northern landscape of the N9/N10 produced a small amount of domestic settlement evidence. The fill of a stakehole associated with a possible structure at Moanduff 1 produced an Iron Age date of AD215–376 (UBA 13124); the site also had evidence of occupation in the Bronze Age which implies that the site may have been used throughout both periods. Radiocarbon dating for Rathcash East 1 also indicates use of the site during the Iron Age period. The excavated features included a possible structure that may be inferred as a ringditch as a result of the middle Iron Age date retrieved from its fill (38BC–AD73; UBA 12221) and an associated rubbish pit (37BC–AD123; UBA 12220). Excavations in the northern landscape of the N9/N10 did not produce any evidence for Iron Age funerary activity. However ephemeral Iron Age activity was discovered at a number of sites in the form of metal working and burnt mound activity. At Rathcash East 3 a large keyhole-shaped furnace that dated to the Iron Age (160BC–AD0; UBA 14032), aligned northeast–southwest was excavated along with six post-pits that may have supported a shelter around the west side of the furnace. The post – pits had a rectangular arrangement, being open on the east (furnace) side. The furnace had 18 fills, with the majority containing significant amounts of charcoal and frequent slag. Some of the post-pits contained charcoal, burnt clay and slag. One of the post-pits has been dated to 362–200BC (UBA 14033). A kiln and pit excavated at Cranavonane 3 have been dated to 104BC–AD50 (UBA 12251) and 341–54BC (UBA 12252) respectively. In addition to these features a pit excavated at Jordanstown 1 returned a date of 382–206BC (UBA 12233) and a pit at the multi-period site of Moanduff 2 retrieved a date of AD140–385 (UBA 12260). Features associated with burnt mound activity dating to this period were excavated at Rathcash 2 where the fill of a trough dated to 344–55BC (UBA 12219) and at Kellymount 2, where a waterhole has been dated to AD236–380 (UBA 14041). The fill of a trough at Kellymount 3 also returned a date of 751–409BC (UBA 14043).

Conclusion
The presence of the Iron Age ringditches along the N9/N10 Phase 4 and the number of sites displaying industrial activity dating to this period confirm the presence of an Iron Age community in the region. The possible structure at Rathcash East 1 may also be indicative of an Iron Age settlement site, further demonstrating Iron Age activity in the locality. The presence of three hillforts in north Kilkenny suggests that it was an area of considerable importance during this period (Condit and Gibbons 1988, 52). The lack of excavated domestic settlements along the route is not indicative of a sparse population at the time rather they were not located along the corridor of the N9/N10 route-way and have yet to be discovered.

3.2.3 The Site Specific Archaeological Landscape of Stonecarthy West 1

There are no recorded monuments in the vicinity of Stonecarthy West 1. The nearest is a cave (KK027-051) 500m to the south-west of the site. Other sites located to the south and south-west show evidence of occupation in the area in the early medieval and medieval periods. These sites are all over 1km away and consist of a ringfort (KK031-006), a castle site (KK031-007) and a possible moated site (KK031-050). To the north-east, *c*. 1.25km away, a ringfort (KK027-050) is also located.

A number of sites were excavated in the vicinity of Stonecarthy West 1 as part of the N9/N10 Phase 4: Knocktopher to Powerstown works. Some of these showed evidence of prehistoric activity dating from the Neolithic to the Iron Age. These include pits with Neolithic pottery at Knockadrina 2 which was located 150m to the north-east. To the south of the site at Tinvaun 4, *c*. 80m away, scattered pits produced medieval pottery and two early-medieval round houses. Two slightly later probable rectangular structures were also identified at this site as well as early medieval and medieval field boundary ditches at Tinvaun 3, *c*. 150m to the south of Stonecarthy West 1. A small structure and a furnace dating to the middle Iron Age was recorded at Tinvaun 2, 250m to the south and a possibly related field system was also excavated at Tinvaun 1, 350m to the south of Stonecarthy West 1. Tinvaun 1 also had evidence of early Bronze Age burnt mound type activity although no mound was identified and very similar results were found at Knockadrina 1, *c*. 550m to the south.

3.3 Typological Backgrounds

3.3.1 Typological Background of Burnt Mounds

Burnt mound sites (also commonly referred to as *Fulacht Fiadh*) are one of the most common field monuments found in the Irish landscape. The last published survey (Power *et al*. 1997), carried out over a decade ago, recorded over 7,000 burnt mound sites and in excess of 1,000 sites have been excavated in recent years through development led archaeological investigations. In spite of this no clear understanding of the precise function of these sites has been forthcoming.

Burnt mound sites are typically located in areas where there is a readily available water source, often in proximity to a river or stream or in places with a high water table. In the field burnt mounds may be identified as charcoal-rich mounds or spreads of heat shattered stones, however, in many cases the sites have been disturbed by later agricultural activity and are no longer visible on the field surface. Nevertheless even disturbed spreads of burnt mound material often preserves the underlying associated features, such as troughs, pits and gullies, intact.

Ó Néill (2003–2004, 82) has aptly identified these sites as the apparatus and by-product of pyrolithic technology. This technology involved the heating or boiling of

water by placing fire-heated stones into troughs of water. Small shallow round-bottomed pits, generally referred to as pot boiler pits or roasting pits, are often associated with burnt mound sites. The purpose of these pits remains unclear. Occasionally large pits are also identified and may have acted as wells or cisterns. Linear gullies may extend across the site, often linked to troughs and pits, and demonstrate a concern with onsite water management. Post and stakeholes are often found on burnt mound sites and these may represent the remains of small structures or wind breakers.

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

Although there is a general consensus that burnt mound sites are the result of pyrolithic technology for the heating or boiling of water, the precise function of these sites has, to date, not been agreed upon. Several theories have been proposed but no single theory has received unanimous support. The most enduring theory is that burnt mounds sites were used as cooking sites. O'Kelly (1954) and Lawless (1990) have demonstrated how joints of meat could be efficiently cooked in trough of boiling water. The use of burnt mound sites for bathing or as saunas has been suggested as an alternative function (Lucas 1965, Barfield and Hodder 1987, O' Drisceoil 1988). This proposal is largely influenced by references in the early Irish literature to sites of a similar character and is very difficult to prove, or disprove. Others, such as Jeffrey (1991), argue that they may have been centres of textile production for the fulling or dyeing of cloth. More recent demonstrations by Quinn and Moore (2007) have shown that troughs could have been used for brewing, however, this theory has been criticised by leading Irish environmentalists due to the absence of cereal remains from most burnt mound sites (McClatchie *et al*. 2007).

3.3.2 Typological Background of Metal Working Features

The ironworking processes in Ireland remained largely static until the 17th century with the introduction of the blast furnace, so the features that survive archaeologically today appear similar in form even though they span the centuries between late prehistory and the later middle-ages. Diagnostic artefacts are also mainly absent so radiocarbon dating is vital for determining the age of various metallurgical features, including smelting furnaces. Radiocarbon-dated examples of furnaces from the M4 show that, despite their morphological similarities, they were in use from the beginnings of the fifth century BC until the late medieval period with the majority dating to the early middle ages (Carlin *et al* 2008, 104). A number of possible furnaces along the M7/M8 (specialist metallurgical reports are awaited) have also produced dates spanning the middle Iron Age through to the later medieval period (Kenny 2007).

The two basic raw materials required for iron working are wood (charcoal) and iron ore. Ironworking and the production of charcoal are closely related, as quantities of charcoal are required in the smelting process. It was produced by carbonising smouldering wood in a controlled oxygen-limited environment, resulting in the wood being roasted and not burnt. The archaeological evidence for this process can be seen in charcoal production kilns/pits – shallow circular or rectangular pits with evidence of heat-scorching at the base and deposits that have a very high charcoal content. The iron ore was sometimes extracted by mining, as at Garryduff 1, Co.

Cork, where surface outcrops of yellow sandstone or lower limestone shale containing limonite were available (O'Kelly, 1962, 103). Haemetite and Siderite were also exploited as at Ballyhenry, Co. Antrim (Lynn 1983) and Nendrum, Co, Down (Lawlor, 1925) respectively. Such resources were not as widespread as bog iron ore (Mytum 1992, 230) which is formed by the leaching of iron from the underlying geology and exists around the margins of bogs and wetlands. It has a high manganese and phosphorous content and low potassium and calcium content (Hall and Photos-Jones, 1998). The manganese acts as a flux that lowers the melting point of the slag (Carlin, 2008). The ore is also a renewable resource and these characteristics would have made it particularly suitable for use in early bloomery technology (Photos-Jones *et al.* 1998).

Much of the technology associated with the primary stages of iron production such as charcoal production kilns, furnaces and smithing hearths, during the bloom smithing process, were located close to natural resources such as wood and bogland. This is not surprising because oak was the preferred fuel for charcoal production as it is denser and burns for longer than softer woods (Raftery 1994, 148; Tylecote 1962), while bog ore was more readily available and required less work to extract compared to mining and was also a regularly renewable resource (Mytum 1992, 230). The primary stages of ironworking generally took place away from dwellings due to the dangers associated with the production, such as the risk of fire and the toxic nature of the process. The results from recent excavations, such as along the M4 (Carlin *et al* 2008) and the M7/M8 (Kenny 2007) testify to this as the majority of furnaces were located in marginal places, availing of the limited drier and sloping ground, close to bog and woodland and away from settlements. However, furnaces do occur within enclosed early medieval settlements in some instances, such as Killickaweeny, Co. Kildare (Walsh 2008), and it appears that iron smelting was practised sometimes within enclosures, possibly in controlled safe environments away from the dwellings.

The primary process in the production of iron was through smelting, a practice whereby iron minerals or ores are reduced and broken up by reactions with burning charcoal in a furnace (bloomery), leading to the production of an iron bloom and liquid slag (Carlin, 2008). This bloom retained numerous impurities as the temperatures did not exceed 1250˚C, well below the melting point of iron. The second stage in the production process bloomsmithing, where the bloom is re-heated in a hearth and hammered to remove excess slag and other impurities (Crew, 1991). This primary smithing may have been conducted at the smelting site and the original furnace pit could have been re-used as the hearth. Some smithing hearths would have had a low clay superstructure to increase efficiency and would have had bellows connected. The slag from this process accumulated in the base of the hearth pit and is known as a smithing hearth bottom or cake (plano-convex base). The purer iron billet produced from the primary smithing then underwent secondary smithing (blacksmithing) or forging to make or repair metal objects. This took place in a sheltered hearth which created suitably dim lighting for the smith, who used the colour of the iron as an indicator of its temperature (Carlin, 2008). The metal was heated in the hearth before being shaped into the desired form using hand tools and an anvil.

Furnaces, used for the smelting of ores into an iron bloom prior to the smithing stages, survive in the archaeological record as small shallow heat-scorched pits, usually oval or hemispherical in shape, containing fills of iron slag, charcoal and, in many cases, oxidised clay. Dense blocks of slag commonly form at the bottom of the furnace which have been termed plano-convex or 'furnace-bottoms' (Scott 1990, 155–6). A total of 30 furnaces – with approximate diameters of between 0.4m and 0.7m and depths not exceeding 0.2m – were identified in advance of the M4 road scheme and survived as bowl-shaped pits, with heat-reddened sides and bases,

which contained slag and, in many examples, vitrified clay fragments (Carlin *et al* 2008, 94). A recent summary of furnaces associated with raths has revealed similar morphological characteristics and deposits whereby they were all heat-scorched small pits containing charcoal, slag and burnt clay in many instances (Comber 2008, 115–7).

Slag is a by-product of smelting as well as smithing, and this vitreous waste is one of the most common archaeological indicators of iron metallurgy. Microscopic analysis of the slag is very informative about the processes that led to its production. This is the key to deciphering the activities that occurred on a site and is of particular importance in detecting whether smelting or smithing, or both, occurred in a particular context (Carlin, 2008)

Debates have recently focused on the arguments for (Carlin *et al* 2008; Crew and Rehren 2002, 96; Mytum 1992, 231) and against (Pleiner 2000; Scott 1990; Raftery 1994, 148) the existence of the low-shaft furnace in Ireland with the former mainly arguing that the low-shaft furnace, in contemporary use in Britain, was more efficient than the bowl furnace. This view was based, to a large extent, on the experimental work on bowl furnaces by O'Kelly (1961) and later by Tylecote (1986). Bowl furnaces consisted of pits containing charcoal, positioned close to the air hole, and ore that were sometimes clay-lined and may have had a low dome-shaped clay roof (Scott 1990, 159). Low-shaft furnaces differed in that they were clay-lined and clay sides were constructed above ground into the shape of a conical- or a cylindrical-shaped chimney (Carlin *et al* 2008, 92). They also differed to the bowl furnace because the charcoal and ore were placed in alternating layers (Mytum 1992, 231). Archaeologically, however, it is difficult to distinguish between the two because both survive as heat-scorched pits containing charcoal and slag deposits and, in many cases, vitrified clay fragments. The presence of the latter cannot be used as evidence for the existence of the low-shaft furnace because bowl furnaces may also have been clay-lined or roofed by a clay dome. Regardless of the existence, or not, of the low-shaft furnace, the large number of furnaces found in excavations across the country demonstrate that iron smelting was an integral part of the iron production process and it usually occurred in marginal places, in proximity to raw materials, and away from settlements where the final process – iron forging – was frequently practised.

3.3.3 Typological Background of Bronze Age Structures

Interpretation of Irish Bronze Age houses has relied considerably on the British evidence. The re-interpretation in the 1970s of several sites such as Itford Hill and Black Patch, both in Sussex, proved seminal in advancing understanding of how these structures functioned (Musson 1970; Drewett 1979). Further excavations in the South Downs facilitated Guilbert to describe a typical Bronze Age roundhouse of post construction, the posts of which were regularly spaced, apart from towards the back of the structure where there was a tendency toward tight spaced posts (Guilbert 1982). The Sussex region is particularly rich in such Bronze Age settlement remains and the interpretations derived from the evidence have since proven enduring and archetypal. It would not be until 2000 that such discussions were taking place within the published domain in Ireland when Doody summarised and categorised the structure features associated with Bronze Age roundhouses and noted their axis of symmetry, as observed by Guilbert in the 1980s, and their similarity in appearance across Ireland (Doody 2000). Doody identified three basic ground-plans: circular (83%), oval, and rectilinear (ibid.); however, these have been recently expanded upon by Ó Néill (forthcoming). The circular roundhouses are generally between 3m and 15m in diameter, use locally available materials for construction and have a broadly eastern entrance (Doody 2000). The roof is predominantly supported by at least one ring of posts (often set in a gully or slot-trench) and occasionally a central post. In

general, the walls are non-load bearing; the entrance is often emphasised by elaborate door sills or, more commonly, the addition of a porch. Internal features include stakeholes representing divisions, storage pits, waste pits, stone paving, and, more infrequently, hearths; it is therefore particularly interesting that the houses on the N9/N10 do have evidence for internal, off-centre hearths. Interpretations regarding the exact lifespan of a typical roundhouse have been wide-ranging and extend from 15–25 years (e.g. Drewett 1982, 343) to 30–75 years (Brück 1999, 149). A widespread paucity or limitation of chronologically diagnostic artefacts associated with roundhouses further complicates such interpretations. Frequently, roundhouses show signs of repair and rebuild, as was extensively evident at the nucleated site of Corrstown, Co. Londonderry (Ginn & Rathbone forthcoming) where 74 roundhouse platforms were excavated. This nucleated site represents the highest concentration of contemporary Bronze Age houses known to date throughout Ireland and Britain. Most excavated examples do occur in isolation or in pairs or small groups of buildings, as along the N9/N10, indicating that the majority of the Irish Bronze Age population lived in small settlement groups.

3.4 Summary of the Excavation Results

The excavation at Stonecarthy West 1 has identified burnt mound activity dated to the middle Bronze Age and early Iron Age. Undated metallurgical activity in the form of a bowl furnace was also recorded.

The earliest phase of occupation at the site was a late-middle Bronze Age structure consisting of a slot trench and trough. This probably originally enclosed an oval area before later disturbance from a field drain on the east side. A possible entrance was noted on the north side. The slot-trench had narrow and tall stone packing (C68) in its fill which suggests it supported narrow vertical plank walls. It is possible given the size of the structure (3m x 2m) that these walls would have supported a light roof. Within the area enclosed by the slot trench was a possible shallow oval trough (C75). Four stakeholes were located at the west end of the trough but it is not clear if these had a structural or other function. It is felt that this trough could have been filled with water which could have then been heated creating a sweathouse within the confines of the slot-trench wall. The possibility that it was a small house-type structure unrelated to burnt mound activity must also be considered based on evidence from Curraghatoor, Co. Tipperary, where similarly sized circular structures with slot-trench foundations were recorded (Doody 200).

Subsequent activity focussed on a large pit that may have functioned as a well or waterhole that was dated to the middle Bronze Age. It is possible that the construction of the well/waterhole feature was contemporary with the slot-trench structure and continued in use during the subsequent phase of activity as no other significant contemporary features were identified in proximity to the well. Near the well, and cutting the earlier slot-trench structure was an early Iron Age sub-rectangular trough which had been impacted by a relatively modern drainage channel. A single posthole was identified in each of the three surviving corners of the trough suggesting that the trough originally had a timber lining. It is felt that the well was used as a water storage facility as there are no obvious water sources in the vicinity to facilitate the filling of an earlier trough and the site is not in a low-lying or marginal location which would have been prone to flooding.

A large spread of burnt mound material consisting of heat shattered stones and blackened soil sealed the well, trough and sweathouse as well as a number of other irregular shaped pits of unknown date and function. Further pits identified to the east of the main burnt mound spread were not sealed by the mound but contained burnt

mound material in their fill suggesting they may have been pot-boilers or oven roasters rather than troughs, although they may just have been waste pits.

In the south-west corner of the site a bowl furnace with slag rich fills was recorded. This feature was undated but it could be contemporary with the Iron Age activity on the site or with early medieval activity at Knockadrina 2 to the north and Tinvaun 3 to the south. Other pits scattered across the south of the site may have been related to this industrial type of activity as many had oxidised bases indicating that they had been subjected to *in situ* burning but no diagnostic material was found.

3.5 Summary of the Specialist Analysis

A number of specialists provided analysis of samples and artefacts recovered from the site as part of the post-excavation works. This work in part formed the basis for the dating evidence for the site. The detailed reports on the results of all analysis are in Appendix 2

Post-Medieval Pottery

Four types of post-medieval pottery were retrieved from contexts on site; glazed red earthenware, porcelain, pearlware and spongeware. These pottery types date the features in which they were recovered to the 18–19th Centuries.

Lithics analysis

The lithic find from the archaeological excavation at Stonecarthy West 1, Co. Kilkenny is a possible sandstone rubbing stone which most likely dates to the late Neolithic period or Bronze Age. This site makes a minor contribution to the evidence for prehistoric settlement and land use in Co. Kilkenny.

Small finds analysis

Only one body sherd (E3610:53:1) from a wine bottle was retrieved from Stonecarthy West 1. It is from free-blown bottle and is now covered in a patina and the surface of the glass has crizzled leading to a network of fine lines over the face of the glass. This sherd probably dates from the eighteenth or nineteenth century.

Charcoal and Wood Species identification

Three charcoal samples from C41, C76 and C114 were selected for charcoal analysis. The mixed wood assemblage of alder, ash, oak, willow, pomaceous woods and oak from features containing burnt mound material (C76 and C114) is not an unusual occurrence on these site types and would have become re-deposited across the site entering and mixing with other deposits and fills. The higher occurrence of oak from C41 may be associated with specialized activities, like metalworking, as suggested.

Analysis of Plant Remains

A single sample from C25 (S6), the primary fill of fire pit C23, was examined from this site. The sample contained small amounts of hazelnut shell fragments, as well as some barley and wheat grains. The plant remains assemblage from the site is so small it is not possible to use this material to discuss relative importance of cereal types and other plant food items from the site.

Animal Bone Analysis

Six burnt bone fragments from C76, the fill of trough C75, were submitted for examination. The bone samples were assessed and identified to species where possible. Due to the size and fragmented nature of the burnt bone pieces it was not possible to identify to species. No definite or statistically detailed conclusions could

be drawn from the burnt bone assemblage retrieved from Stonecarthy West 1 due to its limited size and poor degree of bone preservation.

Petrographical analysis
Coarse grained sandstone is typical of *fulacht fiadh* material (e.g. see Mandal 2004). The use of angular and rounded pieces is interesting. Rounded pieces and / or the use of pebbles / cobbles is clear evidence of the use of secondary sources. Angular pieces are more indicative of the use of bedrock sources, but it is important to note that they could also represent angular blocks occurring in tills.

It is significant that sandstone is the predominant rock type given that, due to the differing underlying bedrock, it would not be the most abundant rock type available, either in outcrop or in the overlying tills. This indicates that sandstones were deliberately being selected for use in preference to the more abundant finer grained rock types in the area.

Metallurgical Waste Analysis
A total of 8.19Kg of metallurgical residues were recovered from this site. The bulk of the material (8Kg) came from C40 the upper fill of bowl furnace/smelting pit C29, 176.6g came from C41 the basal fill. Many of the slags have the characteristic appearance of iron smelting slags with a drippy type morphology and a smooth surface. A large proportion of the slags do not have this morphology and appear to be conglomerates of several different types of material This type of morphology may be indicative of a poor smelting process being carried out and may suggest the furnace is quite early.

Radiocarbon Dating
A total of three samples were sent for AMS radiocarbon dating.

A sample of Ash charcoal from trough fill C76 was radiocarbon dated. The 2 sigma calibrated result was 771–539BC (UBA 12174).

A sample of Pomoideae charcoal from waterhole fill C114 was radiocarbon dated. The 2 sigma calibrated result was 1440–1315BC (UBA 12175).

A sample of Hazel charcoal from slot-trench fill C69 was radiocarbon dated. The 2 sigma calibrated result was 1757–1616 BC (SUERC 40336).

4 DISCUSSION AND CONCLUSIONS

4.1 Discussion

The excavation at Stonecarthy West 1 has identified burnt mound activity dated from the early-middle Bronze Age to the early Iron Age. Undated metallurgical activity in the form of a bowl furnace was also recorded.

The site was located in a field under pasture on a slight westerly slope near the base of Knockadrina Hill. Its location near the base of the slope ensures that it is relatively well drained. Many of the adjacent fields to the west and north are used extensively for tillage, indicating a good quality well drained landscape. Pasture becomes more prominent to the south and the land becomes more marginal as it approaches the low-land of Danganbeg Wetlands. The site is unusually located for burnt mound type activities which are generally located near sources of water. While the hydrology of the area may have changed slightly over time there is no obvious source of water or spring near the site.

The surrounding archaeological landscape contains no previously recorded monuments. Excavations carried out as part of the N9/N10 Phase 4 have identified quite extensive occupation of the immediate area to the north and south of Stonecarthy West 1, but this is mostly dated to the later Iron Age and the early medieval period and there is little contemporary activity evident. The landscape is not intensively occupied in prehistory and in this context the identification of this site is somewhat unexpected. More intensive prehistoric occupation can be seen further south at Danganbeg and Baysrath, which would be part of the wider rather than the immediate environment.

The nature and form of burnt mound sites can be particularly varied, and there are many debates as to what exactly their function was. At a basic level these sites are connected by the use of hot-stone technology – a process that involved placing fire-heated stones into a trough of water in order to heat or boil the water. Simpler sites may have functioned as pot-boilers with the stones being placed directly into a pit rather than into a water filled trough. It is generally accepted that this activity is more often than not associated with cooking, however other uses for the heated water and troughs are suggested based on evidence from recent excavations and research (see section 3.3, Typological Background of Burnt Mounds).

One of the key elements of the site was a very large and deep pit or waterhole. A number of these features have been identified on burnt mound sites along the length of the N9/N10 Phase 4 with further examples at Danesfort 2, Blanchvillespark 4, and Kellymount 2 and 3 among others. These waterholes have been dated to various stages of the Bronze Age and Iron Age on the scheme and have been found on sites in marginal landscapes as well as potentially drier areas such as at Stonecarthy West 1. It is difficult therefore to be accurate in the interpretation of these large pits or wells. On some other sites - Maddockstown 1 and Danesfort 2 - it has been interpreted that on the basis of associated elaborate structural elements that these large pits may be associated with bathing. This is also particularly true on sites where there is no apparent difficulty with accessing water and a large well would not appear to be necessary. It is suggested that given the difficulty in heating such a large volume of water to a temperature suitable for cooking that the water was perhaps merely warmed for bathing. While it is possible that the Stonecarthy West 1 waterhole/well was used for bathing it also seems likely that it may have had a water storage function given the lack of any other obvious water source. It was noted during the excavation that while the waterhole would retain some water it generally drained

away through the substrate. As previously outlined, changes in hydrology may have affected the levels of water presently recorded as opposed to those in prehistory. There was no evidence that the waterhole was lined to assist in water retention despite some wood fragments being identified within fills near the base.

The sub-rectangular early Iron Age trough is in keeping with troughs that would be commonly identified on this site type and the presence of posts in the corners to support a timber lining would also be regularly identified. The random and irregular pits are also commonplace. The identification of a number of possible oven roasters or pot boilers to the east of the main trough are also often identified in the archaeological record, particularly on sites where there may not be access to water. The features are often not associated with a substantial burnt mound deposit and similar examples were identified not more than a few hundred metres away at Knockadrina 1 and Tinvaun 1.

The identification of an Iron Age phase on the site was not entirely unexpected as the bowl furnace could have been dated from this period up to medieval times. It was not anticipated however that elements associated with the burnt mound activity would be dated to this stage of prehistory. It is unfortunate that the early-middle Bronze Age structure consisting a slot-trench and trough was located directly below the later sub-rectangular trough as given the similarity in fills - both filled with burnt mound material consisting of heat shattered stones and blackened soil - it sometimes was difficult to identify the stratigraphic sequence. However, radiocarbon dating of different elements associated with the two phases of activity has resolved the complex stratigraphy. It is also unfortunate that the later Iron Age activity almost completely removed the earlier Bronze Age structure. The placing of the two features in the same location near the large waterhole would suggest that it was potentially open and available for use with both these phases of activity, despite its dating indicating an intermediary phase.

It has been outlined in the results of the excavation that the slot trench would have held vertical plank walls which would probably have supported a light roof. If the possible internal shallow trough was filled with water, when heated this would have created a sweathouse in the enclosed space. The adjacent waterhole, while being a source or store for water may also have provided a bathing location.

It has been a popular theory for some time that burnt mounds were used as bathing sites or saunas (Lucas 1965; Barfield and Hodder 1987; O'Drisceoil 1988) yet few sites had produced evidence of the necessary associated structures. Features interpreted as being associated with possible sweathouses or bathing have been identified at a number of burnt mound sites from different projects over the last number of years, largely as a result of the increase in the volume of development led excavations particularly from infrastructural projects similar to the N9/N10. A probable sweathouse was documented from the N25 Waterford bypass at Rathpatrick (Eogan, 2007). Here the main feature was a 5m diameter sunken area with thirty six stake-holes identified around the periphery of the base representing a structure, as well as other features including a possible bath (trough) and an annex to the main structure. It is interpreted that the stakeholes would have supported a hemispherical, tent-like structure. Eogan identified parallels in other cultures with particular similarities to the Rathpatrick structure in Native American sweatlodges. Clearly an enclosed structure is a key element to the functioning of a sweathouse or sauna, and it is interpreted that the slots and postholes at Blanchvillespark 3 could easily have been associated with such an enclosed area. Similarities between the two sites can also be seen by the sunken nature of the interior of the structure and the creation of an adjacent annex, although the shape and plan of the basic sweathouse structure is different in each

site. Another similar site to Rathpatrick was identified at Ballykeoghan in south Kilkenny which was excavated as part of the N9/N10 Phase 2 (Laidlaw, 2008). Burrow or Glenanummer 3 Co Offaly, which was excavated as part of the N6 Kilbeggan to Athlone, also consisted of a sunken circular area with stakeholes around the perimeter, with an elaborate system of additional troughs designed for water to flow from one to another (Coughlan, 2010). Two bone pendants recovered from the sweathouse area at this site represent personal ornaments that were probably lost while bathing.

The Ballykeoghan and Rathpatrick sites both date to the late Bronze Age/early Iron Age, while Burrow or Glenanummer was dated to the late Bronze Age. Stonecarthy West 1 is therefore similarly dated to the Ballykeoghan and Rathpatrick sites. A number of other possible sweathouses that date to the Iron Age have been identified as part of the N9/N10 Phase 4. These include Blanchvillespark 3 and Kellymount 2 and 3. At Blanchvillespark 3 a somewhat similar construction was employed as at Stonecarthy West 1, where a series of slots would have supported individual upright planks or split timbers that formed the structural walls that enclosed a shallow hollow. The Kellymount sites showed evidence of structural activity both outside and inside the troughs with possible enclosing palisades and a variety troughs and pits, with some very large waterhole or well features. It seems unlikely that water heated in the very large waterhole pits would have been boiled due to the volume of water that would have been involved, so a bathing function is being considered. Kellymount 2 also produced a fragment of an amber bead from the base of the waterhole, and similar to Burrow and Glenanummer, this may represent a personal ornament lost while bathing. It is clear therefore that there is growing evidence that some burnt mound sites functioned as sweathouses or bathing places.

The site at Stonecarthy West 1 was as such potentially a bathing place, certainly in the early-middle Bronze Age. This is significant in terms of our wider understanding of the function of *fulacht fiadh*/burnt mounds. It has been identified that this site type can have many functions and often the precise nature of the activity at excavated burnt mounds is unclear. The results of excavations at Stonecarthy West 1 indicate that these varying functions can potentially occur in tandem when we consider the simpler trough, the isolated possible oven roasters or pot boilers in conjunction with the sweathouse structure.

The possibility that the slot trench structure represented the location of a small house or similar structure, potentially unrelated to burnt mound activity must also be considered. It has been outlined (section 3.3.3) that Doody identified three basic ground plans for Bronze Age houses: - circular, U-shaped or oval, and rectilinear (Doody, 2000). He further outlines that the term “house” is used loosely as not all need necessarily have served as domestic dwellings and may have served as animal pens or shelters or been used for storage (*ibid.*). Even such basic structural details of whether or not a building was roofed may not always be apparent from the excavated evidence so it can be difficult to accurately interpret function. In addition, Bronze Age houses can vary widely in size, as well as in shape, and their components can include slot-trench footings, postholes, stakeholes, and examples where stone was utilized in the construction. While the Stonecarthy West structure is not directly comparable to any of the houses presented by Doody, there is perhaps a sufficient combination of elements to support the theory that it was a house-type building. Huts 2 and 3 at Curraghatoor, Co Tipperary, consisted of small circular slot-trench foundations, *c.* 3m in diameter (*ibid.*), similar in size and general foundation type to Stonecarthy West. These huts had narrow entrances marked by gaps in the slot-trench foundation, again similar to Stonecarthy West. While the Curraghatoor examples were circular, oval structures are also noted and of particular interest are

structures from Ballyvourney 1 and 2, Co. Cork, with both sites being the focus of burnt mound activity. The Balyvourney 1 hut consisted of 10 posts in a roughly oval setting, measuring 5.60m by 4.00 (O'Kelly 1954). Ballyvourney 2 contained a primary and secondary hut. The primary hut was marked by a shallow 0.25m deep oval depression surrounded by seven small postholes with a maximum diameter of 2.4m (*ibid.*). This is only slightly smaller than the shallow oval depression/trough identified within the Stonecarthy West structure. The secondary hut was a larger circular structure of 10 post-holes with a diameter of 5.00m. While the Ballyvourney post-built huts clearly have a different morphology to the Stonecarthy West and Curraghatoor slot trench example, they provide evidence of hut/house structures being identified in conjunction with burnt mound activity. Indeed the Stonecarthy West structure could be seen as an amalgamation of the elements of the Curraghatoor huts and the Ballyvourney 2 oval depression. As it cannot be definitively stated that any of the burnt mound activity at Stonecarthy West was contemporary with the slot-trench structure, its possible function as a small house must be considered.

The identification of a small bowl furnace and other possible industrial pits in the south of the site are potentially related to Tinvaun 3 to the south where a number of early medieval houses were identified or Knockadrina 2 150m to the northeast where a large early medieval enclosure and settlement site was located. It would be usual for metallurgical activity to be carried out at a distance from the domestic settlement due to odour and the basic risk of fire. The furnace was undated as the selected charcoal of oak could have returned a misleading result based on the "old wood" effect. It was also stratigraphically unrelated to the other activities on site.

A nearby trough on the site was dated to Cal 771–539BC and a fill from a large pit C58 was dated to Cal 1440–1315BC. It is unlikely either of these dates have any relation to the possible iron smelting activity being carried out at the site. There is no direct dating evidence for the possible iron smelting furnace from this site. Stonecarthy West 1 is geographically very close to Tinvaun 2 (AR064) located to the south, which had a smelting and possible ore roasting pit, smelting pit was dated to 39BC–AD64 (2 sigma). It is also quite close to Knockadrina 2 (AR068) where a pit associated with some slag was dated to Cal AD650–766 (2 sigma).

4.2 Conclusions

The excavation at Stonecarthy West 1 has identified a burnt mound complex dating from the early-middle Bronze Age to the early Iron Age as well as undated metallurgical activity and pits. The site is important locally as it represents the first record of prehistoric activity from the above periods in the immediate locality. It is however also of regional and national significance based on the nature of the burnt mound activity identified at the site. A number of potential sweathouses and bathing sites have been confirmed from recent excavations of burnt mounds across the country and the results of the Stonecarthy West 1 excavation will significantly add to the further study, analysis and understanding of the varied function and form of burnt mound sites. The morphology of the small slot-trench structure enclosing a shallow depression or possible trough is also an important addition to the study of houses and structures in the first half of the Bronze Age.

5 BIBLIOGRAPHY

5.1 References

Barfield, L. and Hodder, M. 1987 Burnt mounds as saunas, and the prehistory of bathing. *Antiquity,* **61**, 370–9.

Brindley, AL 1989–90 Radiocarbon dates from Irish fulachta fiadh and other burnt mounds. *Journal of Irish Archaeology* **5**, 25–33.

Brück J. 1999 Houses, Lifestyles and Deposition on Middle Bronze Age Settlements in Southern England. *Proceedings of the Prehistoric Society,* **65**, 145–66.

Carlin, N. 2008 Iron working and Production. In N. Carlin, L. Clarke & F. Walsh, *The Archaeology of Life and Death in the Boyne Floodplain: The Linear Landscape of the M4 Kinnegad-Enfield-Kilcock Motorway.* NRA Scheme Monographs 2.

Carlin, N., Clarke, L. & Walsh, F. 2008 *The M4 Kinnegad-Enfield-Kilcock Motorway: The Archaeology of Life and Death on the Boyne Floodplain*. NRA Monograph Series No. 2, Wordwell, Bray.

Cassidy, B. 1991a Digging at Dunbell. *Archaeology Ireland,* **5**(2), 18–20

Channing, J. 2007 *A post excavation report on site AR053 and AR054, Baysrath and Knocktopher Commons, Co Kilkenny.* Unpublished report to Kilkenny County council on behalf of Valerie J Keely Ltd

Comber, M. 2008 *The Economy of the Ringfort and Contemporary Settlement in Early Medieval Ireland*. BAR International Series 1773. Oxford. Archaeopress.

Condit, T. & Gibbons, M. 1988 Two Little-Known Hillforts in Co. Kilkenny. *Decies* **37**, 47–53. Old Waterford Society.

Corlett, C. 1997 A fulacht fiadh site at Moynagh Lough, County Meath. *Ríocht na Mídhe,* **9**(3), 46–9.

Coughlan, T. 2010 Burrow or Glenanummer 3, Co Offaly Final Report. Unpublished report prepared for Irish Archaeological Consultancy Ltd.

Crew, P. 1991 The experimental production of prehistoric bar iron. *Historical Metallurgy* **25**, 21–36.

Crew, P. & Rehren, T. 2002 Appendix 1: High-temperature workshop residues from Tara: iron, bronze and glass. In H. Roche *Excavations at Raith na Rig, Tara Co. Meath 1997.* Discovery Programme Reports **6**, 83–102. Dublin, Royal Irish Academy/Discovery Programme.

Crouch, D. 2002 *William Marshal: Knighthood, War and Chivalry, 1147–1219*. Pearson Education, 101.

Dennehy, Frazer, McQuade, Molloy, & Slater 2006 N9/N10 Kilcullen to Waterford Scheme: Waterford to Powerstown Investigations, Contract 2: Knockmoylan to Danesfort townlands, Co. Kilkenny. Archaeological Assessment Report, A032/05–08. Unpublished Report for MGL Ltd.

Doody, M. 2000 Bronze Age houses in Ireland. In A. Desmond, G. Johnson, M. McCarthy, J. Sheehan & E. Shee Twohig (eds), *New agendas in Irish Prehistory*, 135–60. Wordwell, Bray.

Drewett, P. 1979 New Evidence for the Structure and Function of Middle Bronze Age Round Houses in Sussex. *Archaeological Journal*, **136**, 3–11.

Drewett, P 1982 Later Bronze Age Downland Economy and Excavations at Black Patch, East Sussex. *Proceedings of the Prehistoric Society* **48**, 321–400.

Eoghan, J. 2007 Cleansing the body and soul? *Seanda,* **2**, 38–39.

Foley, C. 1974 Pressé of excavation results, 1973. *National Monuments Files F94/1781/1.*

Foley, C. 2006 Excavation of a ringfort at Dunbell Big, Co. Kilkenny. *Journal of the Royal Society of Antiquaries of Ireland* **136**, 5–22.

Gibbons, M. 1990 The Archaeology of Early Settlement in County Kilkenny. In W. Nolan & K. Whelan (eds.) *Kilkenny: History and Society,* 1–32. Geography Publications.

Ginn, V. and Rathbone, S. 2012 *Corrstown: A Coastal Community*. Oxbow, Oxford.

Graves, J. 1860 Three Urns from Danesfort. *The Journal of the Kilkenny and South-East of Ireland Archaeological Society* **3**, Dublin: University Press, 168–169

Grogan, E., O' Donnell, L. and Johnstown, P. 2007 *The Bronze Age Landscapes of the Pipeline to the West*. Wordwell, Bray.

GSB Prospection Ltd 2003 *Geophysical Survey Report 2003/39, N9/N10 Kilcullen to Waterford – South: Powerstown to Waterford*.

Guilbert, G 1982 A 'Sussex-style' of post-ring layout in Bronze-Age roundhouses. *Sussex Archaeological Collections*, No. 120, 209–13.

Hall, A and Photos-Jones, E. 1998 The bloomery mounds of the Scottish Highlands: Part II – a review of iron mineralization in relation to the Scottish Highlands bloomeries. *Journal of the Historical Metallurgy Society* **32** (2), 54-66.

Jeffrey, S. 1991 Burnt mounds, fulling and early textiles?. In M. Hodder and L. Barfield (eds), *Burnt Mounds and Hot Stone Technology,* 97–102. Sandwell Metropolitan Borough Council.

Keeley, V. J. Ltd 2005 *N9/N10 Kilcullen to Waterford Scheme: Waterford to Powerstown. Environmental Impact Statement. Chapter 17: Archaeology and Cultural Heritage, Chapter 18: Architectural Heritage.*

Kenny, N. 2007 *On the Recent Archaeological Discoveries in the Townlands of Derryvorrigan and Derrinsallagh: Iron Production and Ironworking in the Iron Age and Beyond*. Unpublished report prepared for Archaeological Consultancy Services Ltd.

Laidlaw, G. 2008 Cleansing the body and soul? Part II. *Seanda,* **3**, 26–37.

Lawless, C. 1990 A *Fulacht Fiadh* Bronze Age cooking experiment at Turlough, Castlebar. *Cathair na Mart,* **10,** 1–10.

Lawlor, H.C. 1925 *The Monastery of Saint Mochai of Nendrum*. Belfast Natural History and Philosophical Society

Lucas, A. T. 1965 Washing and bathing in ancient Ireland. *Journal of the Royal Society of Antiquaries Ireland,* **96**, 65–114.

Lyng, T. 1984 *Castlecomer Connections: Exploring History, Geography and Social Evolution in North Kilkenny Environs* 217, 387, 410–413

Lynn, C. 1983 Two raths at Ballyhenry, Co. Antrim. *Ulster Journal of Archaeology* **46**, 67–91.

McClatchie, M., Brewer, A., Dillion, M., Johnston, P., Lyons, S., Monk, M., Stewart, K. and Timpany, S. 2007 Brewing and *fulachta fiadh*. *Archaeology Ireland,* **21**(4), 46.

Musson, C. 1970 House-plans and prehistory. *Current Archaeology*, **2** (10), 267–75.

Mytum, H. 1992 *The Origins of Early Christian Ireland*. London, Routledge.

O' Drisceoil, D. A. 1988 Burnt mounds: cooking or bathing. *Antiquity,* **62**, 671–80.

O' Kelly, M. J. 1954 Excavations and experiments in ancient Irish cooking-places. *Journal of the Royal Society of Antiquaries Ireland,* **84,** 105–55.

O'Kelly, M. J. 1961 The ancient method of smelting iron. *Internat. Kongress fuer Von u. Fruegeschichte*, 459–91. Hamburg, Universitatsbibliothek Basel.

O'Kelly, M.J. 1962 Two Ringforts at Garryduff, Co Cork. *Proceedings of the Royal Irish Acadamy.* **63**C, 17–125.

Ó Néill, J. 2003–2004 Lapidibus in igne calefactis coquebatur: The historical burnt mound 'tradition'. *The Journal of Irish Archaeology,* **12–13**, 79–85.

Ó Néill , J. forthcoming Inventory of Bronze Age Structures. British Archaeology Reports. Archaeopress, Oxford

Photos-Jones, E., Atkinson, J., Hall, A. and Banks, I. 1998 The bloomery mounds of the Scottish Highlands: Part I – the archaeological background. *Journal of the Historical Metallurgy Society* **32** (1), 15–32.

Pleiner, R. 2000 *Iron in Archaeology: The European Bloomery Smelters*. Prague, Archaeologicky USTAV AV CR.

Power, D., Byren, E., Egan, U., Lane, S. and Sleeman, M. 1997 *Archaeological inventory of County Cork. Volume 3: Mid Cork.* The Office of Public Works, Dublin.

Quinn, B. and Moore, D. 2007 Ale, brewing and *fulachta fiadh*. *Archaeology Ireland,* **83**, 8–10.

Raftery, B. 1969 Freestone Hill, Co. Kilkenny: An Iron Age Hillfort and Bronze Age Cairn. *PRIA,* **68**C, 1–108.

Raftery, B. 1994 *Pagan Celtic Ireland: The Enigma of the Irish Iron Age*. London, Thames and Hudson.

Roseveare, M. and Roseveare, A. (ArchaeoPhysica Ltd) 2005 *N9/N10 Kilcullen to Waterford Scheme: Waterford to Powerstown Geophysical Survey Report*.

Scott, B. G. 1990 *Early Irish Ironworking*. Belfast, The Ulster Museum.

Tylecote, R. F. 1962 *Metallurgy in Archaeology*. London: Edward Arnold.

Tylecote, R. F. 1986 *The Prehistory of Metallurgy in the British Isles* London, Institute of Metals.

Walsh, C. 1990 A Medieval Cooking Trough from Peter Street, Waterford. In V. Buckley (ed.), *Burnt Offerings: International Contributions to Burnt Mound Archaeology*, 47–8. Dublin, Wordwell.

Walsh, F. 2008 Killickaweeny 1: high-class early medieval living. In N. Carlin, L. Clarke and F. Walsh, *The Archaeology of Life and Death on the Boyne Floodplain: The Linear Landscape of the M4*, 27–54. Dublin, National Roads Authority, Wordwell.

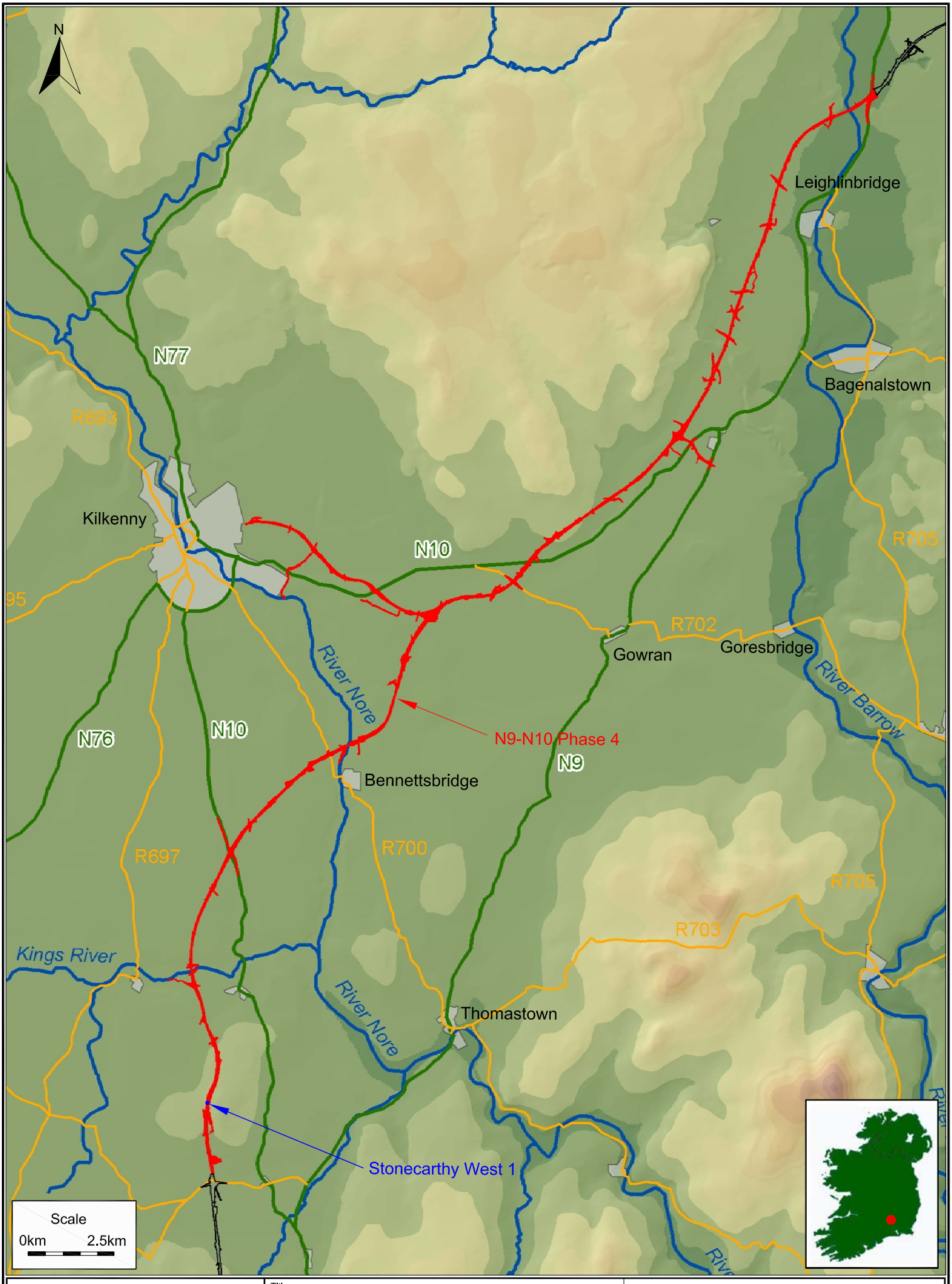
5.2 Other Sources

Record of Monuments and Places (RMP), The Department of the Environment, Heritage and Local Government, 7 Ely Place Upper, Dublin 2.

Topographical Files of the National Museum of Ireland, Kildare Street, Dublin 2.

Electronic references

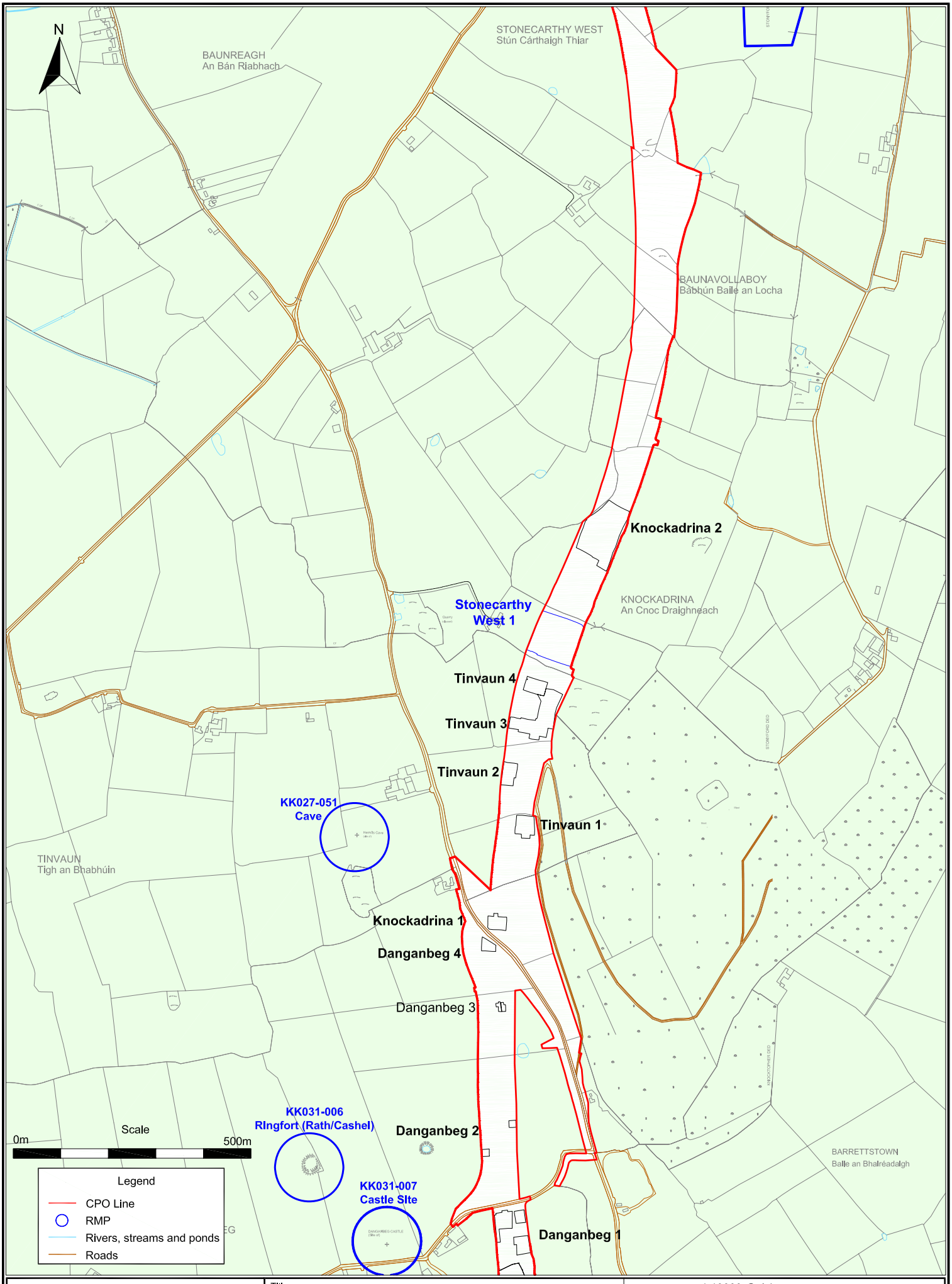
ENVision; *Environmental Protection Agency* (EPA) Soil maps of Ireland
http://www.epa.ie/InternetMapViewer/mapviewer.aspx



IAC Irish Archaeological Consultancy

Title:	Stonecarthy West 1 - General Site Location
Project:	N9-N10 Phase 4: Knocktopher to Powerstown
Client:	Kilkenny County Council

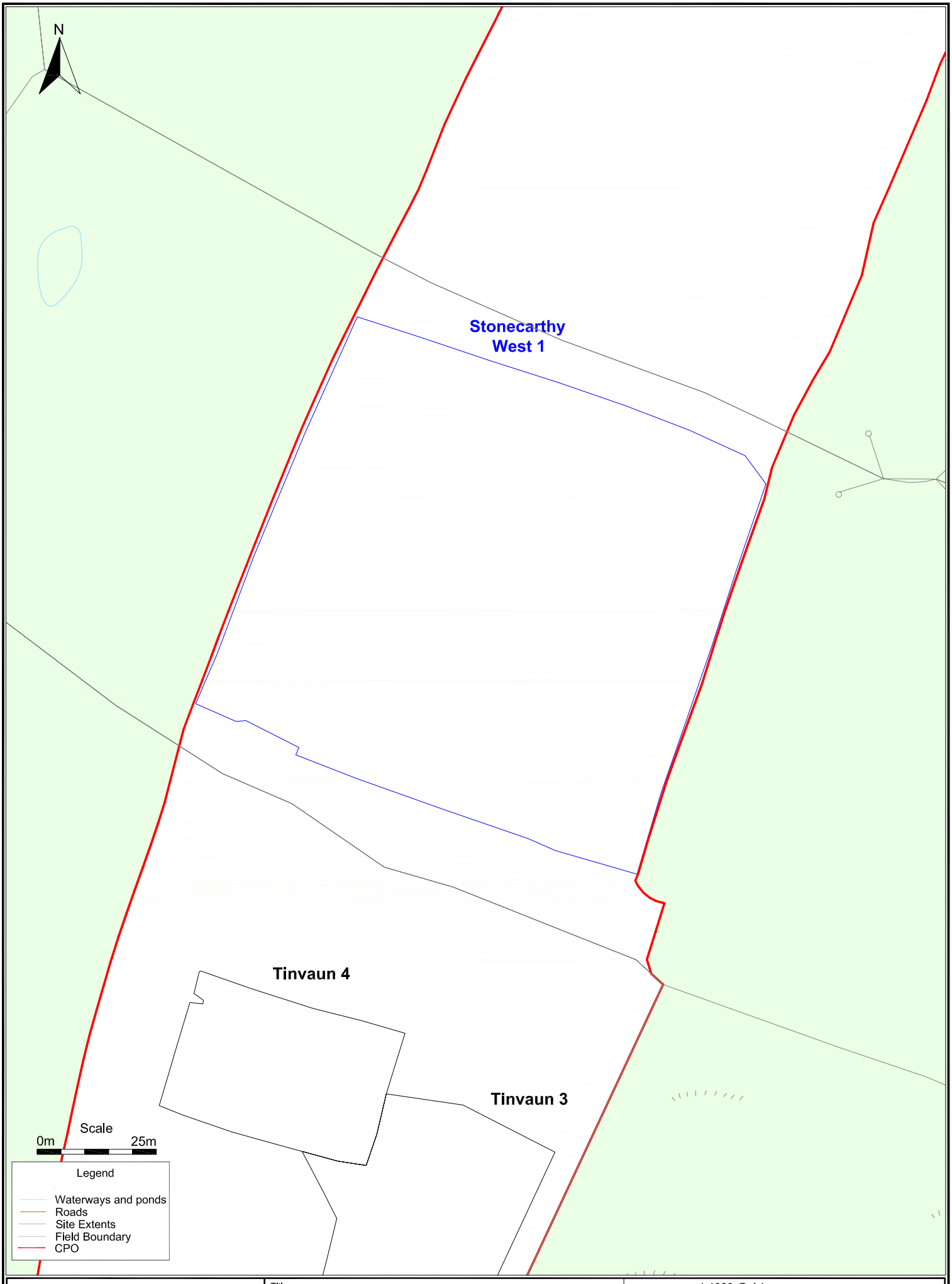
Scale:	As Shown
Date:	31/05/10
Produced by:	P Higgins
Job No:	J2432
Figure No:	1



IAC Irish Archaeological Consultancy

Title:	Stonecarthy West 1 - Location of site showing RMPs
Project:	N9-N10 Phase 4: Knocktopher to Powerstown
Client:	Kilkenny County Council

Scale:	1:10000 @ A4
Date:	17/05/10
Produced by:	P Higgins
Job No:	J2432
Figure No:	2



IAC Irish Archaeological Consultancy

Title:	Stonecarthy West 1 - Location of site within development
Project:	N9-N10 Phase 4: Knocktopher to Powerstown
Client:	Kilkenny County Council

Scale:	1:1000 @ A4
Date:	10/05/10
Produced by:	P Higgins
Job No:	J2432.1
Figure No:	3

N

Pit C104
2A
2B
Field Drain C49
251569, 140046
Pit C61
Pit C83
Pit C72
Pit C62
Limit of burnt mound
Well C58
1440 - 1315 BC
771 - 539 BC Trough C93
Slot trench C65 1757-1616BC
Trough C75
Pit C88
Pit C33
Pit C23
Pit C18
Pit C15
1A
Pit C9
1B
Pit C8
Pit C5
Bowl furnace C29
7A
7B
251519, 139996
251569, 139996
Pit C42
Pit C6
Pit C30
Pit C7
Pit C12
Pit C10
Pit C20
Pit C31

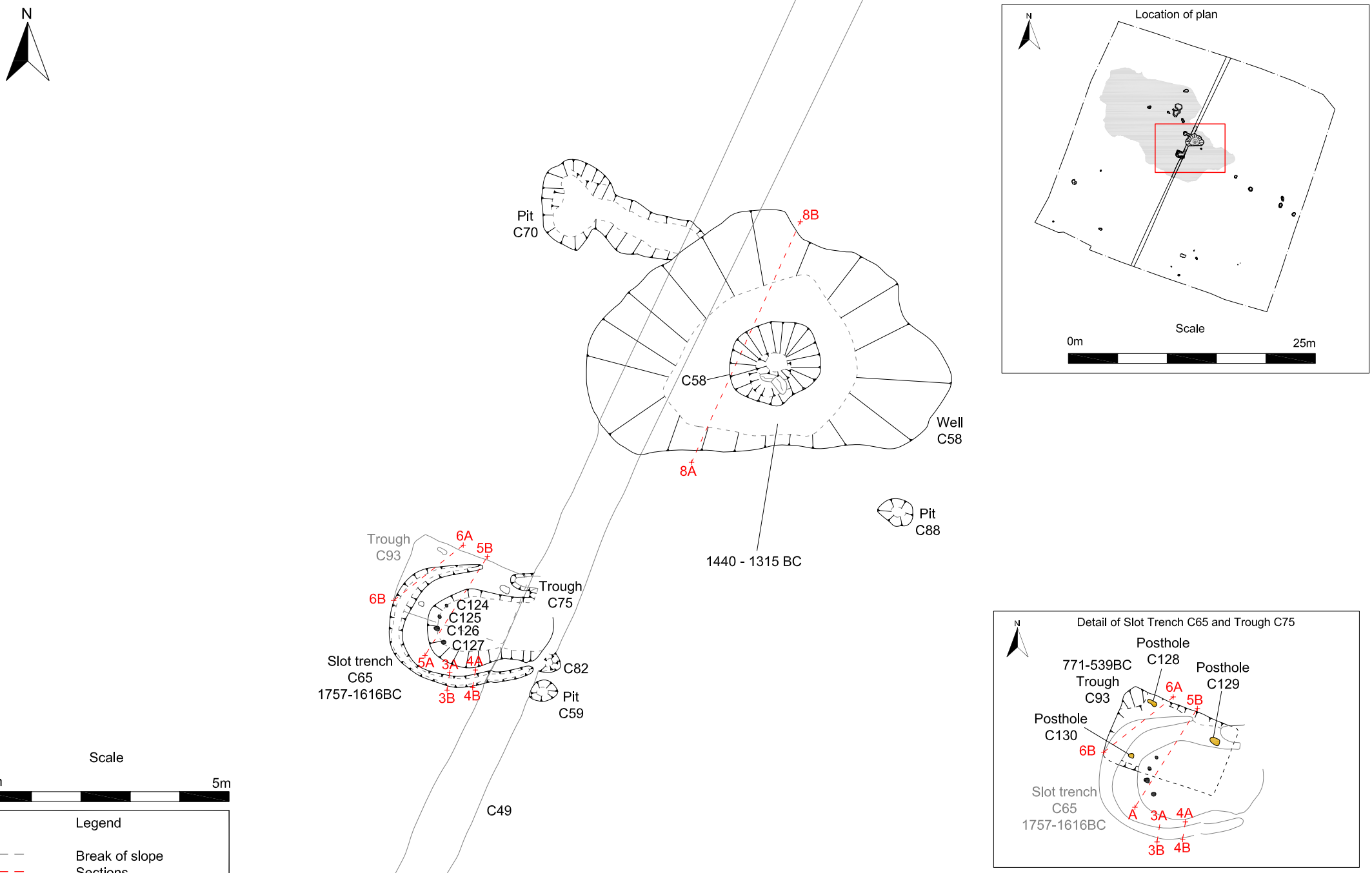
Location of plan

0m Scale 100m

Scale
0m 10m

Legend
- Break of slope
- Sections
- Cxx Cut numbers
- Burnt mound deposits
- XXXXXXE XXXXXXN National Grid Reference
- XX.XX Levels - metres OD

Title:	Stonecarthy West 1 - plan of site	
Project:	N9/N10 Phase 4: Knocktopher to Powerstown	
Client:	Kilkenny County Council	
Scale: 1:300 @A3	Job No: J2432	IAC Irish Archaeological Consultancy
Date: 20/10/12	Figure No: 4	
Produced by: G Kearney		

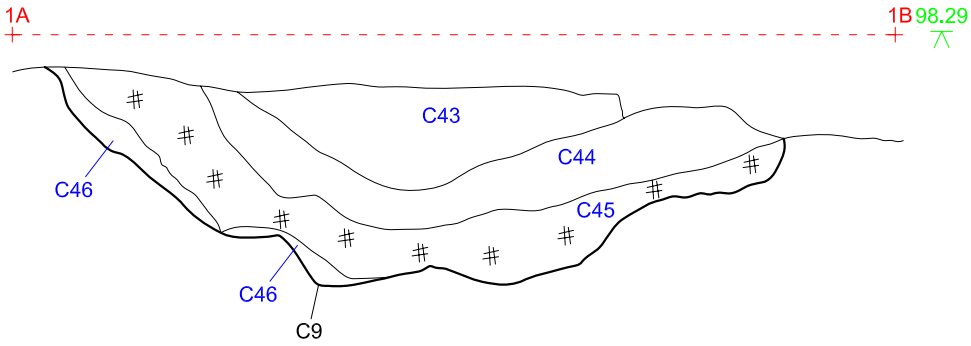


IAC Irish Archaeological Consultancy

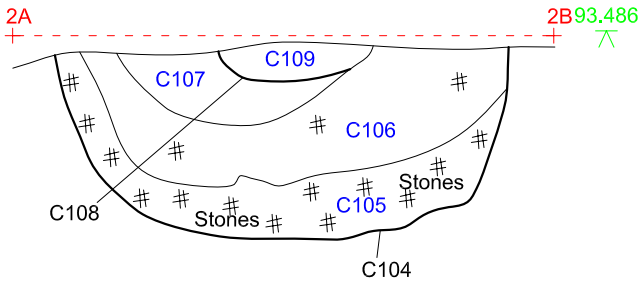
Title:	Stonecarthy West 1 - detail plan of site
Project:	N9/N10 Phase 4: Knocktopher to Powerstown
Client:	Kilkenny County Council

Scale:	1:100 @ A4
Date:	20/10/12
Produced by:	G Kearney
Job No:	J2432
Figure No:	5

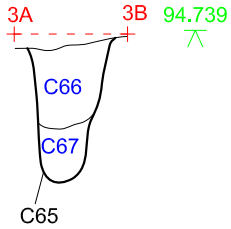
South-west facing section of C9



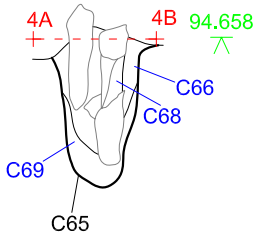
West facing section of C104 & C108



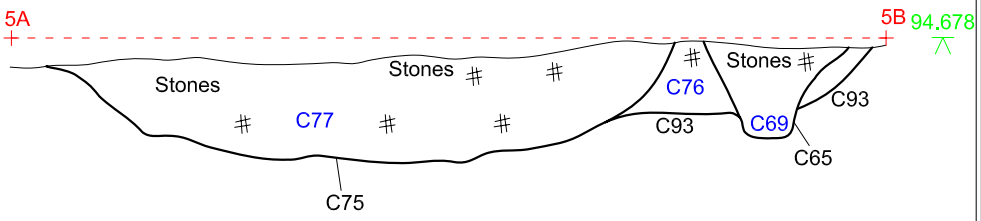
West facing section of C65



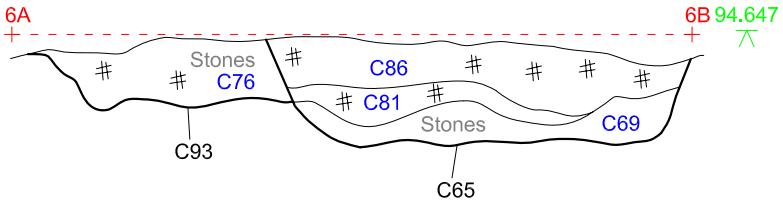
West facing section of C65



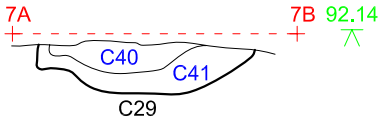
South-east facing section of C65, C75, C93



North-west facing section of C65, C93



South facing section of C29



Scale

0m 1m

Legend

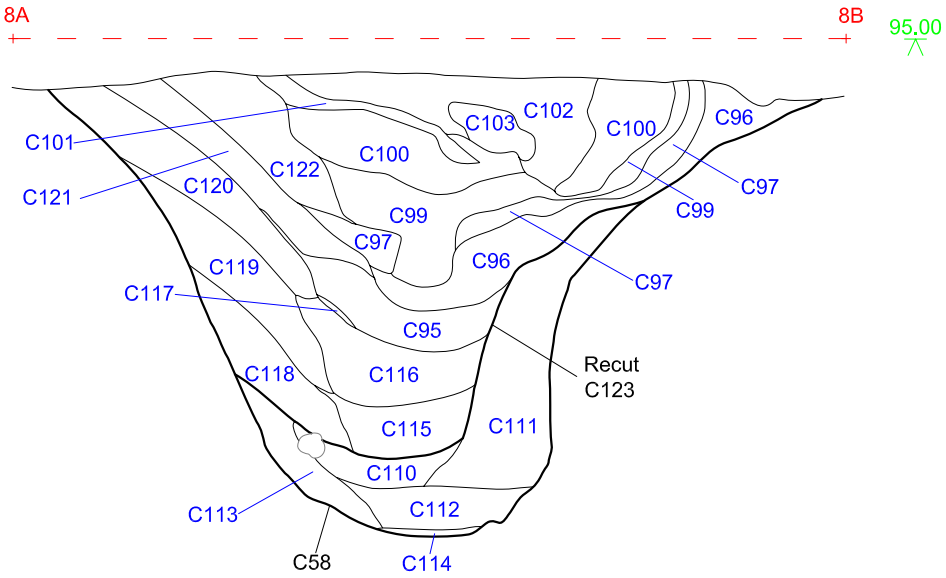
Cxx	Cut numbers
Cxx	Fill numbers
	Stone
#	Charcoal
xx.xx	Levels - metres OD

IAC Irish Archaeological Consultancy

Title:	Stonecarthy West 1 - sections 1 - 7
Project:	N9/N10 Phase 4: Knoctopher to Powerstown
Client:	Kilkenny County Council

Scale:	1:20 @ A4
Date:	31/05/10
Produced by:	G Kearney
Job No:	J2432
Figure No:	6

South-east facing section of Well feature C58



Scale

0m 2.5m

Legend

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

IAC Irish Archaeological Consultancy

Title:	Stonecarthy West 1 - section 8
Project:	N9/N10 Phase 4: Knocktopher to Powerstown
Client:	Kilkenny County Council

Scale:	1:50 @ A4
Date:	31/05/10
Produced by:	G Kearney
Job No:	J2432
Figure No:	7

PLATES

Plate 1: Post-excavation view of central area of site, facing north-east
(Photo: Gavin Duffy, AirShots Ltd)

Plate 2: Slot trench C65 and troughs C75 and C93, post-excavation, facing west

Plate 3: Slot trench C65 and troughs C75 and C93, post-excavation, facing east

Plate 4: Well C58, mid-excavation, facing west

Plate 5: Well C58, mid-excavation, facing west

Plate 6: Basal fill of Well C58, mid-excavation, facing south-east

Plate 7: Basal section of Well C58, post-excavation

Plate 8: Detail of C65 slot trench and C68 packing stones which may have supported vertical planking facing north-east.

Plate 9: Slag rich smelting furnace C29 pre-excavation facing south

APPENDIX 1 CATALOGUE OF PRIMARY DATA

Appendix 1.1 Context Register

Context	Fill of	L(m)	W(m)	D(m)	Interpretation	Description	Context Above	Context Below
C1	N/A	N/A	N/A	0.5	Topsoil	Loose, mid brown sandy silt with occasional roots and pebbles.	N/A	C2
C2	N/A	N/A	N/A	N/A	Natural geology	Compact yellowish brown sandy clay with frequent pebbles and stones.	C1	N/A
C3	void	void	void	void	void	void	void	void
C4	void	void	void	void	void	void	void	void
C5	N/A	1.54	1.17	0.25	Pit	Oval in shape with rounded corners. Gradual break of slope at the top, concave sides, gradual break of slope at the base. Flat base.	C28	C2
C6	N/A	0.6	0.3	0.04	Possible fire pit	Oval in shape. Gradual break of slope at the top, gently sloping sides, imperceptible break of slope at the base. Flat base	C17	C2
C7	N/A	1.2	0.9	0.07	Possible fire pit	Oval in shape with rounded corners. Gradual break of slope at the top, gently sloping sides, gradual break of slope at the base. Concave base.	C16	C2
C8	N/A	2.03	1.4	0.55	Pit	Oval in shape. Sharp break of slope at the top, stepped convex sides, sharp break of slope at the base. Flat base.	C39	C2
C9	N/A	2	1.24	0.6	Pit	Oval in shape. Sharp break of slope at the top, sloping sides with a step at the north, imperceptible break of slope at the base. Concave base.	C46	C2
C10	N/A	0.3	0.28	0.15	Pit	Circular in shape. Sharp break of slope at the top, concave sides, gentle break of slope at the base. Concave base.	C11	C2
C11	C10	0.3	0.28	0.25	Primary fill of pit	Moderately compact, mid greyish brown silty clay with occasional charcoal flecks and small stones.	C1	C10
C12	N/A	0.28	0.28	0.14	Pit	Circular in shape. Sharp break of slope at the top, steep sides, sharp break of slope at the base. Flat base.	C14	C2
C13	C12	0.28	0.28	0.04	Upper fill of pit	Moderately compact, dark brown silty clay with occasional charcoal.	C1	C14
C14	C12	0.28	0.28	0.10	Basal fill of pit	Moderately compact, mid greyish brown silty clay with occasional charcoal flecks and small stones.	C13	C12
C15	N/A	1.76	1.74	0.21	Pit	Circular in shape. Gradual break of slope at the top, sloping sides at the south and steep at the north, gentle break of slope at the base. Flat base.	C26	C2

Context	Fill of	L(m)	W(m)	D(m)	Interpretation	Description	Context Above	Context Below
C16	C7	1.1	0.57	0.07	Primary fill of fire pit	Soft, dark grey silty clay with very occasional charcoal flecking and stones	C1	C21
C17	C6	1	0.76	0.04	Primary fill of fire pit	Soft, mid brown silty clay with moderate charcoal flecking.	C1	C19
C18	N/A	1.1	1.05	0.2	Pit	Circular in shape. Sharp break of slope at the top, sloping sides, imperceptible break of slope at the base. Flat base.	C22	C2
C19	C6	0.6	0.3	0.04	Oxidised base of fire pit	Compact, reddish brown silty clay with very occasional small pebbles.	C17	C6
C20	N/A	0.27	0.15	0.11	Oxidised natural	Compact, orange red sandy clay with frequent charcoal flecking.	C1	C2
C21	C7	1.2	0.9	0.05	Oxidised base of fire pit	Compact, orange red sandy clay with occasional charcoal flecking.	C16	C7
C22	C18	1.1	1.05	0.2	Fill of pit	Friable, dark brown silty sand with frequent stones and charcoal.	C1	C18
C23	N/A	2.1	1.65	0.1	Possible fire pit	Oval in shape. Gentle break of slope at the top, sloping sides, imperceptible break of slope at the base. Flat base.	C25	C2
C24	C23	2.1	1.65	0.1	Primary fill of fire pit	Loose, dark brown silty clay with moderate charcoal flecking.	C1	C25
C25	C23	2.1	1.65	0.02	Oxidised base of fire pit	Compact, reddish brown silty clay.	C24	C23
C26	C15	1.74	1.61	0.17	Basal fill of pit	Moderately compact, dark grey silty sand with frequent charcoal and small sub-angular stones.	C27	C15
C27	C15	1.74	0.82	0.09	Upper fill of pit	Loose, mid brown silty sand with moderate amounts of large sub-angular heat affected stones.	C1	C26
C28	C5	1.54	1.17	0.25	Primary fill of pit	Loose, dark brown black silty sand with frequent charcoal and small heat affected stones.	C1	C5
C29	N/A	0.54	0.46	0.13	Bowl Furnace	Circular in shape. Gentle break of slope at the top, concave sides, imperceptible break of slope at the base. Concave base.	C41	C2
C30	N/A	2.4	1.26	0.27	Possible fire pit	Sub-oval in shape. Gentle break of slope at the top, sloping sides, gentle break of slope at the base. Irregular base.	C32	C2
C31	N/A	0.74	0.66	0.35	Pit	Circular in shape. Sharp break of slope at the top, steep sides, gentle break of slope at the base. Flat base.	C34	C2
C32	C30	2.4	1.26	0.3	Primary fill of pit	Friable, light brown silty sand with moderate amounts of small stones and occasional charcoal.	C1	C30
C33	N/A	0.57	0.57	0.12	Pit	Circular in shape. Sharp break of slope at the top, sloping sides, gentle break of slope at the base. Concave base.	C36	C2
C34	C31	0.3	0.3	0.07	Lens fill of pit	Soft, dark brown clayey sand with occasional charcoal.	C35	C35
C35	C31	0.74	0.66	0.3	Primary fill of pit	Loose, mid brown silty sand with moderate amounts of	C1	C31

Context	Fill of	L(m)	W(m)	D(m)	Interpretation	Description	Context Above	Context Below
						small stones.		
C36	C33	0.57	0.57	0.12	Primary fill of pit	Loose, yellowish brown silty sand with moderate amounts of small stones and very occasional charcoal.	C1	C33
C37	C8	2.03	1.4	0.28	Upper fill of pit	Friable, dark greyish black clayey silt with occasional small heat affected stones and very occasional large stones.	C1	C38
C38	C8	1.56	0.9	0.22	Mid fill of pit	Friable, mid grey sandy clay with frequent small gravelly stones and occasional large stones.	C37	C39
C39	C8	1.48	0.9	0.18	Basal fill of pit	Firm, dark greyish clayey silt with frequent charcoal and occasional small heat affected stones	C38	C8
C40	C29	0.38	0.32	0.1	Upper fill of bowl furnace	Loose, brownish grey sand with frequent amounts of iron slag.	C1	C41
C41	C29	0.52	0.42	0.1	Basal fill of bowl furnace	Loose, brownish black silty clay with frequent amounts of charcoal.	C40	C29
C42	N/A	1.42	0.87	0.12	Possible fire pit	Oval in shape. Sharp break of slope at the top, sloping sides, imperceptible break of slope at the base. Concave base.	C47	C2
C43	C9	1.2	0.93	0.28	Upper fill of pit	Friable, dark brown sandy silt with moderate amounts of large stones and occasional charcoal and small stones.	C1	C44
C44	C9	1.6	1.14	0.38	Mid fill of pit	Friable, dark grey sandy silt with occasional small stones and very occasional large stones.	C43	C45
C45	C9	1.98	0.7	0.4	Mid fill of pit	Friable, dark black sandy silt with frequent charcoal and moderate amounts of small sub angular stones.	C44	C46
C46	C9	1	0.3	0.09	Basal fill of pit	Friable, mid brown sandy silt with moderate amounts of small sub angular stones.	C45	C9
C47	C42	1.07	0.87	0.11	Basal fill of hearth	Compact, dark grey silty sand with moderate amounts of angular heat affected stones and occasional charcoal flecking.	C48	C42
C48	C42	0.44	0.33	0.12	Upper fill of hearth	Compact, mid brown silty sand with moderate amounts of mid size angular heat affected stones.	C1	C47
C49	N/A	-	1.2	0.35	Modern field drain	Linear in shape. Sharp break of slope at the top, concave sides, imperceptible break of slope at the base. Concave base.	C50	C2
C50	C49	-	0.5	0.35	Basal fill of field drain	Loose, mid greyish brown sandy silt with frequent large angular stones which were moderately sorted.	C71	C49
C51	N/A	40	25	0.18	Mound material	Firm, Dark brownish black sandy silt with frequent charcoal and heat shattered stones.	C1	C2
C52	N/A	12	5	0.16	Mound material	Firm, black sandy silt with frequent charcoal and heat shattered stones.	C1	C2

Context	Fill of	L(m)	W(m)	D(m)	Interpretation	Description	Context Above	Context Below
C53	N/A	c.40	2	0.22	Mound material	Moderately compact, mid brown sandy clay with moderate small and medium sized heat shattered stones.	C1	C2
C54	void	void	void	void	Void	void	void	void
C55	void	void	void	void	Void	void	void	void
C56	void	void	void	void	Void	void	void	void
C57	void	void	void	void	Void	void	void	void
C58	N/A	7	4.6	3	Well	Sub-circular in shape. Sharp break of slope at the top, sloping sides to a visible ridge then steep to the base. Sharp break of slope at the base. Flat base.	C114	C2
C59	N/A	0.62	0.54	0.09	Pit	Oval in shape. Gentle break of slope at the top, sloping sides, gradual break of slope at the base. Concave base.	C60	C2
C60	C59	0.62	0.54	0.9	Primary fill of pit	Loose, dark grey silty sand with occasional charcoal flecking and small stones.	C1	C59
C61	N/A	1.5	0.93	0.38	Pit	Oval in shape. Gentle break of slope at the top, sloping sides, gradual break of slope at the base. Flat base.	C92	C2
C62	N/A	2.25	0.9	0.28	Pit	Oval in shape. Sharp break of slope at the top, sloping sides, gentle break of slope at the base. Flat irregular base.	C63	C2
C63	C62	0.9	0.64	0.25	Basal fill of pit	Friable, mid brown silty clay with occasional charcoal flecking and heat shattered medium sized stones.	C64	C62
C64	C62	1.4	0.9	0.28	Upper fill of pit	Loose, black silty clay with frequent charcoal, medium sized stones and occasional ash.	C1	C63
C65	N/A	6	0.23	0.36	Slot-trench	Horse shoe shaped with opening to the east. Sharp break of slope at the top, steep sides, gentle break of slope at the base. Concave base.	C67	C2
C66	C65	6	0.23	0.22	Upper fill of slot-trench	Moderately compact, dark grey silty sand with frequent small sub angular stones and occasional charcoal.	C1	C67
C67	C65	2.82	0.14	0.13	Basal fill of slot-trench	Loose, light grey silty sand with very occasional small stones.	C66	C65
C68	C65	2.82	0.2	0.36	Stone packing of slot	large stones within C66 which may represent stone packing. Max size of stones was 0.25x0.06.	C1	C69
C69	C65	4	0.13	0.17	Basal fill of slot-trench	Loose, mid grey silty sand with no inclusions.	C68	C65
C70	N/A	3.1	1.72	0.37	Pit	Sub-oval in shape. Sharp break of slope at the top, steep sides, sharp break of slope at the base. Concave base.	C78	C2
C71	C49	-	0.7	0.45	Upper fill of field drain	Moderately compact, mid orangey brown sandy silt with occasional medium sized angular heat shattered stones.	C1	C50
C72	N/A	1.12	0.85	0.25	Pit	Sub-oval in shape. Gentle break of slope at the top, sloping sides, gentle break of slope at the base. Irregular	C74	C2

Context	Fill of	L(m)	W(m)	D(m)	Interpretation	Description	Context Above	Context Below
						base.		
C73	C72	1.12	0.85	0.13	Upper fill of pit	Friable, black silty clay with frequent charcoal and occasional small stones.	C1	C74
C74	C72	1.12	0.85	0.13	Basal fill of pit	Friable, greyish brown silty sand with occasional charcoal flecking and medium sized stones.	C72	C73
C75	N/A	2.4	1.5	0.28	Trough	Oval in shape. Sharp break of slope at the top, steep sides, sharp break of slope at the base. Slightly concave base.	C76	C2/ C77
C76	C93	3.45	0.44	0.2	Fill of trough	Soft, dark blackish grey silty clay with frequent charcoal, moderate amounts of heat affected angular stones and occasional burnt bone.	C75	C93
C77	C75	2.4	1.5	0.28	Fill of trough	Soft, dark grey clayey silt with moderate amounts of angular stones and occasional charcoal.	C1	C75
C78	C70	1.15	1.36	0.42	Basal fill of pit	Friable, dark black silty sand with small and large stones	C79	C70
C79	C70	2.05	1.5	0.42	Upper fill of pit	Friable, mid to dark orange brown sandy silt with small sub rectangular stones	C1	C78
C80	C70	0.41	0.6	0.16	Basal fill of pit	Friable, dark grey sandy silt with small and large stones	C79	C70
C81	C65	0.3	2.82	0.06	Mid fill of pit	Loose, light grey mottled with orange silty sand	C66	C69
C82	N/A	0.47	0.34	0.18	Pit	Oval in plan. sharp break of slope at the top, sides are steep on SW edge, slightly more gradual on SE, gradual break of slope at the base. Concave base	C87	C2
C83	N/A	5.3	2.8	0.68	Pit	Irregular in plan with a sharp break of slope at the top and base, steep sides and round base.	C84	C2
C84	C83	1.36	1.7	0.46	Primary fill of pit	Friable, black silty clay with frequent quantity of stones and charcoal	C85	C83
C85	C83	1.76	2.25	0.68	Fill of pit	Friable, black mottled yellow brown silty sand with frequent amount charcoal and stones at the top	C86	C84
C86	C83	2.79	2.6	0.26	Fill of pit	Friable, black grey silty sand with stones and charcoal	C1	C85
C87	C82	0.47	0.34	0.18	Primary fill of pit	Loose dark blackish grey silt or clayey silt with frequent amount of charcoal, moderate angular pebbles, occasional sub angular stones	C1	C82
C88	N/A	0.65	0.82	0.21	Pit	Oval shaped, sharp break of slope at the top, steep sides gentle break of slope at the base and U-shaped base.	C90	C2
C89	C88	0.41	0.82	0.13	Upper fill of pit	Moderately compact, dark grey silty sand with abundant small burnt stones	C1	C90
C90	C88	0.57	0.82	0.06	Basal fill of pit	Loose, light grey silty sand with occasional small sub angular stones	C89	C88
C91	C61	1.5	0.93	0.2	Upper fill of pit	Slightly friable mid to dark brownish grey sandy clay with	C1	C92

Context	Fill of	L(m)	W(m)	D(m)	Interpretation	Description	Context Above	Context Below
						frequent roots, occasional flecks of charcoal and very occasional red sandstone stones		
C92	C61	0.9	0.93	0.15	Basal fill of pit	Very friable brown yellowish gravelly sandy silt with frequent roots.	C91	C61
C93	N/A	2.45	1.44	0.2	Trough	Sub oval, NW-SE orientated, gentle break of slope at the top, sloping sides are at the NE, steep on NW, gentle break of slope at the base. Flat base.	C77	C2
C94	C58	3.18	0.6	1.6	Fill of Well	Moderately compact, grey sandy silt with occasional amount of small stones. Same as C111.	C96	C112
C95	C123	2	1.3	0.44	Fill of well re-cut	Greyish brown silty clay	C98	C116
C96	C123	3.18	2.9	0.8	Fill of well re-cut	Moderate, yellowish grey clayey silt with occasional amount of angular/sub angular stones	C97	C95
C97	C123	3	2.6	0.75	Fill of well re-cut	Moderately compact, yellowish brown silty clay	C99	C96
C98	C58	3.18	1.5	3.05	Fill of Well	Black stony silt with frequent amounts of angular/sub angular stones. Same as C113	C1	C114
C99	C123	3	2.4	0.64	Fill of well re-cut	Moderately compact, yellowish brown silty clay with occasional medium/large angular stones.	C100	C97
C100	C123	3	2.6	0.92	Fill of well re-cut	Moderately compact, brownish yellow silty clay with occasional angular stones	C101	C99
C101	C123	3	1.45	0.26	Fill of well re-cut	Moderately compact, dark brown silty clay	C102	C100
C102	C123	3	2.05	0.75	Fill of well re-cut	Compact mid brown silty clay with occasional small stones	C1	C103
C103	C123	0.6	0.6	0.31	Fill of well re-cut	Compact mid to dark brown silty clay with occasional small stones	C102	C100
C104	N/A	2	1.3	0.6	Pit	Oval shaped, E-W orientated, sharp break of slope at the top, steep sides, gentle break of slope at the base. Flat base	C105	C2
C105	C104	2	1.3	0.18	Basal fill of pit	Friable, black silt with charcoal with occasional large/medium angular stones and small sub angular reddish sandstone	C106	C104
C106	C104	2	1.3	0.3	Mid fill of pit	Weakly cemented, mid grey clayey silt with occasional amount of small stones, flecks of charcoal and roots	C108	C105
C107	C104	–	0.77	0.17	Mid fill of pit	Friable, light brownish grey clayey silt with very occasional small irregular pebbles	C108	C106
C108	N/A	2	0.4	0.1	Furrow	Linear, E-W orientated with sharp break of slope at the top & base with sloping sides and flat base.	C109	C107
C109	C108	2	0.4	0.1	Fill of furrow	Friable, mid brown sandy silt with occasional roots and pebbles	C1	C108

Context	Fill of	L(m)	W(m)	D(m)	Interpretation	Description	Context Above	Context Below
C110	C58	2	1.3	0.25	Fill of Well	Compact light yellow grey silty clay with occasional small stones and charcoal	C115	C111
C111	C58	–	0.9	2.1	Fill of Well	Compact, mid to light grey silty clay with occasional small sub rounded stones and charcoal.	C110	C112
C112	C58	–	1.41	0.3	Fill of Well	Compact, mid grey silt with occasional stones and very occasional burnt mound material	C111	C113
C113	C58	–	0.4	0.25	Fill of Well	Loose, mottled grey silt with moderate burnt mound material and charcoal. Same as C98	C112	C114
C114	C58	1.2	0.43	0.08	Fill of Well	Soft, dark brown, grey silt with frequent organic inclusions and wood at base	C113	C58
C115	C123	2	0.9	0.35	Fill of well-recut	Compact mid to dark grey silty clay with occasional small washed in stones	C116	C110
C116	C123	2.3	1.05	0.7	Fill of well-recut	Compact light to mid greyish brown silty clay with occasional small washed in stones	C117	C115
C117	C123	0.4	0.3	0.08	Fill of well-recut	Mottled light to mid grey silty clay with charcoal rich and stone material	C95	C116
C118	C123	-	0.95	0.5	Fill of well-recut	Dark grey/black silt clay, frequent charcoal, occasional burnt stones	C119	C123
C119	C123	-	1.4	0.5	Fill of well-recut	Dark grey/black silt clay, frequent charcoal	C120	C118
C120	C123	-	1.55	0.4	Fill of well-recut	Dark grey/black silt clay, frequent charcoal, occasional burnt stones	C121	C119
C121	C123	-	1.5	0.25	Fill of well-recut	Dark grey/black silt clay, frequent charcoal	C122	C120
C122	C123	-	1.2	0.75	Fill of well-recut	Dark grey/black silt clay, frequent charcoal	C99	C121
C123	N/A	3	2.8	2.4	Re-cut of Well C58	Circular, steep sides, rounded base	C118	C110
C124	N/A	0.1	0.1	-	Stakehole cut and fill	Soft, dark grey clayey silt with occasional charcoal.	C76	C2
C125	N/A	0.12	0.12	-	Stakehole cut and fill	Soft, dark grey clayey silt with occasional charcoal.	C76	C2
C126	N/A	0.18	0.17	-	Stakehole cut and fill	Soft, dark grey clayey silt with occasional charcoal.	C76	C2
C127	N/A	0.15	0.14	-	Stakehole cut and fill	Soft, dark grey clayey silt with occasional charcoal.	C76	C2
C128	N/A	0.22	0.1	0.2	Cut of posthole	Sub oval, sharp sides, rounded base	C131	C2
C129	N/A	0.22	0.15	0.15	Cut of posthole	Sub oval, sharp sides, rounded base	C132	C2
C130	N/A	0.15	0.14	0.15	Cut of posthole	Sub circular, sharp sides, flat base	C133	C2
C131	C128	0.22	0.1	0.2	Fill of posthole	Dark grey charcoal rich silt	C76	C128
C132	C129	0.22	0.15	0.15	Fill of posthole	Dark grey charcoal rich silt	C76	C129
C133	C130	0.15	0.14	0.15	Fill of posthole	Dark grey charcoal rich silt	C76	C130

Appendix 1.2 Catalogue of Artefacts

Registration Number	Context	Item No.	Simple Name	Full Name	Material	Description	No. of Parts
E3610:001:1	1	1	Body sherd	Body sherd of Spongeware	Ceramic	A body sherd of spongeware dating to the 18th / 19th century	N/A
E3610:001:3	1	3	Crystal	Quartz crystal	Quartz crystal	Quartz crystal	N/A
E3610:001:4	1	4	Stone	Stone	Stone	Stone	N/A
E3610:001:5	1	5	Cup	Sherd of modern pottery	Ceramic	A sherd of pearlware, part of a cup dating to the 18th / 19th century	N/A
E3610:051:1	51	1	Fragment	Fragment of unidentifiable iron	Iron	A fragment of corroded iron, which may be a part of a knife. Sub-rectangular in shape, with one curving edge. Flat and rectangular in section	N/A
E3610:052:1	52	1	Cup	Sherd of modern pottery	Ceramic	A sherd of spongeware, part of a cup dating to the 19th century	N/A
E3610:053:1	53	1	Bottle	Sherd of modern glass	Glass	A bodysherd of black glass from a modern wine bottle	N/A
E3610:053:2	53	2	Rubbing-stone	Sandstone rubbing-stone	Sandstone	A possible rubbing-stone which is smoothened and flattened on one side and bears a natural depression on its opposite side.	N/A
E3610:053:3	53	3	Nail	Part of iron nail	Iron	Part of a corroded iron nail shaft, which does not retain its head. Slightly bent out of shape and sub-circular in section	N/A
E3610:053:4	53	4	Plate	Sherd of modern pottery	Ceramic	A sherd of glazed red earthenware, part of a plate or pancheon dating to the 18th / 19th century	N/A
E3610:053:5	53	5	Plate	Sherd of modern pottery	Ceramic	A sherd of glazed red earthenware, part of a plate or pancheon dating to the 18th / 19th century	N/A
E3610:053:6	53	6	Plate	Sherd of modern pottery	Ceramic	A sherd of glazed red earthenware, part of a plate or pancheon dating to the 18th / 19th century	N/A
E3610:053:7	53	7	Plate	Sherd of modern pottery	Ceramic	A sherd of porcelain, part of a plate dating to the 18th century	N/A

Appendix 1.3 Catalogue of Ecofacts

During post excavation works specific samples were processed with a view to further analysis. A total of 18 soil samples were taken from features at Stonecarthy West 1 and all 13 samples were processed by flotation and sieving through a 250µm mesh. The following are the ecofacts recovered from these samples:

Context #	Sample #	Feature type i.e. Structure A, hearth C45	charcoal	Seeds and hazelnut	Burnt animal bone	animal bone	human bone	metallurgical waste	Other
C5	9	Pit	18.0g						
C25	6	Pit	0.4g	0.1g					1g (burnt clay)
C26	5	Pit	7.1g						1.0g (shell)
C40	7	fill of bowl furnace						3500.0g	
C41	8	Furnace	29.0g					176.6g	
C45	10	Pit	58.6g						0.5g (shell)
C53	11	Mound material						14.5g	
C69	14	Slot trench	4.8g						0.3g (shell)
C76	12	Trough			3.4g				
C76	13	Trough	34.7g						0.2g (shell)
C84	15	Pit	6.2g						0.4g (shell)
C105	16	Pit	25.3g						5.3g (shell)
C114	17	Well	13.4g						

Appendix 1.4 Archive Index

Project: N9/N10 Phase 4 Knocktopher to Powerstown		
Site Name: AR067 Stonecarthy West 1		
Excavation Registration Number: E3610		
Site director: James Kyle		
Date: July 2009		
Field Records	**Items (quantity)**	**Comments**
Site drawings (plans)	22	
Site sections, profiles, elevations	17	
Other plans, sketches, etc.	0	
Timber drawings	0	
Stone structural drawings	0	
Site diary/note books	1	Shared with other JK sites
Site registers (folders)	1	
Survey/levels data (origin information)	0	
Context sheets	117	
Wood Sheets	0	
Skeleton Sheets	0	
Worked stone sheets	0	
Digital photographs	0	
Photographs (print)	0	
Photographs (slide)	0	
Security copy of archive	Yes	Digital copy

APPENDIX 2 SPECIALIST REPORTS

Appendix 2.1 Post-medieval Pottery Report – Clare McCutcheon

Appendix 2.2 Lithics Analysis Report – Farina Sternke

Appendix 2.3 Small Finds – Siobhán Scully

Appendix 2.4 Charcoal and Wood analysis Report – Susan Lyons

Appendix 2.5 Plant Remains Analysis Report – Penny Johnston

Appendix 2.6 Faunal Assemblage Report/Osteo – Aoife McCarthy

Appendix 2.7 Petrographical Reports – Dr. Stephen Mandel

Appendix 2.8 Metallurgical Waste Analysis Report – Angela Wallace MSc, MIAI

Appendix 2.9 Radiocarbon Dating Results – QUB Laboratory

Appendix 2.1 Post Medieval Pottery Report – Clare McCutcheon

A Note on the Pottery from
Stonecarthy West 1 (E3610)
N9/N10 Knocktopher to Powerstown, Co. Kilkenny

Clare McCutcheon MA MIAI

Introduction:
A total of six sherds were presented for study. All of these date to the later 18th to early 20th century.

Fabric	Sherds	MNV	MVR	Form	Date
Glazed red earthenware	3	-	1	Plate, pancheon	18th-19th
Porcelain	1	-	1	Plate	18th
Pearlware	1	-	1	Cup	18th-19th
Spongeware	1	-	1	Cup	19th
Total post-medieval	**6**	**-**	**4**		

Table 1: Pottery identification, Stonecarthy West 1 (E3610)

Glazed red earthenware:
Glazed red earthenware or 'brownwares' were made widely in Britain and Ireland from the later 17th century through to the 19th century (Dunlevy 1988, 24–5). Because of the standardisation of the clay and vessel form it is always difficult to specify a particular production site but a typical kiln was excavated at Tuam, Co. Galway with milk pans and dishes comprising a majority of the vessels (Carey & Meenan 2004). The fabric is generally sandy earthenware, usually oxidised buff to light orange through to brown. The clear lead glaze takes its colour from the fabric with variations due to firing conditions (Jennings 1981, 157).

Porcelain:
Vast quantities of porcelain were imported into Europe in the 17th and 18th centuries. The single is decorated in green rather than the more typical blue colouring.

Pearlware:
Wedgwood's development of creamware was further refined as pearlware, with a harder-fired clay and a blue rather than a green tinge in the collected glaze (Savage & Newman 1985, 216). This formed the basis for many decorative forms of the later 18th and 19th centuries such as shell-edged, mochaware, transfer printed and sprigged wares.

References:
Carey, A. and Meenan, R. 2004 Excavation of a post-medieval pottery kiln, Tuam, Co. Galway, *Journal of the Galway Archaeological & Historical Society*, **56**, 37–45.

Dunlevy, M. 1988 *Ceramics in Ireland.* National Museum of Ireland, Dublin.

Jennings, S. 1981 *Eighteen centuries of pottery in Norwich.* Norwich Survey, Centre of East Anglian Studies, University of East Anglia, Norwich.

Savage, G. and Newman, H. 1985 *An illustrated dictionary of ceramics.* Thames and Hudson, London.

Appendix 2.2 Lithics Analysis Report – Farina Sternke

Lithics Finds Report for
E3610 Stonecarthy West 1 (A032/079), Co. Kilkenny
N9/N10 Road Scheme – Phase 4

Farina Sternke MA, PhD

Contents

List of Tables

Introduction
One lithic find from the archaeological excavation of a multi-period site at Stonecarthy West 1, Co. Kilkenny was presented for analysis (Table 1). The find is associated with the remains of a *fulacht fiadh* with associated troughs, a curvilinear slot-trench, several pits and a possible well as well as a number of medieval hearths and a bowl furnace.

Find Number	Context	Material	Type	Condition	Cortex	Length (mm)	Width (mm)	Thickness (mm)	Complete	Retouch
E3610:053:2	53	Sandstone	Rubbing Stone?	Heavily weathered		148	85	37	No	No

Table 1 Composition of the Lithic Assemblage from Stonecarthy West 1 (E3610)

Methodology
All lithic artefacts are examined visually and catalogued using Microsoft Excel. The following details are recorded for each artefact which measures at least 20mm in length or width: context information, raw material type, artefact type, the presence of cortex, artefact condition, length, with and thickness measurements, fragmentation and the type of retouch (where applicable). The technological criteria recorded are based on the terminology and technology presented in Inizan *et al.* 1999. The general typological and morphological classifications are based on Woodman *et al.* 2006. Struck lithics smaller than 20mm are classed as debitage and not analysed further, unless they represent pieces of technological or typological significance, e.g. cores etc. The same is done with natural chunks.

Quantification
The lithic (E3610:053:2) is a modified piece of sandstone.

Provenance
The artefact was recovered from burnt mound material C53.

Condition:
The lithic survives in heavily weathered and incomplete condition.

Technology/Morphology:
The artefact is a possible rubbing stone which is smoothened and flattened on one side and bears a natural depression its opposite side. The stone measures 148mm long, 85mm wide and 37mm thick.

Dating:
The artefact most likely dates to the late Neolithic or Bronze Age.

Conservation
Lithics do not require specific conservation, but should be stored in a dry, stable environment. Preferably, each lithic should be bagged separately and contact with other lithics should be avoided, so as to prevent damage and breakage, in particular edge damage which could later be misinterpreted as retouch. Larger and heavier items are best kept in individual boxes to avoid crushing of smaller assemblage pieces.

Summary

The lithic find from the archaeological excavation at Stonecarthy West 1, Co. Kilkenny is a possible sandstone rubbing stone which most likely dates to the late Neolithic period or Bronze Age.

This site makes a minor contribution to the evidence for prehistoric settlement and land use in Co. Kilkenny.

References:

Inizan, M.-L, Reduron-Ballinger, M., Roche, H. and Tixier, J. 1999 *Technology and Terminology of Knapped Stone* **5**. CREP, Nanterre.

Woodman, P. C., Finlay, N. and Anderson, E. 2006 *The Archaeology of a Collection: The Keiller-Knowles Collection of the National Museum of Ireland*. National Museum of Ireland Monograph Series 2. Wordwell, Bray.

Appendix 2.3 Small Finds Report – Siobhán Scully

N9/N10 Knocktopher to Powerstown
Phase 4
Stonecarthy West 1
E3610 A032/079 AR067

Siobhán Scully
Margaret Gowen & Co. Ltd
For
Irish Archaeological Consultancy
December 2009

Introduction

This report details a single piece of post-medieval glass recovered from excavations at Stonecarthy West 1 (E3610) as part of the N9/N10 Knocktopher to Powerstown road scheme.

Glass

There is one body sherd (053:1) from a wine bottle. It is from free-blown bottle and is now covered in a patina and the surface of the glass has crizzled leading to a network of fine lines over the face of the glass. This sherd probably dates from the eighteenth or nineteenth century.

Catalogue

E3610:053:1 Wine Bottle. Body sherd. 'Black glass'. Bubbles. Patina. Crizzling. 18th–19th century.

Appendix 2.4 Charcoal and Wood analysis Report – Susan Lyons

Client – Irish Archaeological Consultancy Ltd
Site Name- Stonecarthy West 1
Excavation number –E3610 AR067
County – Kilkenny
Job code –100.89
Author- Susan Lyons

Date –15/04/10

CHARCOAL IDENTIFICATION SUMMARY REPORT

Illustrations

Figures

Tables

1 Introduction

Three charcoal samples were identified and analysed from excavations associated with burnt mound activity at Stonecarthy West 1, Co. Kilkenny as part of the resolution of the N9/N10 Kilcullen to Waterford Scheme, Phase 4B – Rathclogh to Powerstown.

The archaeological excavations revealed evidence of a burnt mound, comprising of a mixed spread, two troughs, a slot-trench, associated pits, and a large possible well. To the east and to the south were several pit clusters, with small examples to the south, probably of a medieval date and industrial function, and larger examples to the east which were filled by burnt mound material and therefore probably related to the earlier activities recorded at the site (Kyle, 2009). Two radiocarbon dates were obtained for the site; Pomoideae spp. charcoal from C114 (fill of well C58) returned a middle Bronze Age date of Cal 1440–1315BC (2 sigma), while ash charcoal from C76 (fill of trough C93) was dated to Cal 771–539BC (2 sigma).

It is generally considered that the principle reason for charcoal analysis is the hypothesis that wood used as firewood will be collected from as close to a site as possible and as such can help to reflect the local wooded environment in the area. It is also likely that abandoned structural timbers or wood brought to the site for uses in construction works or other activities are also reused as firewood. The charcoal identified can also go some way to interpreting the local woodland that grew in the vicinity of the site and possible changes to that woodland over time. This charcoal report serves as a summary report only for Stonecarthy West 1 and will later form part of an overall scheme-wide charcoal study for the N9/N10 (Lyons, *et al, forthcoming).*

2 Methodology (After IAC Ltd)

2.1 Processing

- A mechanical flotation tank using a pump and water recycling system is used for soil flotation

- The soil is washed using a 1mm mesh in the flotation tank and a 300 micron and 1mm sieve is used to catch floated material.

- The volume of all soil samples are recorded in litres using a measuring jug.

- The sample is then placed into the 1mm mesh in the flotation tank, the tank is then filled with water and the sample washed. Any large lumps of soil can be carefully broken down by hand, but the jets of water in the flotation tank gently clean the rest of the sample.

- Once the sample is clean (just stones, charcoal, artefacts remaining in the mesh) the tank is filled up with water and at this stage any floating material (charcoal, seeds etc) should flow over the spout and into the sieves.

- The retent is then gently poured into a labelled tray (containing site code, site name, sample number and context number) and place on a shelf to dry.

- The flots are securely packaged in tissue, labelled and hung up to dry. This prevents any loss of light material (seeds) which could result once the flots are dry and being moved (if they are dried on trays).

- Before washing a new sample all equipment used (measuring jugs, 1mm mesh, sieves etc) are thoroughly washed using clean water.
- The large black settling tanks (and water) are cleaned between every site, or if a large site is being processed, every 1-2 weeks.

- Any samples containing high clay content will be soaked in water for 1-2 days to aid the sieving process.

- Charcoal fragments are removed and bagged separately for identification and analysis

2.2 Charcoal identifications

Three charcoal samples from **C41** (basal fill of pit furnace **C29**), **C76** (fill of trough **C93**) and **C114** (fill of well **C58**) were selected for charcoal analysis.

The larger sized charcoal fragments (>3mm in width) are fractured to view the three planes [transverse, radial and tangential sections] necessary for microscopic wood identification. The wood species identifications are conducted under a binocular microscope using a trancident light and viewed at magnifications of 100x, 200x and 400x where applicable.

Wood species identifications are made using wood reference slides and wood keys devised by Franklin and Brazier (1961), Schweingruber (1978), Hather (2000) and the International Association of Wood Anatomists (IAWA) wood identification manuals and (www.lib.ncsu/edu/insidewood) by Wheeler, Bass and Gasson (1989).

Quantifying charcoal samples can be difficult as many wood species can be affected by heat is different ways and hence become fragmented into an arbitrary number of fragments. Due to the potential for a very high number of charcoal fragments from the samples, a representative sample of 50 charcoal fragments (Keepax, 1988) are randomly chosen from larger samples for identification and analysis. In the case of smaller samples all charcoal fragments within are identified. The charcoal fragments of each species identified are counted, weighted (grams) and bagged according to species.

2.3 Details of charcoal recording

The general age group of each taxa per sample is recorded, and the growth rates are classified as slow, medium, fast or mixed. It was not within the scope of this project to measure all the ring widths from the charcoal, however, some measurements are taken with a graticule in the microscope in order to make the scale of slow, medium and fast growth less subjective. Slow growth within the charcoal from this site is considered to be approximately 0.4mm per annum, medium approximately 1mm per annum and fast approximately 2.2mm per annum.

The ring curvature is also noted where applicable from each charcoal fragment. Weakly curved annual rings suggest the use of trunks or larger branches, while strongly curved annual rings indicate the burning of smaller branches or twigs **Fig. 1.** Tyloses within the vessels of species such as oak can denote the presence of heartwood. These are balloon-like outgrowths of adjacent parenchyma cells of xylem vessels (vascular tissue used to transport water and minerals). When the plant is

subjected to stressful conditions, tyloses will develop and block the vascular tissue to prevent further damage to the plant.

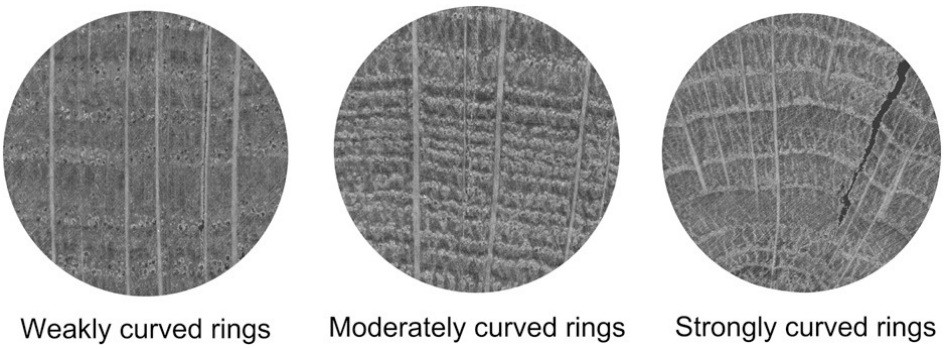


Fig. 1. Ring curvature (after Marguerie and Hunot 2007 1421, Fig. 3)

3 Results

The results of the charcoal identifications are summarized in **Table 1.**

Five wood species totaling 150 identifications were recorded from the samples associated with Stonecarthy West 1. *Alnus glutinous* (alder) was the dominant wood species recorded, especially from **C76** (fill of trough **C93**) and **C114** (fill of well **C58**). *Quercus* sp. (oak) was the second dominant species recorded, most notably from **C41** (fill of furnace **C29**). *Fraxinus excelsior* (ash) were recorded from just one feature, **C76** (fill of trough **C93**). Lesser incidences of Pomoideae spp. (pomaceous woods) and *Salix* sp. (willow*)* were also recorded from **C76** and **C114 (Fig. 2)**.

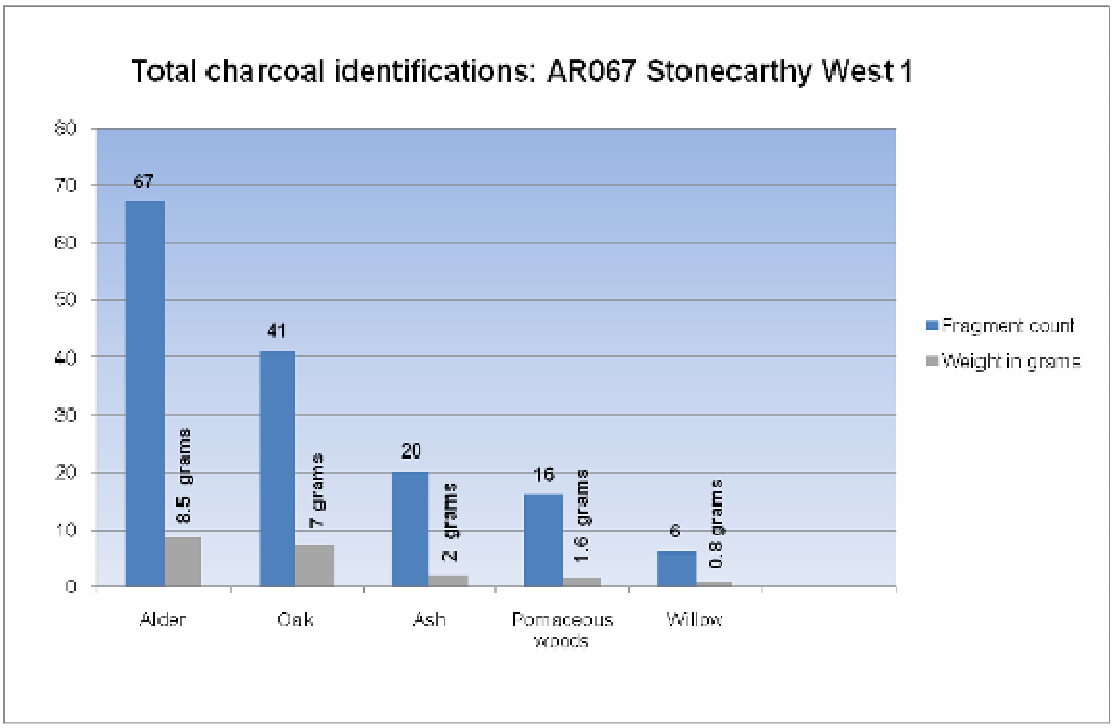


Fig. 2

4 Discussion

4.1 Background and origin of wood species

Alnus glutinous L. Gärtner (alder or black alder)
Alder is usually found growing close to running water, rivers or in damp woodland, in the latter often with oak (Orme and Coles, 1985; Rackham, 1995). In marshland alder grows as a shrub frequently mixed with willow and alder buckthorn to form alder carr (Cutler and Gale, 2000). It can also grow well in and on fen peat. Germination and early growth of alders requires a constant supply of water, however once the tree reaches maturity its root system makes the tree less dependent on high water levels (Stuijts, 2005). Alders commonly produce root nodules which contain nitrogen-fixing bacteria, known as *Schinzia alni* which enables alder to enrich soils through its fallen leaves hence allowing the tree to survive in poorer soil conditions (Milner cited in Culter and Gale, 2000; van der Meiden cited in Stuijts, 2005). In suitable conditions alder growth is fast, usually reaching a height of 25m with a maximum girth of 1m and can grow to an age of sixty to one hundred years (Strotelder cited in Stuijts, 2005). While alder makes for poor fuel, it produces good quality charcoal (Edlin, 1951). The wood can quickly turn a reddish colour after cutting and once dry it is water resistant and does not split easily. Once in a waterlogged state, alder is very durable and is often used in the construction of underwater bridge piles, houses and scaffolding (Culter and Gale, 2000). Alder is traditionally used in the making of smaller objects such as bowls, handles and broomsticks and its bark can be used in the tanning of leather (Rackham, 1980).

Quercus sp. (oak)
Oak is a tall deciduous woodland tree, often growing in association with hazel and ash. Most oak species prefer damp non-calcareous soils on lowland or montane sites at altitudes up to 4,000 m (Gale & Culter, 2000). It is a tall deciduous woodland tree, often growing in association with hazel and ash. Oaks can reach a height of 40 metres and live for 1,000 years or more (Hickie, 2002, 60). Of the 27 European species, pedunculate oak (*Quercus robur)* and sessile oak (*Quercus petraea)* are native to Ireland. Pedunculate oak is common on heavy clay and lowland soils whereas sessile oak thrives on the lighter loams characteristic of higher ground (Culter & Gale, 2000). The two native Irish oaks are usually distinguished by their acorns: the sessile oak has acorns with no stalks, while the pedunculate oak has acorns with long stalks (peduncles). The wood is easy to cleave both radially and tangentially and has provided one of the most important building materials since the prehistoric period (Gale & Culter, 2000). The heartwood timber is renowned for its durability but the paler sapwood is susceptible to beetle and fungal attack. The strength of the timber depends on the species and is influenced by climatic and edaphic factors (Edlin, 1951). When burnt, oak charcoal, particularly the dense heartwood, has higher calorific values than most European woods and this can make for good long-lasting fuel (Culter & Gale, 2000).

Fraxinus excelsior (ash)
Ash thrives well on nutrient-rich soils but is also a common woodland species and grows in mixed woodland with oak on damp, slightly acidic soils (Gale & Culter, 2000). Pollen analysis indicates that ash became more common in the pollen record from the Neolithic period onwards (Mitchell, 1953/4). This could be as a result of more clearance due to agricultural practices at the time, where ash was able to germinate and grow more vigorously as secondary woodland and in marginal areas and hedges (Kelly, 1976). Ash is also abundant in native hedgerows and was quite common in the later historic period.

Pomoideae spp. (pomaceous fruit woods)
The Pomoideae (Maloideae) woods are pomaceous fruit wood species which includes the genera *Malus* (apple), *Pyrus* (pear), *Sorbus* (rowan or whitebeam) and *Crataegus* (hawthorn). They are anatomically very similar and in the absence of bark, buds and leaves cannot be differentiated between each other very often. The pomaceous wood types are small deciduous trees or shrubs and are common to the scrub margins of woodlands and hedgerows (Gale and Culter, 2000). The apple species, often crab apple (*Malus sylvertris*) in woodlands, is a light-demanding tree and is often found in open oak woods. When dry, crab apple makes for good firewood. While its wood is durable and tough, its crooked trunks and small branches make this species unsuitable for most construction works and instead it is used in making small implements, such as tool handles, bodkins and screws.

Pear, grown as wild pear (*Pyrus pyraster*), is good as fuel. The wood is smooth, fine-grained and also suitable for turnery, household utensils, instruments and small decorative woodwork. Rowan/whitebeam (*Sorbus*) grows well in light soils and avoids clays and limestone. It can be found growing close to oak, hornbeam and hazel in Britain (Rackham, 1995). This species produces the hardest wood and was used in Europe to make cogs for machine wheels until the introduction of cast iron (Gale and Culter, 2000). Coppiced shoots were used as hoops and crates and the bark was commonly used as animal fodder (Gale and Culter, 2000, 184). Hawthorn is shade-tolerant and forms understorey in ash and hazel woodland and was commonly planted as a hedge or boundary marker. It was also used in the production of small woodworkings, turnery and idal for carving and engraving. Both hawthorn and apple-type (*Malus* sp.) produce edible fruits which would have been gathered as a foodstuff from the prehistoric period (Greig, 1991). These wood types burn slow and steady and provide excellent heat with minimal smoke (Gale and Culter, 2000).

Salix spp. (willows).
There are a number of different species of willow which cannot be differentiated through wood anatomy. They grow rapidly, and can be easily propagated from cuttings. General comments only about the genus can be made, as there are different varieties of it. They are not naturally a woodland species, although shrubby growth may occur under light woodland cover. All willows appear to favour wet conditions, and it may be a pioneer species on wet soils. The use of willow depends on the species concerned, for some grow as shrubs and others as trees, and a species may be particularly suited to some purpose. In general, the flexibility of willow shoots has led to coppicing or pollarding to produce the raw materials for baskets, frames, hurdling etc. (Orme & Coles, 1985). The main Irish native willows are grey willow (*Salix cinera*), goat willow (*Salix caprea*) and eared willow (*Salix aurita*).

4.2 Distribution of charcoal from Stonecarthy West 1

The number of identifiable charcoal fragments recovered from Stonecarthy West 1 were localised to just three features; **C41** (basal fill of pit furnace **C29**), **C76** (fill of trough **C93**) and **C114** (fill of well **C58**).

The mixed charcoal assemblage of alder, ash, oak, willow and pomaceous woods recorded from **C76** and **C114** would fit with the composition of typical burnt mound material. The periodic dumping of charred remains associated with *fulacht fiadh* activity would inevitably result in the mixing of wood species from different sources representing one or more burning events. A mixed wood assemblage is not an unusual occurrence from *fulacht fiadh*/burnt mound sites and has also been recorded from a number of similar sites excavated along the routeway of the Gas Pipeline, which ran through Counties Dublin, Meath, Westmeath, Galway and Clare

(O'Donnell, 2007) as well as from AR103 Rathcash 2 (Lyons, 2009a), AR105 Rathcash East 2 (Lyons, 2010), AR109 Blanchvillesaprk 3 (Lyons, 2009b) and AR137 Moanduff 1 (Lyons, 2010).along this scheme. While radiocarbon dating has revealed that **C76** and **C114** were not contemporary, alder and pomaceous were recorded from both features. Ash was recorded from **C76**, while willow was identified from **C114.** Whether this is indicative of a change in the local woodland species is difficult to ascertain based on just two samples and may just represent the localised selection of wood burnt.

The interpretation of pit **C29** as being associated with possible metalworking (Kyle, 2009, 9) would fit well with the high incidence of oak from **C41**. Studies of charcoal from sites containing medieval metalworking pits and bowl furnaces, namely Borris, Co. Tipperary (Lyons, 2009c), Aghamore, Co. Westmeath (O'Donnell, 2007, 51) and Kiltenan South, Co. Limerick (O'Donnell, 2007, 51) have also revealed that oak was the wood of choice used in these features. Oak produces high temperatures and long lasting charcoal, which would be very suited for such industrial activities (Culter and Gale, 2000).

5 Summary

Three charcoal samples from **C41** (basal fill of pit furnace **C29**), **C76** (fill of trough **C93**) and **C114** (fill of well **C58**) were selected for charcoal analysis.

The mixed wood assemblage of alder, ash, oak, willow, pomaceous woods and oak from features containing burnt mound material (**C76** and **C114**) is not an unusual occurrence on these site types and would have become re-deposited across the site entering and mixing with other deposits and fills. The higher occurrence of oak from **C41** may be associated with specialized activities, like metalworking, as suggested.

The results from this site will be later merged and discussed with similar sites also excavated along the N9/N10 scheme.

6 References

Brazier, J. D. and Franklin, G. L. 1961 *Identification of hardwoods: a microscopic key.* London: H.M Stationary Office

Caseldine, C. J. & Hatton, J. M. 1996 Early land clearance and wooden trackway construction in the third and fourth millennium BC at Corlea, C. Longford. *Proceedings of the Royal Irish Academy* 95**B**, 1–9

Edlin, H. L. 1951 *British plants and their uses.* London B T Batsford

Gale, R. & Cutler, D. 2000 *Plants in Archaeology: Identification manual of artefact of plant origin from Europe and the Mediterranean.* Westbury and the Royal Botanic Gardens Kew

Greig, R. A. 1991 'The British Isles' in van Zeist, W Wasylikowa & K Behre (eds), *Progress in Old World Palaeoethnobotany,* 299–334. Rotterdam: A A Balkema.

Hather, J.G. 2000 *The Identification of the Northern European Woods. A guide for archaeologists and conservators*. London: Archetype Publications Ltd

Hickie, D. 2002 *Native trees and forests of Ireland*. Dublin: Gill and Macmillan

Keepax, C.A. 1988 Charcoal Analysis with Particular Reference to Archaeological Sites in Britain. Unpublished PhD thesis, University of London

Kelly, F. 1976 The old Irish tree-list. *Celtica,* **11**, 107–124

Kyle, J. 2009 E3610 Stonecarthy West 1 Stratigraphic Report. Unpublished Stratigraphic Report. National Monuments Service. Department of the Environment, Heritage and Local Government, Dublin.

Lyons, S 2009a 'Charcoal Identification Summary Report: AR103 Rathcash 2 E3860', N9/N10 Kilcullen to Waterford Scheme. IAC Ltd

Lyons, S 2009b 'Charcoal Identification Summary Report: AR109 Blanchvillespark 3 E3913', N9/N10 Kilcullen to Waterford Scheme. IAC Ltd

Lyons, S 2009c 'Charcoal Identification Report: Site AR33 Borris, Co. Tipperary E2376', N8 (M8) Cullahill to Cashel Scheme. Unpublished technical report for Valerie J Keeley Ltd

Lyons, S 2010 'Charcoal Identification Summary Report: AR105 Rathcash East E3893', N9/N10 Kilcullen to Waterford Scheme. IAC Ltd

Lyons, S 2010 'Charcoal Identification Summary Report: AR137 Moanduff 1 E3839', N9/N10 Kilcullen to Waterford Scheme. IAC Ltd

Lyons, S., O'Carroll, E. and O'Donnell, L. forthcoming. 'Charcoal analysis from the N9 N10- overall integrated report', Unpublished report for IAC Ltd

Marguerie, D. and Hunot, J.Y. 2007 Charcoal analysis and dendrology: data from archaeological sites in north-western France. *Journal of Archaeological Science* **34** 1417–1433

Mitchell, G F, 1953/4. A Pollen Diagram from Lough Gur, Co. Limerick. *Proceedings of the Royal Irish Academy* 56**C,** 481–488

O'Donnell, L. 2007 'Environmental Archaeology: identifying patterns of exploitation in the Bronze Age' , in E Grogan, L O'Donnell and P Johnson *The Bronze Age Landscapes of the Pipeline to the West: An integrated archaeological and environmental assessment,* Ch 3, 27–101. Wordwell Ltd, Bray

Orme, B. J. and Coles, J. M. 1985 'Prehistoric woodworking from the Somerset levels: 2: Species selection and prehistoric woodlands'. *Somerset Levels papers,* **11**, 7–24

Pilcher, J. & Hall, V. 2001 *Flora Hibernica: The wild flowers, plants and tress of Ireland.* The Collins Press

Rackham, O. 1980 *Ancient woodland: its history, vegetation and uses in England,* London: Arnold

Rackham, O. 1995 *Trees and woodland in the British landscape,* London: Weidenfeld and Nicolson

Schweingruber, F. H. 1978 *Microscopic wood anatomy*, Birmensdorf: Swiss Federal Institute for Forest, Snow and Landscape Research

Stuijts, I. 2005 'Wood and charcoal identification', in M. Gowen, J. O Neill and M. Philips (eds) *The Lisheen Mine Archaeological Project 1996-8,* 137–186. Wordwell: Bray.

Wheeler, E. A., Bass, P. & Gasson, P. E. 1989 *IAWA list of microscopic features for hardwood identification* IAWA Bulletin nos. **10** (3): 219–332. Rijksherbarium: Leiden

Table 1 Charcoal identification results from Stonecarthy West 1 (E3610)

Context number	Sample number	Flot volume (grams)	Context description	Wood Species Identifications	No. of fragments	Charcoal weights (grams)	Size of fragments (mm)	No. of growth rings	Growth ring curvature
41	08	29 grams	Basal fill of pit furnace C29	Quercus sp. (oak)	40	6.7 grams	4mm – 20mm	4-5 rings	weak
				Alnus glutinous (alder)	10	2.9 grams	3mm – 10mm	3-5 rings	weak
76	13	34.7 grams	Primary fill of trough C93	Alnus glutinous (alder)	23	2.2 grams	3mm – 8mm	3–4 rings	weak
				Fraxinus excelsior (ash)	20	2 grams	4mm – 8mm	3-5 rings	weak
				Pomoideae spp. (pomaceous woods)	7	0.6 grams	3mm – 5mm	2–3 rings	
114	17	13.4 grams	Fill of well C58	Alnus glutinous (alder)	34	3.4 grams	3mm – 6mm	3 rings	weak
				Pomoideae spp. (pomaceous woods)	9	1 gram	4mm – 5mm	2-3 rings	
				Salix sp. (willow)	6	0.8 grams	2mm – 10mm	3 rings	
				Quercus sp. (oak)	1	0.3 grams	4mm	<3 rings	

Appendix 2.5 Plant Remains Analysis Report

Client – Irish Archaeological Consultancy Ltd
Site Name- Stonecarthy West 1
Excavation number – E3610 AR067
County – Kilkenny
Author- Penny Johnston
Date – June 2009

Introduction

This report details the analysis of plant remains recovered from excavations at Stonecarthy West 1 along the proposed N9/N10 Kilcullen to Waterford Scheme, Phase 4 – Knocktopher to Powerstown.

Methodology

The samples were processed by the client, who also carried out a preliminary sorting of the samples. This pre-selection of the plant remains may bias the final plant records from these sites, as it is possible that many small items, such as weed seeds and chaff, were not picked out.

The selected material was sent to Eachtra Archaeological Projects where it was examined under a low-powered binocular microscope (X6–X45). Suitable plant material was identified and the results of analysis are presented in Tables 1–25 at the end of this report. Scientific names are mainly confined to these identification tables in order to facilitate easy reading of the text. Nomenclature and taxonomic orders generally follows Stace (1997).

Results

A single sample, from C25 (S6), was examined from this site. These included small amounts of hazelnut shell fragments, as well as some barley and wheat grains. The plant remains assemblage from the site is so small it is not possible to use this material to discuss relative importance of cereal types and other plant food items from the site.

Table 8: Identified plant remains from Stonecarthy West 1 E3610

Context	**25**
Sample	**6**
Hazelnut shell fragments (*Corylus avellana* L.)	1
Barley grains (*Hordeum vulgare* L.)	3
Wheat grains (*Triticum* L. species)	2

References

Clarkson, L. A. and Crawford, E. M. 2001 *Feast and Famine: Food and Nutrition in Ireland 1500-1920*. Oxford, Oxford University Press.

Davidson, A. 1999 *The Oxford Companion to Food*. Oxford, Oxford University Press.
Fernández-Armesto, F. 2002 *Food: A History*. London, Pan Books.

Geraghty, S. 1996 *Viking Dublin: Botanical Evidence from Fishamble Street*. Medieval Dublin Excavations 1962-81 Series C, vol. 2. Dublin, Royal Irish Academy.

Hillman, G. C., Mason, S., de Moulins, D. and Nesbitt, M. 1995 Identification of archaeological remains of wheat: the 1992 London workshop. *Circaea* **12** (2), 195–210.
IADG (Irish Archaeobotanists Discussion Group) 2007 Brewing and *fulachta fiadh*. *Archaeology Ireland* **21** (7).

Jessen, K. and Helbaek, H. 1994 'Cereals in Great Britain and Ireland in Prehistoric Times,' *det Kongelige Danske Videnskabernes Selskab, Biologiske Skrifter* III, Nr. 2, 1–68.

Johnston, P. 2007a 'Analysis of carbonised plant remains' in E. Grogan, L. O'Donnell and P. Johnston, *The Bronze Age Landscapes of the Pipeline to the West*. Bray, Wordwell, 70–79.

Johnston, P. 2007b 'The plant remains,' in A. Richardson and P. Johnston, 'Excavations of a Middle Bronze Age enclosed settlement site at Knockhouse Lower, Co. Waterford (03E1033),' *Decies*.

Johnston, P. 2002 Analysis of the plant remains from a cremation burial, Kilmainham Dublin. Unpublished technical report for Archaeological Projects Ltd.

Johnston, P. 2003 Analysis of the plant remains South-eastern Motorway Sites 54, 55, 56 and 79 Carmanhall and Carrickmines Great, Co. Dublin. Unpublished technical report for Valerie J. Keeley Ltd.

Johnston, P., Cummins, T. and Daly, C. 2003 Analysis of soil samples from Rathgall, Rath East, Co. Wicklow. Unpublished technical report for Margaret Gowen and Co. Ltd.

Jones, G. and Halstead, P. 1995 Maslins, mixtures and monocrops: on the interpretation of archaeobotanical crop samples of heterogeneous composition. *Journal of Archaeological Science* **22**, 103–14.

Kelly, F. 1998 *Early Irish Farming.* Dublin, Institute for Advanced Studies.

McClatchie, M. 2007 'The plant remains,' in Doody, M. Excavations at Curraghatoor, Co. Tipperary. Cork, UCC Department of Archaeology Archaeological Monograph, 62–67.

Mitchell, F. and Ryan, M. 1997 *Reading the Irish Landscape*. Dublin, Tower Books.

Monk, M. 2000 'Seeds and soils of discontent: an environmental archaeological contribution to the nature of the Early Neolithic,' in Desmond, A., Johnson, G., McCarthy, M., Sheehan, J. and Shee Twohig, E. (eds) *New Agendas in Irish Prehistory,* 67–87. Bray, Wordwell.

Monk, M. Tierney, J. and Hannon, M. 1998 'Archaeobotanical studies and early medieval Munster,' in M. Monk and J. Sheehan (eds.) *Early Medieval Munster Archaeology, History and Society,* 65–75. Cork, Cork University Press.

Monk, M.A. 1987a 'Appendix The charred plant remains in Doody, M. Late Bronze Age settlement, Ballyveelsih 2, Co. Tipperary,' in R.M Cleary, M.F. Hurley and E.A. Twohig (eds.) *Archaeological Excavations of the Cork-Dublin Gas Pipeline (1981–82).* Cork, Cork Archaeological Studies No.1.

Monk, M. 1987b 'Appendix II Charred seeds and plant remains from Kilferagh, Co. Kilkenny', in R.M Cleary, M.F. Hurley and E.A. Twohig (eds.) *Archaeological Excavations on the Cork-Dublin Gas Pipeline (1981–82),* 98–99. Cork, Cork Archaeological Studies No.1.

Monk, M. 1987c 'Appendix V: The charred plant remains from Ballyveelish' in Doody, M. 'Ballyveelish, Co. Tipperary,' in R.M Cleary, M.F. Hurley and E.A. Twohig (eds.) *Archaeological Excavations on the Cork-Dublin Gas Pipeline (1981–82)*. Cork, Cork Archaeological Studies No.1.

Monk, M. 1985/6 Evidence from macroscopic plant remains for crop husbandry in prehistoric and early historic Ireland: a review. *The Journal of Irish Archaeology* **3**.

Nicholls, K. 2003 (2nd edition) *Gaelic and Gaelicized Ireland in the Middle Ages*. Dublin: Lilliput Press.

Pilcher, J. and Hall, V. 2001 *Flora Hibernica*. Cork: The Collins Press.

O'Keeffe, T. 2000 *Medieval Ireland: an archaeology*. Stroud, Tempus.

Stace, C.A. 1997 (2nd edition) *New Flora in the British Isles*. Cambridge, Cambridge University Press.

Appendix 2.6 Burnt bone – Aoife McCarthy

Osteoarchaeological Report of Burnt Bone from
E3610: Stonecarthy West 1 AR067
Co. Kilkenny
N9/N10 Kilcullen to Waterford Scheme
Phase 4: Knocktopher to Powerstown
Author: Aoife McCarthy MA BA
Date: November 2009

Table of Contents

1. Introduction

1.1 Introduction

This report details the osteological analysis of burnt bone remains recovered during excavations at Site E3610 AR067 Stonecarthy West 1 in the townland of Stonecarthy West, Co. Kilkenny as part of the archaeological mitigation programme of the N9/N10 Kilcullen to Waterford Road Scheme. Aoife McCarthy MA (Osteoarchaeology University of Southampton 2006) undertook the analysis on behalf of Irish Archaeological Consultancy Ltd in November 2009. At the time of writing this report, background archaeological information was obtained from a draft interim excavation report (Kyle, J. 2009) and from consulting the original site register documents.

1.2 General Osteological Information

The osteological analysis of burnt bone remains recovered from Site AR067 was undertaken to provide an overview of the osteoarchaeological aspect of the site and determine if the material could provide further interpretation of site activity.

A total of 6 burnt bone fragments from 6 possible skeletal elements and weighing 3.50g were recorded within the assemblage. The degree of preservation of the animal bone assemblage recovered at Site AR067 was poor with a very high degree of fragmentation.

All 6 fragments of burnt bone recovered at Site AR067 Stonecarthy West 1 originated from C76 the grey silty clay primary fill of trough feature C93.

Due to the high degree of fragmentation and minuscule size of the individual bone fragments it was not possible to identify any of the 6 burnt bone fragments to species. Bone elements were identified where possible.

2. Methodology

SPECIES IDENTIFICATION: Identification of the bones involved reference to Schmid (1972) and Hillson (1992) as well as comparison with the author's own reference material.

- NISP: Number of Identified Specimens Indicates the total number of fragments found.

- MNI: Minimum Number of Individuals. Indicates the minimum number of individuals from every species that were present in the material. Estimating MNI is calculated on the specimen of the most abundant skeletal element present; whilst taking age, sex, size and archaeological context into account.

- MNE: Minimum Number of Elements. Indicates the minimum number of anatomical units that are present and what side they are from. To avoid getting a higher MNE all loose epiphyses have to be paired with all unfused diaphysis.

AGEING: Two main methods are used to determine the age of faunal remains; tooth eruption and degree of Epiphysial fusion (a less reliable method). Tooth eruption and wear stages were recorded for the following teeth where possible; dP4 (deciduous fourth premolar), P4 (fourth premolar), M1 (first molar), M2 (second molar) and M3 (third molar) of cattle, sheep/goat and pig (Grant 1982). The analysis of tooth wear patterns refers to the alteration of the enamel surface and exposure of inner dentine

through use. Due to the nature of material recovered from site AR067 Stonecarthy West 1 ageing was not possible.

BIOMETRICAL DATA: Due to the high degree of fragmentation and small size of the burnt bone remains recovered from Site AR067 measurements were taken but biometrical data interpretation was not possible.

SEX DETERMINATION: Sex determination of animal remains is possible by analysis of certain sexually dimorphic elements. For example goat horncores may be classified as male or female based on their morphology and cattle metacarpals can be defined as male or female through calculation of the slenderness index (McCormick 1992). Sexual determination of species was not possible due to the high degree of fragmentation of the animal bone material recovered from Site AR067 Stonecarthy West 1.

BUTCHERY/GNAWING/BURNING: Evidence for butchery was recorded under the categories of cut, chopped, chopped and cut. All specimens were analysed for evidence of rodent or carnivorous gnawing as well as evidence of burning. Burnt bones were recorded in accordance with colour changes resulting from differing heat levels e.g. calcined bones acquire a bluish-whitish hue through exposure to high temperatures.

PATHOLOGY: The discovery of any injury and/or pathology was recorded for all specimens, where present.

3. Results

Context 76 Sample 12:
A total of 6 burnt bone fragments (3.50g) representing 6 possible skeletal elements were identified within C76 the silty clay primary fill of trough feature C93. The small size and degree of fragmentation of the bone fragments meant it was not possible to identify species.

Indeterminate Vertebrate
Due to a high degree of fragmentation and minute size the two rib and four long bone diaphysis fragments recovered from C76 were unidentified to species. All 6 bone fragments displayed evidence of exposure to heat in the form of colour change to black, grey/white with blue hues combined with alteration in bone surface in the form of cracking. Bone structure changes through exposure to heat with a white or pale grey colour indicating exposure to temperatures in excess of *c.* 600°C combined with a ready oxygen supply (McKinley, 2004). As detailed by Luff & Pearce in 1994 contact of bone with heat diminishes its moisture content and results in the combustion of the organic or collagen component; the remaining structure of the bone after this process is mineral. Such distortion to the bone structure reduces its size and as detailed above alters bone colour (Luff R. & Pearce J. 1994).

4. Summary
Six burnt bone fragments from archaeological context C76 on Site AR067 Stonecarthy West 1 were submitted for examination. The bone samples were assessed and identified to species where possible. Due to the size and fragmented nature of the burnt bone pieces it was not possible to identify to species. No definite or statistically detailed conclusions could be drawn from the burnt bone assemblage retrieved from Site AR067 Stonecarthy West 1 due to its limited size and poor degree of bone preservation. No finds were recovered from trough feature C93 containing burnt bone sample 12.

Bone Database:

Spec	C	S	Taxa	Anat	Side	Prox	Dist	1	2	3	4	5	6	7	8	But	Bu	G	Q	Weight (g)	Comments
1	C76	12	Unid	Long Bone													W B		1	1.4	Fragment of calcined thick cortical bone of long bone diaphy Bone surface is cracking and chalky white. Fragment is 14 long & 5mm thick
2	C76	12	Unid	Long Bone													W B		1	0.7	Fragment of calcined thick cortical bone of a long bone diaphysis. Bone surface is cracking and chalky white. Fragment is 13mm long & 5mm thick. Singeing at the margins
3	C76	12	Unid	Long Bone													WG	R	1	0.6	Fragment of calcined thick cortical bone of long bone diaphysis. Bone surface is cracking and chalky white. Fragment is 11mm long & 4mm thick
4	C76	12	Unid	Long Bone													WGB		1	0.4	Fragment of calcined cortical bone of long bone diaphysis. Bone surface is cracking and chalky white. Fragment is 14mm long & 3mm thick. Singeing visible at margins
5	C76	12	Unid	Rib													WGB		1	0.1	Fragment of calcined rib corpus costae, singeing of bone visible
6	C76	12	Unid	Rib													WG B Bl		1	0.3	Fragment of calcined rib corpus costae, singeing of bone visible

Key:

C= Context
S=Sample
Anat=Anatomical Element
But=Butchery
Bu=Burnt
G=Gnaw
Prox=Proximal
Unid=Unidentifiable
Taxa=Taxon
Dist=Distal
R=Rodent
W=White
G=Grey
B=Black
Q=Quantity of Pieces

5. References:

Binford, L & Howell, F.C. 1981 *Bones, Ancient Men and Modern Myths*. Florida Academic Press Inc.

Boessneck, J. 1969 'Osteological Differences between Sheep and Goat' in D. Brothwell and E. Higgs (eds.), *Science in Archaeology*, 331–358, Thames & Hudson, London.

Davis, S.J. 1987 *The Archaeology of Animals*. New Haven & London: Yale University Press.

Fisher J.W. 1995 Bone Surface Modifications in Zooarcheology'. *Journal of Archaeological Method and Theory* **2**(1), Springer, Netherlands.

Grant, A. 1982 'The use of tooth wear as a guide to the age of domestic ungulates' in B. Wilson, C. Grigson and S. Payne (eds.) *Ageing and sexing animal bones from Archaeological Sites*, 91–108, BAR 109, Oxford.

Haynes G. 1978 Morphological Damage and Alteration to Bone: Laboratory experiments, field studies and zoo studies. *American Quaternary Association 210*, Edmonton Alberta.

Hillson, S. 1992 *Mammal Bones and Teeth: An Introductory Guide to Methods and Identification*. London Institute of Archaeology: UCL, London.

Luff R. & Pearce J. 1994 The Taphonomy of Cooked Bone' in *Whither Environmental Archaeology*. Oxbow Books Ltd, Oxford.

Lyman R.L. 1994 *Vertebrae Taphonomy*, Cambridge University Press

McCormick, F. 1992 Early Faunal Evidence for Dairying. *Oxford Journal of Archaeology* **11** (2), 201–209.

McCormick F. & Murray E. 2007 *Knowth and the Zooarchaeology of Early Christian Ireland*, Royal Irish Academy, Dublin.

McKinley, J.I. 2004 Compiling a Skeletal Inventory: Cremated Human Bone in Brickley, M. & McKinley J. I. (eds) *Guidelines to the Standards for Recording Human Remains*, 9–13, Southampton.

O'Connor T.P. 2000 *The Archaeology of Animal Bones*, Sutton.

Olsen P.S. 1988 Surface Modification on Bone: Trampling versus Butchery. *Journal of Archaeological Science* **15**, 535–559.

Reitz, E.J and Wing, E.S. 2008 *Zooarchaeolgoy Second Edition*. Cambridge Manuals in Archaeology, Cambridge University Press.

Schmid, E. 1972 *Atlas of Animal Bones for Prehistorians, Archaeologists and Quaternary Geologists*. Amerstadam, London, New York, Elsevier Publishing.

Shaffer, B.S. & Sanchez, J.L.J 1994 Comparison of 1/8" and 1/4" mesh recovery of controlled samples of small-to-medium-sized mammals. *American Antiquity* **59**(3), 525–30.

Silver, I.A. 1969The Ageing of Domestic Animals' in D.R. Brothwell and E. Higgs (eds.) *Science in Archaeology*, 283–302. London.

Kyle, J. 2009 E3610 Stonecarthy West 1 Stratigraphic Report. Unpublished Stratigraphic Report. National Monuments Service. Department of the Environment, Heritage and Local Government, Dublin.

GLOSSARY OF TERMS:

BOS: Latin term for Cow
SUS: Latin term for Pig
CERVUS: Latin term for Deer
EQUUS: Latin term for Horse
OVIS: Latin term for Sheep
CAPRINAE: Latin term for Sheep/Goat
CANIS: Latin term for Dog
LEPUS: Latin term for Hare
AVES: Latin term for Bird
TAPHONOMY: The study of the processes affecting an organism after death from the time of burial until collection.
TRABECULAR BONE: Osseous tissues that fill the interior cavity of bones and resemble a sponge or honeycomb.
DIAPHYSIS: Bone shaft
CORPUS COSTAE: Body of Rib Bone

Appendix 2.7 Petrographical Reports – Dr. Stephen Mandel

Petrographical Report on Stone Samples taken during Archaeological Excavations at
Stonecarthy West 1 (AR067), Co. Kilkenny

EurGeol Dr Stephen Mandal MIAI PGeo

Introduction
This report is based on the macroscopic (hand specimen) examination of stone samples taken during archaeological excavations in advance of the N9/N10 Phase 4 Knocktopher to Powerstown Road Scheme. The purpose of the study was to identify the rock types from which the stone objects were made, to highlight potential sources for them, and to comment on their possible function. It is important to note that macroscopic petrographical studies have been considered of limited value in comparison to microscopic (thin section and geochemical analysis) studies. On the other hand, macroscopic studies provide an excellent preliminary assessment tool and have proven to be of considerable value in petrographical studies (e.g. see Mandal 1997; Cooney and Mandal 1998).

Solid Geology and Soils of the Site (see Figure 1; McConnell 1994)
The bedrock under the site consists of fossiliferous dark-grey muddy limestone belonging to the Ballysteen Formation (shown on Figure 1 as BA).

The stratigraphical sequence in the area consists of the following. Gaps in the stratigraphically sequence are represented by line breaks.

Carboniferous (Silesian)
Killeshin Silstone Formation (KN) – Muddy siltstone and silty mudstone
Luggacurren Shale Formation (LS) – Mudstone and shale with chert and limestone

Carboniferous (Dinantian)
Clogrenan Formation (CL) – Cherty, muddy calcarenite limestone
Ballyadams Formation (BM) – Crinoidal wackestone/ packstone limestone

Butlersgrove Formation (BU) – Very dark grey argillaceous limestones

Ballysteen Formation (BA) – Fossiliferous dark-grey muddy limestone
Ballymartin Formation (BT) – Limestone and dark grey calcareous shales

Porter's Gate Formation (PG) – Sandstones, shales and thin limestones

Devonian
Kiltorean Formation (KT) – Yellow and red sandstones, green mudstones
Carrigmaclea Formation (CI) – Red, brown conglomerates and sandstones

Ordovician
Oaklands Formation (OA) – Green, red-purple, buff shale, siltstone
Maulin Formation (MN) – Dark blue-grey slate, phyllite, schist

Igneous Intrusions (undated)
Granite (Gr) – Undifferntiated
Dolerite (D)

The geology of the area is generally dominated by Lower Carboniferous Age rocks, principally limestones. These rocks, which also make up much of the Midlands of Ireland, represent the northward return of the sea at the end of the Devonian, *c.* 360 million years ago, owing to the opening of a new ocean to the south called the Palaeo-Tethys in what is now central Europe.

To the south of the study area occur Ordovician-Devonian Age rocks. The Devonian Age rocks consist of coarse sandstone and conglomerates representing terrestrial sediments resulting from a period of tectonic uplift.

The older, Ordovician Age rocks represent tectonic activity, relating to the closure of the Iaepetus Ocean, a major ocean which at its widest was probably greater than 3000km across. These rocks have been metamorphosed to slates, phyllites and schists by the intrusion of the Tullow granite pluton *c.* 405 million years ago.

Bedrock is not exposed at surface at the site; instead the overburden consists of boulder clay; surface drift from early glaciations. The area is part of a physical region known as the Caledonian province of the south-east. The soils of the area consist of acid brown earths (Aalen et al. 1997).

Results

Site	License			Sample	Context	Notes		
Stonecarthy West 1	A032/079	AR067	E3610	5	26	Burnt;	Angular;	Sandstone, coarse grained, quartz rich, red
Stonecarthy West 1	A032/079	AR067	E3610	9	5	Burnt;	Angular;	Sandstone, coarse grained, quartz rich, red
Stonecarthy West 1	A032/079	AR067	E3610	10	45	Burnt;	Angular;	Sandstone, coarse grained, quartz rich, red
Stonecarthy West 1	A032/079	AR067	E3610	13	76	Burnt;	Angular;	Sandstone, coarse grained, quartz rich, red
Stonecarthy West 1	A032/079	AR067	E3610	14	69	Burnt;	Angular;	Sandstone, coarse grained, quartz rich, red
Stonecarthy West 1	A032/079	AR067	E3610	15	84	Burnt;	Angular;	Sandstone, coarse grained, quartz rich, red
Stonecarthy West 1	A032/079	AR067	E3610	16	105	Burnt;	Angular;	Sandstone, coarse grained, quartz rich, red
Stonecarthy West 1	A032/079	AR067	E3610	17	114	Burnt;	Angular;	Sandstone, coarse grained, quartz rich, red

Table 1. Results of petrographical analysis of stone samples from the site

Potential Sources

Coarse grained sandstone does not occur in bedrock in the immediate vicinity of the site. The dominant rock type in the area is limestone. Whilst there are minor sandstones within some of the limestone formations, the closest bedrock source for coarse grained yellow / red sandstone is within the Devonian Age Kiltorean Formation (yellow and red sandstones, green mudstones) and Carrigmaclea Formation (red, brown conglomerates and sandstones) (see Figure 1, shown as KT and CI respectively). It is important to note that these rock types were not necessarily sourced from bedrock. The sample is clearly a shattered cobble, indicating a secondary source, such as in the glacial tills / river cobbles. It is therefore possible that these rocks were sourced locally.

Discussion

Whilst it is not possible to determine a definitive source for these stone samples based on macroscopic examination alone, it can be stated that these rock types are available locally in outcrop and within the glacial tills / sub-soils. It is therefore probable that the material in these samples were sourced in the vicinity of the site.

Fifty two samples were also examined from the scheme across 6 sites during the course of the main excavations (A032 – phase 4; see Table 2). The samples showed a remarkable consistency across the scheme in terms of the principal rock type utilised; coarse grained sandstone, typically red in colour. All samples contain a variation of this type of rock as their principal component. All but one of the samples from UA2 (sample 3) are clearly burnt / altered. All contain angular pieces of stone. Thirty seven (70%) also contain sub-rounded to rounded pieces; in all cases these

samples contain pebbles and / or cobbles, in most cases broken. Three of the samples contain minor amounts of limestone as a secondary rock type to sandstone.

Site	Licence			No.	Burnt	Angular	Rounded	Limestone
UA2				3	2	3	0	0
Baysrath 4	A032/089	AR057	E3629	2	2	2	2	2
Danganbeg 1	A032/075	AR058	E3606	15	15	15	15	0
Stonecarthy West 1	A032/079	AR067	E3610	8	8	8	0	0
Danesfort 2	A032/065	AR078	E3540	19	19	19	19	1
Danesfort 5	A032/058	AR082	E3456	5	5	5	0	0
Grand Total				**53**	**52**	**53**	**37**	**3**

Table 2. Results of petrographical analysis of stone samples from the N9/N10 Phase 4 Road Scheme

These samples are also very consistent with the samples examined from the N9/N10 Phase 4b road scheme to the north.

Coarse grained sandstone is typical of fulacht fiadh material (e.g. see Mandal 2004). The use of angular and rounded pieces is interesting. Rounded pieces and / or the use of pebbles / cobbles is clear evidence of the use of secondary sources. Angular pieces are more indicative of the use of bedrock sources, but it is important to note that they could also represent angular blocks occurring in tills.

It is significant that sandstone is the predominant rock type given that, due to the differing underlying bedrock, it would not be the most abundant rock type available, either in outcrop or in the overlying tills. This indicates that sandstones were deliberately being selected for use in preference to the more abundant finer grained rock types in the area.

References:

Aalen, F.H.A., Whelan, K. and Stout, M. 1997. *Atlas of the Irish Rural Landscape*. Cork University Press: Cork.

Cooney, G. and Mandal, S. 1998. *The Irish Stone Axe Project: Monograph I*. Wordwell: Wicklow.

Mandal, S., 1997 Striking the balance: the roles of petrography and geochemistry in stone axe studies in Ireland. *Archaeometry* **39**(2), 289–308.

Mandal, S. 2004. Petrographical Report on Stone Samples found during Archaeological Investigations relating to the Sligo Inner Relief Road (Licence No. 03E0535). Unpublished report commissioned by ACS Ltd for the NRA.

McConnell, B. (ed), 1994 Geology of Carlow-Wexford: A Geological Description to Accompany the Bedrock Geology 1:100,000 Map Series, Sheet 19, Carlow-Wexford. Geological Survey of Ireland Publications Westprint: Sligo.

Appendix 2.8 Metallurgical Waste Analysis Report – Angela Wallace MSc, MIAI

Report on Archaeometallurgical Residues
From E3610: Stonecarthy West 1 AR067
Co. Kilkenny
N9/N10 Kilcullen to Waterford Scheme
Phase 4: Knocktopher to Powerstown

Author: Angela Wallace MSc, MIAI
Date: April 2010

A total of 8.19Kg of metallurgical residues were recovered from this site. The bulk of the material (8Kg) came from C40 the upper fill of bowl furnace C29, 176.6g came from C41 the basal fill. One single isolated piece of drippy type slag (14.5g) came from C53 part of a nearby burnt spread which is not dated but had associated artefacts of modern glass and pottery, a nail and possible medieval knife blade. It is likely slag from C53 is disturbed material originally from C29.

Many of the slags from possible smelting pit C29 have the characteristic appearance of iron smelting slags with a drippy type morphology and a smooth surface. A large proportion of the slags do not have this morphology and appear to be conglomerates of several different types of material, some have baked clay and small iron fragments combined with slag. This type of morphology may be indicative of a poor smelting process being carried out and may suggest the furnace is quite early.

A nearby trough on the site was dated to Cal 771–539 BC and a fill from a large pit C58 was dated to Cal 1440–1315 BC. It is unlikely either of these dates have any relation to the possible iron smelting activity being carried out at the site. There is no direct dating evidence for the possible iron smelting furnace from this site. Stonecarthy West 1 is geographically very close to Tinvaun 2 (AR064) located to the south, which had a smelting and possible ore roasting pit, smelting pit was dated to 39 BC- AD 64 (2 sigma). It is also quite close to Knockadrina 2 AR068 where a pit associated with some slag was dated to Cal AD 650–766 (2 sigma).

Further Recommendations

Given the location of this furnace and its position in relation to other metal-working sites in the landscape it is recommended radiocarbon dating of the furnace be considered. Further analysis on several samples is also recommended in order to determine efficiency or otherwise of the process being carried out.

Catalogue of Material

Sample #	Context #	Weight (g)	Description
8	C41	176.6	Very small fragments of smelting slags with drippy appearance (40%) and rusty amorphous nodules, all ranging from 3-20mm across.
7	C40	8000	40% smelting slags of drippy type with smooth surface and 60% conglomerate, rough surface, porous material with slag, solidified baked clay & iron particles, all ranging from 10-110mm across.
11	C53	14.5	1 single piece of smooth drippy type smelting slag.

Appendix 2.9 Radiocarbon Dating Results – QUB Laboratory

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

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

Calibration data set (QUB samples): intcal04.14c
Calibration data set (SUERC samples): Oxcal 4.1

Context	Sample No	Material	Species id/ Weight	Lab	Lab Code	Date Type	Calibrated date ranges	Measured radiocarbon age (BP)	13C/12C Ratio ‰
C76- fill of possible trough C93	13	Charcoal	*Fraxinus excelsior* / 0.43g	QUB	UBA 12174	AMS (Std)	760–551BC (1 sigma), 771–539BC (2 sigma)	2498±22	-27.3
C114- fill of reservoir C58	17	Charcoal	*Pomoideae* / 0.47g	QUB	UBA 12175	AMS (Std)	1428–1326BC (1 sigma) 1440–1315BC (2 sigma)	3116±24	-26.4
C69 – fill of slot trench		Charcoal	*Corylus Avellana*	SUERC	SUERC 40336	AMS (Std)	1740-1642BC (1 sigma) 1757-1616BC (2 sigma)	3935±30	-24.3

References for calibration datasets:
Intcal01.14c: -PJ Reimer, MGL Baillie, E Bard, A Bayliss, JW Beck, PG Blackwell, C Bronk Ramsey, CE Buck, GS Burr, RL Edwards, M Friedrich, PM Grootes, TP Guilderson, I Hajdas, TJ Heaton, AG Hogg, KA Hughen, KF Kaiser, B Kromer, FG McCormac, SW Manning, RW Reimer, DA Richards, JR Southon, S Talamo, CSM Turney, J van der Plicht, CE Weyhenmeyer (2009) Radiocarbon 51:1111–1150.
Oxcal 4.1: - Bronk Ramsey 2009

Comments:
* This standard deviation (error) includes a lab error multiplier.
** 1 sigma = square root of (sample std. dev.^2 + curve std. dev.^2)
** 2 sigma = 2 x square root of (sample std. dev.^2 + curve std. dev.^2)
where ^2 = quantity squared.
[ ] = calibrated range impinges on end of calibration data set
0* represents a "negative" age BP
1955* or 1960* denote influence of nuclear testing C-14
NOTE: Cal ages and ranges are rounded to the nearest year which may be too precise in many instances. Users are advised to round results to the nearest 10 yr for samples with standard deviation in the radiocarbon age greater than 50 yr.

APPENDIX 3 LIST OF RMP IN AREA

RMP No	Description
KK027-051	Cave
KK031-006	Ringfort (unclassified)
KK031-007	Castle (unclassified)
KK031-050	Moated Site (possible)

See Figure 2 for location.

APPENDIX 4 LIST OF SITE NAMES

Site Name	Site Code	E Number	Director	NGR
Baysrath 2	AR055	E3627	Fintan Walsh	251593/137855
Baysrath 3	AR056	E3628	Fintan Walsh	251672/138000
Baysrath 4	AR057	E3629	Fintan Walsh	251515/138280
Danganbeg 1	AR058	E3606	Emma Devine	251462/138754
Danganbeg 2	AR059	E3607	Emma Devine	251397/138939
Danganbeg 3	AR060	E3671	Emma Devine	251430/139245
Danganbeg 4	AR061	E3676	Emma Devine	251401/139372
Knockadrina 1	AR062	E3677	Ed Lyne	251422/139420
Tinvaun 1	AR063	E3678	Ed Lyne	251482/139625
Tinvaun 2	AR064	E3680	James Kyle	251445/139736
Tinvaun 3	AR065	E3608	James Kyle	251501/139832
Tinvaun 4	AR066	E3609	James Kyle	251508/139917
Stonecarthy West 1	AR067	E3610	James Kyle	251538/140023
Knockadrina 2	AR068	E3611	James Kyle	251647/140237
Rathduff 1	AR069	E3612	Ed Lyne	251286/142167
Rathduff Upper 1	AR070	E3613	Ed Lyne	251280/142559
Kellsgrange 1	AR071	E3575	James Kyle	250911/143732
Kellsgrange 2	AR072	E3577	James Kyle	250967/143861
Kellsgrange 3	AR073	E3576	James Kyle	250948/144003
Ennisnag 1	AR074	E3614	Richard Jennings	251416/145690
Ennisnag 2	AR075	E3615	Richard Jennings	251638/146068
Danesfort 12	AR076	E3616	Richard Jennings	251669/146186
Danesfort 13	AR077	E3617	Richard Jennings	251765/146384
Danesfort 2	AR078	E3540	Richard Jennings	251953/146745
Danesfort 4	AR079	E3539	Richard Jennings	251880/147579
Danesfort 3	AR080A	E3542	Richard Jennings	252221/146845
Danesfort 1	AR080B	E3541	Richard Jennings	252267/146707
Croan 1	AR081	E3543	Emma Devine	252280/147332
Danesfort 5	AR082	E3456	Emma Devine	252567/147767
Danesfort 6	AR083	E3538	Emma Devine	252764/147995
Danesfort 7	AR084	E3537	Emma Devine	252878/148099
Danesfort 8	AR085	E3461	Richard Jennings	253020/148246
Danesfort 9	AR086	E3458	Richard Jennings	253089/148345
Danesfort 10	AR087	E3459	Richard Jennings	253229/148414
Danesfort 11	AR088	E3460	Richard Jennings	253245/148462
Rathclogh 1	AR089	E3726	Patricia Lynch	253365/145515
Rathclogh 2	AR090	E3727	Patricia Lynch	253650/148848
Kilree 1	AR091	E3728	Patricia Lynch	254088/149310
Kilree 2	AR092	E3729	Patricia Lynch	254320/149500
Kilree 3	AR093	E3643	Patricia Lynch	254449, 149639
Kilree 4	AR094	E3730	Patricia Lynch	255330/150084
Dunbell Big 2	AR095	E3853	Yvonne Whitty	256684/151066
Holdenstown 1	AR096	E3681	Yvonne Whitty	256737/151253
Holdenstown 2	AR097/98	E3630	Yvonne Whitty	256891/151781
Holdenstown 3	AR099	E3854	Yvonne Whitty	256990/152085
Holdenstown 4	AR100	E3682	Yvonne Whitty	256828/152048
Dunbell Big 1	AR101	E3855	Yvonne Whitty	257034/152315
Rathcash 1	AR102	E3859	Tim Coughlan	258178/154199
Rathcash 2	AR103	E3860	Tim Coughlan	258294/154293
Rathcash East 1	AR104	E3892	Tim Coughlan	259419/154546
Rathcash East 2	AR105	E3893	Tim Coughlan	259555/154566
Rathcash East 3	AR106	E3861	Tim Coughlan	259821/154653
Blanchvillespark 1	AR107	E3894	Richard Jennings	260535/155212
Blanchvillespark 2	AR108	E3895	Tim Coughlan	260637/155449

Site Name	Site Code	E Number	Director	NGR
Blanchvillespark 3	AR109	E3913	Tim Coughlan	260785/155653
Blanchvillespark 4	AR110	E3914	Tim Coughlan	261442/156269
Blanchvillespark / Ballyquirk 1	AR111	E3862	Ruth Elliott	261531/156323
Ballyquirk 1	AR112	E3863	Ruth Elliott	261531/156323
Ballyquirk 2	AR113	E3864	Ruth Elliott	261811/156508
Ballyquirk 3	AR114	E3865	Ruth Elliott	261875/156559
Ballinvally 1	AR115	E3836	Emma Devine	263258/157521
Garryduff 1	AR116	E3852	Emma Devine	263933/157991
Kilmacahill 1	AR117	E3915	Tim Coughlan	264267/158369
Kilmacahill 2	AR118	E3833	Tim Coughlan	264380/158453
Jordanstown 1	AR119	E3834	James Kyle	264546/158643
Jordanstown 2	AR120	E3851	James Kyle	264893/159038
Kellymount 6	AR121	E3758	Przemaslaw Wierbicki	265130,159277
Jordanstown 3	AR122	E3916	Przemaslaw Wierbicki	265103/159227
Kellymount 1	AR123	E3756	Przemaslaw Wierbicki	265250/159397
Kellymount 2	AR124	E3757	Przemaslaw Wierbicki	265164/159463
Kellymount 3	AR125	E3856	Przemaslaw Wierbicki	265338/159597
Kellymount 4	AR126	E3857	Przemaslaw Wierbicki	265412/159803
Kellymount 5	AR127	E3858	Przemaslaw Wierbicki	265530,159977
Shankill 2	AR128	E3738	Richard Jennings	265924/160651.
Shankill 3	AR129	E3737	Richard Jennings	266052/161141
Shankill 4	AR130	E3838	Richard Jennings	266286/161526
Shankill 5	AR131	E3850	Richard Jennings	266374/161730
Shankill 6	AR132	E3840	Richard Jennings	266403/161836
Moanmore 1	AR133	E3835	Richard Jennings	266476/162016
Moanmore 2	AR134	E3843	Sinead Phelan	266756/162866
Moanmore 3	AR135	E3837	Sinead Phelan	266856/163259
Bannagagole 1	AR136	E3844	Sinead Phelan	266942/163569
Moanduff 1	AR137	E3839	Robert Lynch	267261/164397
Coneykeare 1	AR138	E3683	Sinead Phelan	267836/166209
Coolnakisha 1	AR139	E3768	Ellen O'Carroll	268175/167274
Coolnakisha 2	AR140	E3767	Ellen O'Carroll	268306/167559
Cranavonane 1	AR141	E3842	Tim Coughlan	268554/167895
Cranavonane 2	AR142	E3732	Ellen O'Carroll	268830/168154
Cranavonane 3	AR143	E3731	Ellen O'Carroll	269123/168362
Tomard Lower 1	AR144	E3733	Ellen O'Carroll	269349/168496
Paulstown 1	AR145	E3642	Ruth Elliot	265889/158499
Paulstown 2	AR146	E3632	Ruth Elliot	265664/158651
Rathgarvan or Clifden 1	AR147	E3760	Przemaslaw Wierbicki	257026/154123
Maddockstown 1	AR148	E3759	Przemaslaw Wierbicki	256886/154199
Templemartin 3	AR149	E3845	Emma Devine	255095/155200
Templemartin 4	AR150	E3841	Emma Devine	254920/155427
Templemartin 5	AR151	E3846	Emma Devine	254706/155636
Templemartin 1	AR152	E3849	Emma Devine	254504/155826
Templemartin 2	AR153	E3847	Emma Devine	254173/156236
Leggetsrath East 1	AR154	E3734	Emma Devine	253793/156484
Moanduff 2	AR155	E3735	Sinead Phelan	267470/164887
Moanduff 3	AR156	E3736	Sinead Phelan	267515/164979
Ballyquirk 4	AR157	E3848	Richard Jennings	262596/157025
Shankill 1	AR158	E3766	Przemaslaw Wierbicki	265707/160269
Rathgarvan or Clifden 2	AR159	E3921	Tim Coughlan	257095/154119
Ballynolan 1	AR160	E3755	Sinead Phelan	267714/165597
Rathduff Upper 3	UA2	E3974	Tim Coughlan	250991/143565
Rathduff Bayley	UA4	E4011	Tim Coughlan	251005/143564