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

Ministerial Direction Scheme Reference No.	A032
Registration No.	E3613
Site Name	AR070, Rathduff Upper 1
Townland	Rathduff Upper
County	Kilkenny
Excavation Director	Ed Lyne
NGR	251280 142559
Chainage	30500

FINAL REPORT

ON BEHALF OF KILKENNY COUNTY COUNCIL

FEBRUARY 2011

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	E3613
Excavation Director	Ed Lyne
Senior Archaeologist	Tim Coughlan
Consultant	Irish Archaeological Consultancy Ltd, 120b Greenpark Road, Bray, Co. Wicklow
Client	Kilkenny County Council
Site Name	AR070, Rathduff Upper 1
Site Type	Burnt mound activity
Townland(s)	Rathduff upper
Parish	Kells
County	Kilkenny
NGR (easting)	251280
NGR (northing)	142559
Chainage	30500
Height OD (m)	50.987
RMP No.	N/A
Excavation Dates	23 July–17 August 2007
Project Duration	20 March 2007–18 April 2008
Report Type	Final
Report Date	February 2011
Report By	Ed Lyne and Tim Coughlan
Report Reference	Lyne, E. and Coughlan, T. 2011 E3613 Rathduff Upper 1 Final Report. Unpublished Final Report. National Monuments 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.

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ABSTRACT

Irish Archaeological Consultancy Ltd (IAC), funded by the National Roads Authority (NRA) through Kilkenny County Council, undertook an excavation at the site of AR070, Rathduff Upper 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 Ed Lyne under Ministerial Direction A032 and Excavation Registration Number E3613 issued by the DOEHLG in consultation with the National Museum of Ireland for IAC. The fieldwork took place between the 23 July and 17 August 2007.

An area of 75m by 30m was stripped and revealed two burnt spreads on the edge of an area of wetland, at the base of a gently sloping hill. Both of these spreads were heavily disturbed by ploughing. Indeed much of the material had been moved over the years so that it filled a post-medieval drainage ditch running along the edge of the wetland, with only traces of the original mounds being found in their original locations.

A number of mostly irregular pits were identified, some of which were sealed by the remainder of the burnt spreads. In all cases these features were filled by heat-affected stones and charcoal-rich soil. A bipolar flint flake, a chert chunk, a quartzite rubbing stone and a possible hone stone made of limestone were recovered during excavation. Three samples were forwarded for radiocarbon dating and returned three separate dates ranging from the early to middle Bronze Age indicating that there were at least two and possibly three phases of activity on the site.

There were no previously known prehistoric monuments in the immediate area and as such the identification of the site could be viewed as unexpected. However the site is in a marginal and wet landscape, an area where bunt mound sites are typically found. The presence of other burnt mounds in the immediate area confirms that it is an area that was attractive for this type of activity throughout the Bronze Age. The site is important locally as it provides evidence for previously unknown occupation of this landscape in 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 Rathduff Upper 1, AR070 (Figure 1), in the townland of Rathduff Upper 1 undertaken by Ed Lyne 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 2250m^2 and was first identified during testing carried out between 30 January and 03 March 2006 by Bernice Molloy (E2811) for Margaret Gowen & Co. Ltd on behalf of the National Roads Authority. Rathduff Upper 1 was excavated between 23 July and 17 August with a team of one director and 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.

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.

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: 7000–4000 BC
Neolithic: 4000–2500 BC
Early Bronze Age: 2500–1700 BC
Middle Bronze Age: 1700–1200 BC
Late Bronze Age: 1200–800 BC
Iron Age: 800 BC–AD 500
Early medieval period: AD 500–1100
Medieval period: AD 1100–1600
Post-medieval: AD 1600–1800

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 situated on the edge of an area of wetland, at the eastern foot of a very low hill and slopes gently eastwards into the boggy terrain. The terrain rolls gently to the north and south and a low-lying hill is visible on the southern horizon. The landscape surrounding the site is under pasture and tillage. Rathduff 1 and Stonecarthy West 2 are located *c*. 300m and 500m respectively to the south. There are two enclosure sites within proximity to the site located *c*. 800m north-west (KK027–033) and *c*. 750m to the NNE (KK027-034).

2.1 Phase 1 Natural Drift Geology

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C2	N/A				Pale grey to yellow silty clay	Subsoil

The natural geological subsoil was cut by all negative features on site. It consisted of a pale grey to yellow silty clay, and was consistent with a wetland environment.

2.2 Phase 2 Bronze Age Activity

2.2.1 Burnt mound and associated features

2.2.1.1 Pits sealed by burnt spread C4

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C20	C21	1.87	1.6	0.38	Loose black stony, charcoal	Fill of pit C21
C21	N/A	1.87	1.6	0.5	Irregular	Pit
C22	C23	1.55	1.42	0.42	Dark clayey silt, burnt stone	Fill of pit C23
C23	N/A	1.55	1.42	0.42	Sub-circular. Uneven base	Pit
C69	C70	1.38	1.1	0.1	Soft dark clayey silt, burnt stone	Upper fill of pit C70
C70	N/A	1.38	1.1	0.22	Oval	Pit
C71	C21	0.57	0.58	0.15	Loose brown sandy clay, 90% stone	Fill of pit C21
C72	C70	1.34	0.75	0.12	Soft greyish brown silty clay	Primary fill of C70
C86	C87	5.18	0.45	0.03	Soft brownish grey clayey silt, stone	Fill of curvilinear pit
C87	N/A	5.18	0.45	0.03	C-shaped	Curvilinear pit
C88	C89	5	1.5	0.2	Black sandy stony silt, charcoal stained	Fill of pit C89
C89	N/A	5	1.5	0.2	Linear	Pit
C90	C91	1.5	1.3	0.2	Loose dark grey/black silt, stone	Fill of pit C91
C91	N/A	1.5	1.3	0.2	Sub-rectangular where exposed	Pit
C92	C93	1.1	0.9	0.09	Loose black sand, 30% stone	Upper fill of pit C93
C93	N/A	1.8	0.9	0.21	NW-SE, irregular	Pit
C96	C97	2.12	1.25	0.13	Soft brownish grey silty clay, stone	Fill of pit C97
C97	N/A	2.12	1.25	0.13	Linear	Pit
C103	C93	1.3	0.9	0.14	Compact grey soil	Primary fill of pit C93

Finds:

Context	Find Number	Material	Period	Description
103	103:001	Flint	Neolithic	Flake

These eight pits all contained burnt mound material - heat-affected stones in a charcoal-rich matrix - and were all covered by the burnt spread C4 (Plates 3–4; Figures 4–5).

A flint flake was retrieved from pit fill C103. The flake had been burnt and most likely dated to the second half of the Neolithic based on its technology (Sternke, Appendix 2.1). No evidence of Neolithic archaeology was identified on or in the vicinity of the site so it is possible that this find is residual.

Charcoal was retrieved from pit fills C71 and C88 during post-excavation soil flotation. This was subsequently identified to species. Fragments of hazel charcoal (*Corylus avellana*), pomaceous fruit charcoal (*Pomoideae* sp.), elm charcoal *(Ulmus* sp.), blackthorn/cherry charcoal (*Prunus s*p.), alder charcoal (*Alnus glutinosa*) and ash charcoal (*Fraxinus excelsior*) were identified from pit fill C71 (O' Carroll, Appendix 2.2). Fragments of pomaceous fruit charcoal (*Pomoideae* sp.), oak charcoal (*Quercus sp.*), hazel charcoal (*Corylus avellana*) and ash charcoal (*Fraxinus excelsior*) were identified from pit fill C88 *(ibid.).* This charcoal was most likely representative of firewood used in the various activities associated with the burnt mound and indicates that a mosaic of woodland existed in the surrounding environment.

A soil sample from pit fill C90 produced evidence of plant remains. This consisted of a single grain of oat floret bases / indeterminate species (*Avena* L. species). This was not likely to have been archaeological material and probably represents modern contamination of the pit fill (Johnston, Appendix 2.3).

A small fragment (0.1g) of hazel charcoal from C71 was chosen for AMS dating and returned a result of 3648±30 (UBA 10996). The 2 Sigma calibrated result for this was 2134–1937BC (QUB, Appendix 2.4) dating this feature to the early Bronze Age.

A small fragment (0.1g) of blackthorn/cherry (*Prunus spp.*) charcoal was chosen for AMS dating from C88 and returned a result of 3180±23 (UBA 10998). The 2 Sigma calibrated result for this was 1497–1417BC (QUB, Appendix 2.4) dating this feature to the middle Bronze Age.

2.2.1.2 Non-archaeological features filled with burnt mound material beneath the spread

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C66	C67	2.9	2.4	0.07	Soft white sandy silt	Fill of poss pit C67
C67	N/A	2.9	2.4	0.07	C-shaped	Possible pit
C76	C77	3.17	2.92	0.08	Soft greyish brown sandy silt	Fill of poss pit C77
C77	N/A	3.17	2.92	0.08	C-shaped	Possible pit
C94	C95	1.96	1.7	0.14	Dark clay/sand, burnt stones, charcoal	Fill of poss pit C95
C95	N/A	1.96	1.7	0.22	Irregular	Possible pit
C102	C95		0.8	0.08	Soft grey silty clay, shell	Primary fill of pit C95
C128	C129	1.2	0.62	0.15	Loose dark grey silty clay, 35% stone	Fill of poss pit C129
C129	N/A	1.22	0.69	0.17	NE-SW, sub-oval. Flat base	Possible pit

These features represent possible irregular-shaped pits, or natural hollows / depressions which were filled with burnt mound type material and which were also sealed by the main burnt spread C4 (Plates 3–4; Figures 4–5). It is possible that they were filled with this material through ploughing and other activities.

2.2.1.3 Pits sealed by topsoil C1

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C8	C9	1.35	1.1	0.17	Black silty clay, 50% stones, charcoal	Fill of pit C9
C9	N/A	1.35	1.1	0.17	NW-SE, sub-rectangular	Pit
C14	C15	1.27	1.17	0.13	Black silty clay, 40% stones, charcoal	Fill of pit / depression
C15	N/A	1.27	1.17	0.13	Oval. Flat base	Pit / depression
C16	C17	2.18	0.84	0.09–0.25	Loose black silty clay, stones	Fill of pit C17
C17	N/A	2.18	0.84	0.09–0.25	Sub-rectangular. Uneven base	Pit
C18	C19	1.5	0.8	0.1	Grey, silty clay, sand, stones, charcoal	Fill of pit C19
C19	N/A	1.5	0.8	0.2	Sub-oval. Gradual, concave sides	Pit
C24	C25	1.6	0.9	0.13	Loose black silty clay, 50% stones	Fill of pit C25
C25	N/A	1.6	0.6	0.2	NW-SE, irregular. Stepped sides	Pit

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C26	C27	4.02	0.5	0.2	Grey, charcoal-stained, silty clay, stones	Fill of pit C27
C27	N/A	4.02	0.5	0.2	E-W, irregular	Pit
C30	C31	1.7	0.88	0.27	Loose dark silty clay, 45% burnt stone	Fill of pit C31
C31	N/A	1.75	0.92	0.3	NW-SE, sub-oval. Uneven base	Pit
C52	C53	0.88	0.5	0.22	Loose dark silty clay, 25% burnt stone	Fill of pit C53
C53	N/A	0.92	0.55	0.25	NW-SE, sub-oval. Concave sides	Pit
C54	C55	2.3	0.84	0.25	Black sandy clay, stones, snail shells	Fill of pit C55
C55	N/A	2.3	0.84	0.25	E-W, linear	Pit
C58	C59	1.5	1.04	0.1	Loose black silty clay, 45% stones	Fill of pit C59
C59	N/A	1.4	1	0.14	NW-SE, oval	Pit
C68	C19	1.5	0.8	0.1	Brown sandy clay, silt, sandstone	Fill of pit C19
C84	C85.	1.5	0.45	0.16	Loose black sandy clay, stones	Fill of pit C85
C85	N/A	1.5	0.45	0.16	E-W, linear	Pit
C98	C99	1.73	1.65	0.37	Loose dark silty sand, stones	Fill of possi pit C99
C99	N/A	1.73	1.65	0.37	Irregular shaped cut	Possible pit
C106	C107	0.39	0.2	0.17	Loose dark silty sand, stones	Fill of pit C107
C107	N/A	0.39	0.2	0.17	Circular	Pit

Finds:

Context	Find Number	Material	Period	Description
18	018:001	Chert	Late Neolithic / early Bronze Age	Chunk
98	098:001	Limestone	Late Neolithic / early Bronze Age	Hone stone

These 13 pits of various shapes and sizes were filled by burnt mound type material and sealed by topsoil. Although the precise function of these pits is not discernable, it is likely that they related to the burnt mound activity (Plates 1–2; Figures 4–5).

A chert chunk was recovered from pit fill C18. It had been burnt and most likely dated to the late Neolithic / early Bronze Age (Sternke, Appendix 2.1). A limestone hone stone was recovered from pit fill C98. It was smoothened on all sides and most likely dated to the late Neolithic / early Bronze Age (*ibid.*). While only one feature was definitively dated to the early Bronze Age period, there was no evidence of Neolithic activity on site or in the immediate vicinity so these artefacts are likely to also be early Bronze Age in date rather than Neolithic.

Charcoal was retrieved from pit fill C8 during post-excavation soil flotation. This was subsequently identified to species. Fragments of ash charcoal (*Fraxinus excelsior)*, hazel charcoal (*Corylus avellana*) and oak charcoal (*Quercus* sp.) were identified (O' Carroll, Appendix 2.2). A small fragment (0.05g) of ash was chosen for AMS dating and returned a result of 3786±36 (UBA 10997). The 2 Sigma calibrated result for this was 2341–2050BC (QUB, Appendix 2.4) dating this feature to the early Bronze Age.

As mentioned above, the wood identified in pits C9, C21 and C89 is most likely representative of firewood used for various processes in association with the burnt mound activity (O' Carroll, Appendix 2.2).

A soil sample from pit fill C8 also produced evidence of un-charred plant remains. These were identified as fat-hen (*Chenopodium album* L.) which were likely to have been modern contaminants of the pit fill and are not thought to have any archaeological significance (Johnston, Appendix 2.3).

2.2.1.4 Trough C105

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C104	C105	1.9	1.39	0.12	Greyish brown sandy silt, burnt stone	Upper fill of pit C105
C105	N/A	3.3	2.9	0.68	SE-NW, sub-oval. Uneven base	Pit
C108	C105	3	2.25	0.17	Soft black clayey silt, burnt stone	Fill of pit C105
C109	C105	1.81	-	0.16	Soft greyish brown silty sand	Fill of pit C105
C110	C105	0.26	-	0.055	Soft dark grey silt, snail shells	Fill of pit C105
C111	C105	0.48	-	0.045	Soft dark grey silt	Fill of pit C105
C112	C105	1.4	-	0.12	Soft light grey silt	Fill of pit C105
C113	C105	0.29	-	0.11	Soft dark brownish black silty sand	Fill of pit C105

This was the largest of the pits on site, and had somewhat more complex stratigraphy than the others. Some of its fills may represent natural sedimentation, while some appear to be similar to the burnt spread material with burnt stones and charcoal-rich soil. It is likely to have been an important pit during the lifetime of the site, and may have functioned as a trough. It was cut by a modern drain (C11) (see Plate 5, Figure 4).

2.2.1.5 Probable natural hollows

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C64	C65	2.5	0.6	0.15	Loose black silty sand, stones	Fill of poss pit C65
C65	N/A	2.5	0.6	0.15	N-S, linear	Depression
C116	C117	1.3	1.3	0.06	Loose black stony clay	Upper fill of pit C117
C117	N/A	1.62	1.2	0.28	E-W, sub-oval. Uneven base	Pit

There were two possible pits, C117 and C65, which may be associated with the burnt mound activity. These are extremely irregular in shape and form, they may represent natural hollows or depressions in the underlying natural clay which were filled by burnt mound material through ploughing and other activity (Plate 6).

2.2.1.6 Burnt spreads

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C4	N/A	16.5	11	0.15	Silty sand, 80% charcoal, h-s stones	Burnt mound deposit
C140	N/A	17.5	6	0.25	Brown/black silty sand, h-s stones	Burnt mound deposit

This group is made up of two burnt spreads which were identified and excavated on site (Figure 4). In both cases it was clear from modern plough marks in the natural clay beneath, and indeed from the nature of the spreads, that they had been disturbed to a very great degree by ploughing and perhaps land reclamation over the years. The main spread, C4, sealed some of the pits on site and is likely, despite disturbance, to have been located close to the main focus of activity on site in more or less its present day position. The smaller spread, C140, was located down-slope from C4 to the east, and was cut by (and partially slipping into) ditch C74 (Plate 8). It is a possibility that this was once part of the main spread C4, and that plough and reclamation activity moved it to its location as recorded on site. It did not seal any pits or other features.

2.2.2 Discussion

The burnt spread on this site was made up of typical heat-affected stone and charcoal-rich soil type material. This material would probably have been in a low mound originally, prior to ploughing and perhaps reclamation. It was quite a sizeable spread, though part of it extended beyond the C.P.O. to the west, so the full extent is unknown. The site was in low-lying, marshy land, with an area of wetland located to the east; such locations are typical of burnt mound sites. Given the size of the spread, the site is likely to have been in use for a prolonged period of time.

The pits on site were in some cases quite regular and clearly man-made, while some were very irregular in nature, scarcely more than hollows or depressions in the natural underlying clay. All were filled with material similar to the burnt mound material C4 and C140. Apart from pit C105, which given its size may have functioned as a trough for heating water, the other pits were largely non-descript and it can only be speculated that they functioned as waste or perhaps storage pits.

2.3 Phase 3 Post-medieval Activity

2.3.1 Ditches

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C3	C132	-	4.15	0.45	Soft dark clayey sand, burnt stone	Fill of C132
C5	N/A	-	3	0.5	Undulating base	Ditch
C6	C5	-	1.15	0.2	Loose greyish brown silty sand	Fill of C5
C7	C5	-	2.7	0.25	Loose sandy silt, 50% stone	Primary fill of C5
C12	C13	-	1.35	0.36	Loose greyish brown silty sand	Fill of drain C13
C13	N/A	-	1.35	0.36	Rounded base	Drain / boundary
C73	C74	-	2	0.2	Loose dark greyish black clayey sand	Fill of ditch C74
C74	N/A	-	*c.*2	0.6	Flat base	Ditch
C75	C74	-	2.1	0.2	Loose light greyish brown silty clay, shells	Fill of ditch C74
C78	C74	-	0.8	0.16	Loose black material	Fill of ditch C74
C79	C74	14	2.2	0.15	Loose black clayey sand, 15% charcoal	Fill of ditch C74
C80	C74	-	1.1	0.14	Loose light grey clay, snail shell	Fill of ditch C74
C81	C74	-	1.8	0.3	Loose brown and grey clay	Fill of ditch C74
C82	C74	1.1	1	0.3	Loose brown silty sand	Fill of ditch C74
C83	C74	_	4.5	0.14	grey and brown sandy clay, snail shell	Fill of ditch C74
C132	N/A	> 50	4.15	0.68	Rounded base, concave sides	Ditch / boundary
C133	C132	> 50	1.48	0.46	Soft dark brown clayish silt, peat	Fill of ditch C132
C137	N/A	-	2.2	0.48	Flat base	Ditch / boundary
C138	C74	-	0.3	0.4	Loose brown silty sand, waterlogged roots	Fill of ditch C74
C139	C74	-	4.6	0.15	Loose light brown silty sand, roots	Fill of ditch C74

Finds:

Context	Find Number	Material	Period	Description
3	003:001	Quartzite	Neolithic	Rubbing stone

Three relatively small and simple ditches were recorded on site. These are likely to be related to drainage, given the waterlogged nature of the site. Ditch C5 ran northeast–southwest, to the south of the site and appeared to be parallel with a field boundary in an adjoining field, suggesting that it may have been part of the field-boundary system until relatively recently, as well as having a drainage function (Figure 4). Ditch C13 ran north–south east of C74, and connected with C5 at an almost 90 degree angle, suggesting that these were contemporary. Ditch C137 ran northwest–south-east and connected with ditch C5, again suggesting it was part of the same system of ditches (Plate 9).

Ditch C74 ran north–south along the eastern edge of site, and seemed to define the boundary between the wetland proper and the drier ground to the west. This ditch cut spread C140 (Plate 8), and was filled by a series of peaty layers, and indeed some burnt spread material which had slipped into it over time (Figure 4). This ditch seemed to have a role both as a boundary (defining the wetland) and as a drainage feature. It linked into ditches C5 and C13 before turning south-east (becoming ditch C132) and continuing outside the limits of the excavation. It is likely to be broadly contemporary with these ditches. Ditch C132 is in effect a continuation of ditch C74, from the point where it turns south-east becoming wider and more flat bottomed at

the same time (Plate 9). It is considered to have the same function and date as ditch C74. Ditch C132 in turn splits to form C137 and C5.

A quartzite rubbing stone was recovered from ditch fill C3. The rubbing stone had been burnt, was smoothened on one surface and most likely dated to the Neolithic (Sternke, Appendix 2.1). No features dated to the Neolithic were identified on site or in the immediate vicinity so it is possible that this artefact was residual.

2.3.2 Furrow

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C119	C120	0.68	0.28	0.07	Loose greyish brown silty sand	Fill of furrow C120
C120	N/A	0.68	0.28	0.07	Linear	Furrow

C120 was the only furrow recorded on site as it was the only substantial example. It was located to the north-east of the site where it truncated C105. Others identified consisted of no more than scratch marks on the surface of the natural subsoil. All furrows on site were clearly made in the recent past by modern tractor-pulled ploughs.

2.3.3 Drains

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C10	C11	Unknown	0.4	0.47	Loose dark grey silty sand and clay	Fill of drain C11
C11	N/A	Unknown	0.4	0.47	Linear. Steep sides, pointed base.	Drain

Two parallel drains ran northwest–southeast across the site. A third drain was located to the north of these running NNW-SSE. The nature of these drains (filled with fine clean crushed stone, with a plastic pipe at the base) made it quite clear that they were extremely modern in nature. Indeed a conversation with the landowner revealed that these were laid in 1979. As these were clearly part of one drainage system, they were all recorded with one cut and fill number C11 and C10. These were stratigraphically the latest features on site.

2.4 Phase 4 Topsoil

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
C1	N/A			0.2	Dark brown/black sandy clay	Topsoil

Prior to machine stripping of the area the site was sealed with dark brown to black sandy clay. The topsoil was peaty in nature, but dry, perhaps as a result of the various drainage features on the site. The topsoil layer was fairly shallow generally, at *c.* 0.2m in depth.

3 SYNTHESIS

The synthesis presents the combined results of all of the archaeological analysis carried out at Rathduff Upper 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.

3.1 Landscape Setting – compiled by Michelle Brick

3.1.1 The General Landscape

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 Slevenamon (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 140 kilometres 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 Banagagole. 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. Rathduff Upper 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 situated on the edge of an area of wetland, at the eastern foot of a very low hill and slopes gently eastwards into the boggy terrain. The terrain rolls gently to the north and south and a low-lying hill is visible on the southern horizon. The landscape surrounding the site is under pasture and tillage. Rathduff 1 and Stonecarthy West 2 are located *c*. 300m and 500m respectively to the south. There are two enclosure sites within proximity to the site located *c*. 800m north-west (KK027–033) and *c*. 750m to the NNE (KK027-034).

3.2 The Archaeological Landscape

As part of the general research relating to sites along the scheme and the specific research relating to Rathduff Upper 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 Rathduff Upper 1 has been identified as being Bronze 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 (KK010-0550[01–10]) and Jenkinstown (KK014-0050[01–06] and KK014-0060[01–07]) 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 of this scheme; 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&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 Site Specific Archaeological Landscape of Rathduff Upper 1

There were no recorded monuments in the vicinity of Rathduff Upper 1. The nearest sites consisted of two enclosure sites located *c*. 800m north-west (KK027–033) and *c*. 750m to the NNE (KK027-034) of the site. A complex of ecclesiastical remains (KK027-046), holy well (KK027-045) and deserted village (KK027-047) all *c*. 700m to the south-west.

Rathduff Upper 1 forms part of a cluster of five burnt mounds identified as part of the N9/N10 Phase 4: Knocktopher to Powerstown in this area. Rathduff Bayley 1 was located 600m to the north on the banks of the Kings River. The site consisted of a large mound with no trough or other cut features and was dated to the middle Bronze Age (1489–1300BC; UBA 15448). Rathduff 1 was located 350m to the south, adjacent to a small stream. It consisted of a single rectangular trough and associated burnt mound spread which provided a dating range of 1610–1455BC (UBA 10994, 10995). Further south was Stonecarthy West 2 at a distance of 550m. It consisted of a trough, pits and burnt mound spread adjacent to a small stream. It produced two non-contemporary radiocarbon dates (2398–2136BC and 1755–1627BC) suggesting that there may have been two separate phases of activity on site. A fifth burnt mound was identified during monitoring of ancillary works 150m to the north-east of Rathduff Upper 1. The site was not excavated and is preserved *in situ*.

3.3 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).

3.4 Summary of the Excavation Results

An area of 75m by 30m was stripped and revealed two burnt spreads on the edge of an area of wetland, at the base of a gently sloping hill. Both of these spreads were heavily disturbed by ploughing. Indeed much of the material had been moved over the years so that it filled a post-medieval drainage ditch running along the edge of the wetland, with only traces of the original mounds being found in their original locations.

A number of mostly irregular pits were identified, some of which were sealed by the remainder of the burnt spreads. In all cases these features were filled by heat-affected stones and charcoal-rich soil. Two possibly worked pieces of flint and two possibly worked stones were recovered during excavation.

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

Lithics analysis

The lithic finds from the archaeological excavation at Rathduff Upper 1, Co. Kilkenny are a bipolar flint flake, a chert chunk, a quartzite rubbing stone and a possible hone stone made of limestone. The assemblage is technologically diagnostic and most likely dates to the late Neolithic/early Bronze Age.

Charcoal and Wood Species identification

Charcoal was examined from three contexts associated with pits at Rathduff Upper 1. Although there is no function attributed to the pit activity it is likely that the pits were used with activities at the burnt mound site and the charcoal is the remains of firewood used in various processes. The results are dominated by ash, hazel, pomoideae and oak, with smaller amounts of elm, alder and blackthorn/cherry.

Analysis of Plant Remains

The site was situated on the edge of an area of wetland and comprised two burnt spreads, both heavily disturbed by ploughing. Just two samples from this site contained plant remains. These were un-charred remains that are unlikely to have been archaeological material, but rather modern contaminants of the deposits.

Radiocarbon Dating

A total of 3 samples were sent for AMS radiocarbon dating.

The results of the analysis dated ash charcoal from the fill C8 of a pit. The 2 sigma calibrated date was 2341–2050BC (UBA 10997).

The results of the analysis also dated hazel charcoal from the fill C71 of a pit. The 2 sigma calibrated date was 2134–1937BC (UBA 10996).

The results of the analysis dated cherry-type charcoal from the fill C8 of a pit. The 2 sigma calibrated date was 1497–1417BC (UBA 10998).

4 DISCUSSION AND CONCLUSIONS

4.1 Discussion

The excavation at Rathduff Upper 1 produced evidence for burnt mound activity. Radiocarbon dating of samples from the site has indicated that there may have been at least two phases of activity on the site, in the early and middle Bronze Age. The site had been heavily disturbed and the mound material had been substantially moved from its original primary location. What remained were small thin patches of burnt mound material. A later post-medieval ditch contained a large volume of the burnt mound spread in its fill, providing further evidence for the substantial disturbance of the site.

The site was located at the western edge of a very wet, marshy area and it is likely that this landscape was similar in prehistory. This would have been an attractive setting for this activity as it would have provided a ready source of water, and generally burnt mound activity is focussed on the heating of water in a trough or other such feature.

There was evidence of a possible trough although there was no definitive rectangular trough as often found on other burnt mound sites. It is possible that this exists outside the limits of the site. It may have been truncated by one of the later post-medieval ditches. The majority of features on the site consisted of irregular small pits. While these were probably associated with the main burnt mound activities on the site it is unlikely that they represent primary features. Many other irregular features have been interpreted as natural hollows and it is possible that some of the shallow pits are also natural.

A number of lithic artefacts were retrieved and specialist analysis has suggested that they may be indicative of Neolithic activity. Radiocarbon dating of samples from the site has not indicated a Neolithic date, but has provided an early and middle Bronze Age date. A large number of excavated burnt mounds across the country produce dates from the Bronze Age, so this would be expected based on the typology of the site. The Neolithic artefacts may be residual from undated Neolithic features that may exist on or near the site.

4.2 Conclusions

There are no previously known prehistoric monuments in the immediate area and as such the identification of the site could be viewed as unexpected. However the site is in a marginal and wet landscape, an area where burnt mound sites are typically found. The presence of other burnt mounds in the immediate area confirms that it is an area that was attractive for this type of activity throughout the Bronze Age. The site is important locally as it provides evidence for previously unknown occupation of this landscape in the Bronze Age.

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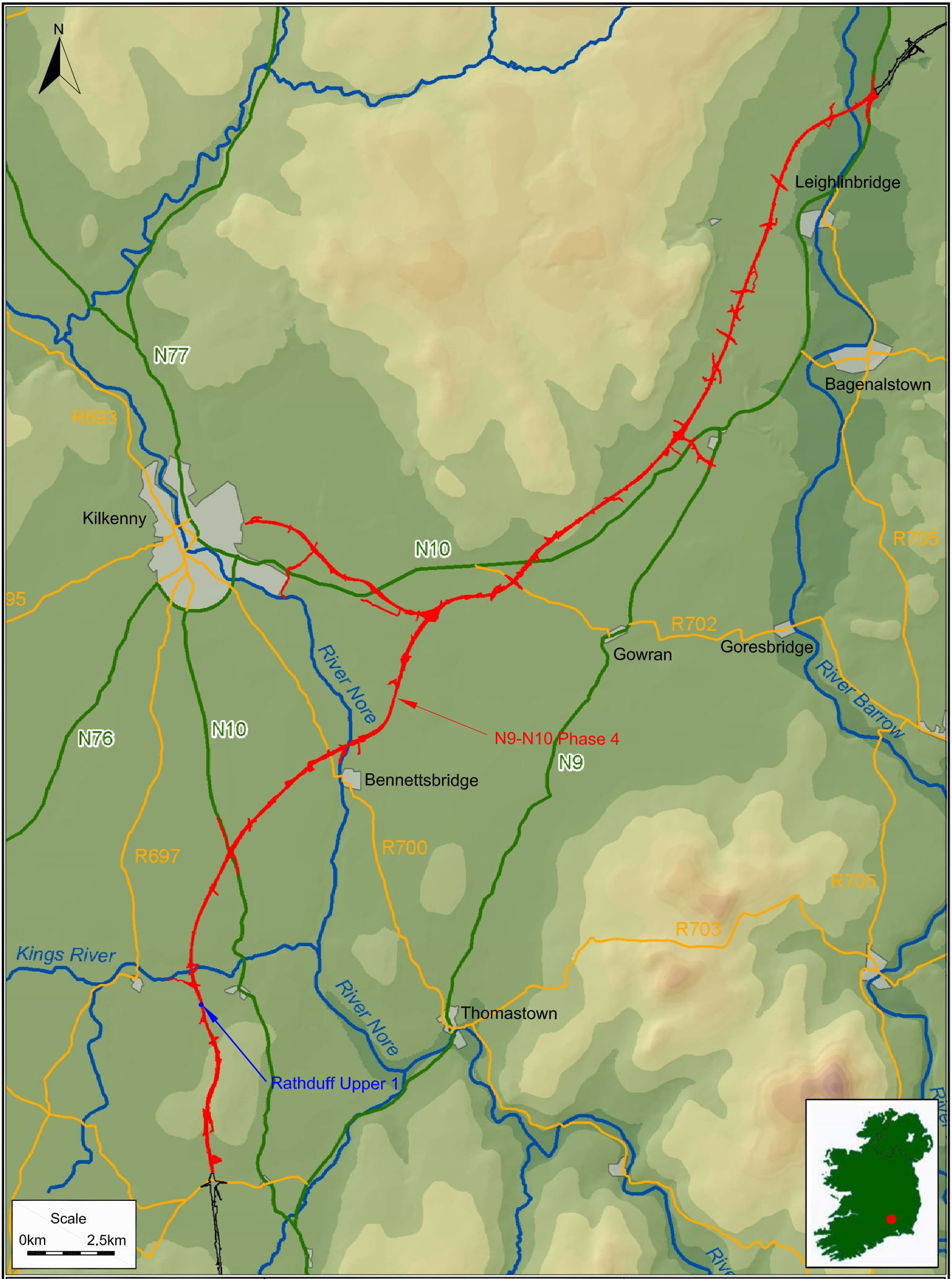

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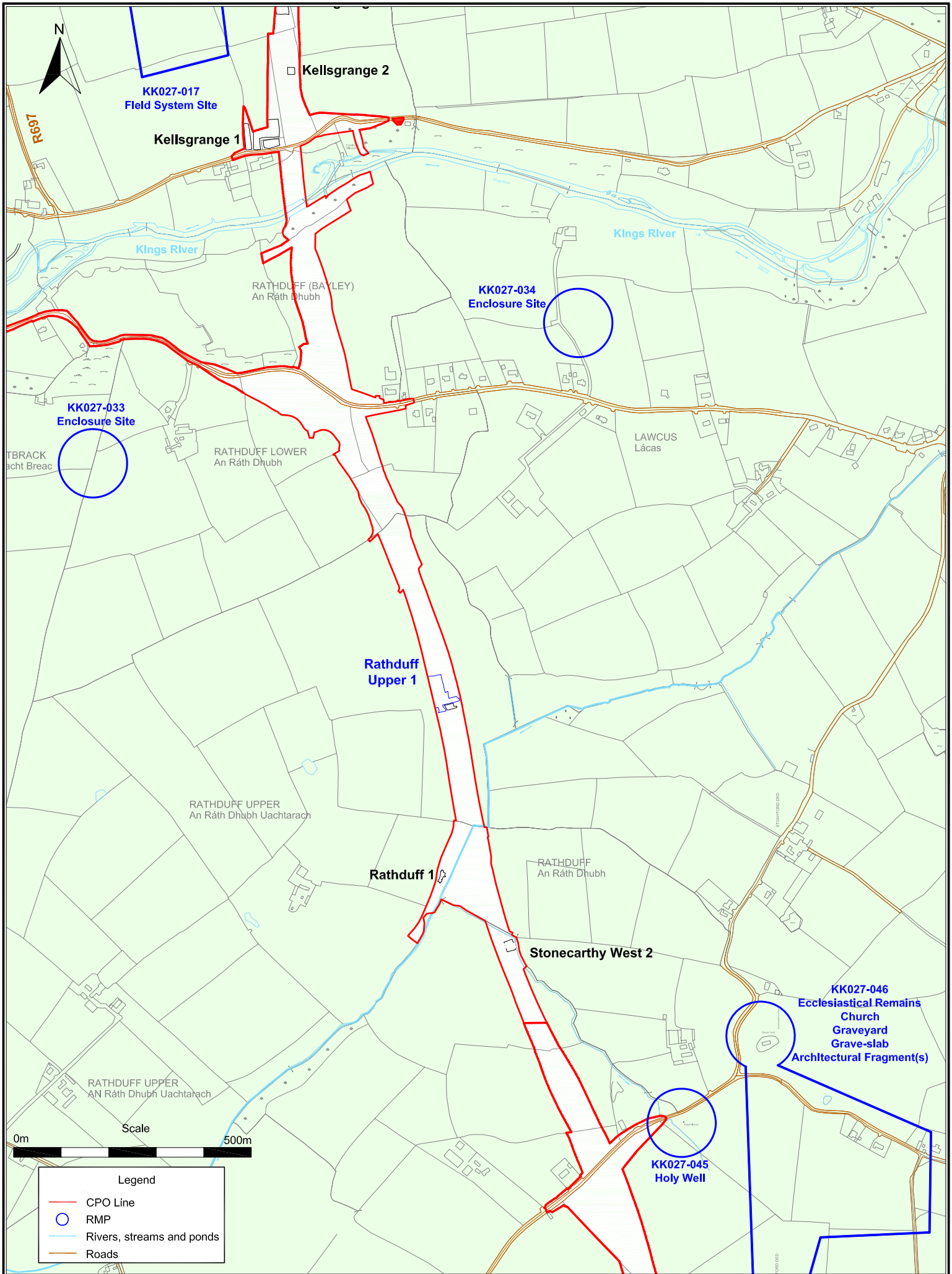

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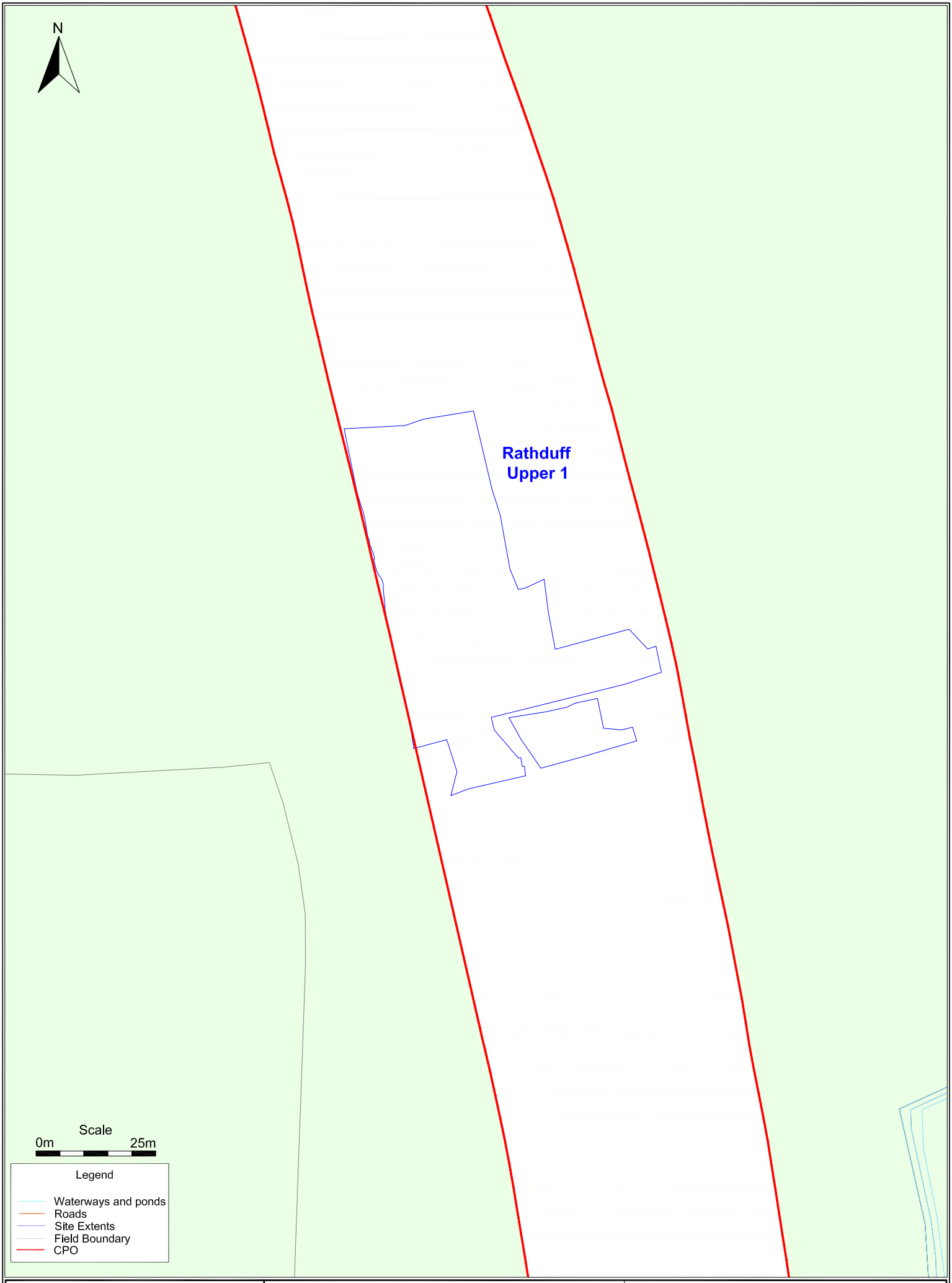

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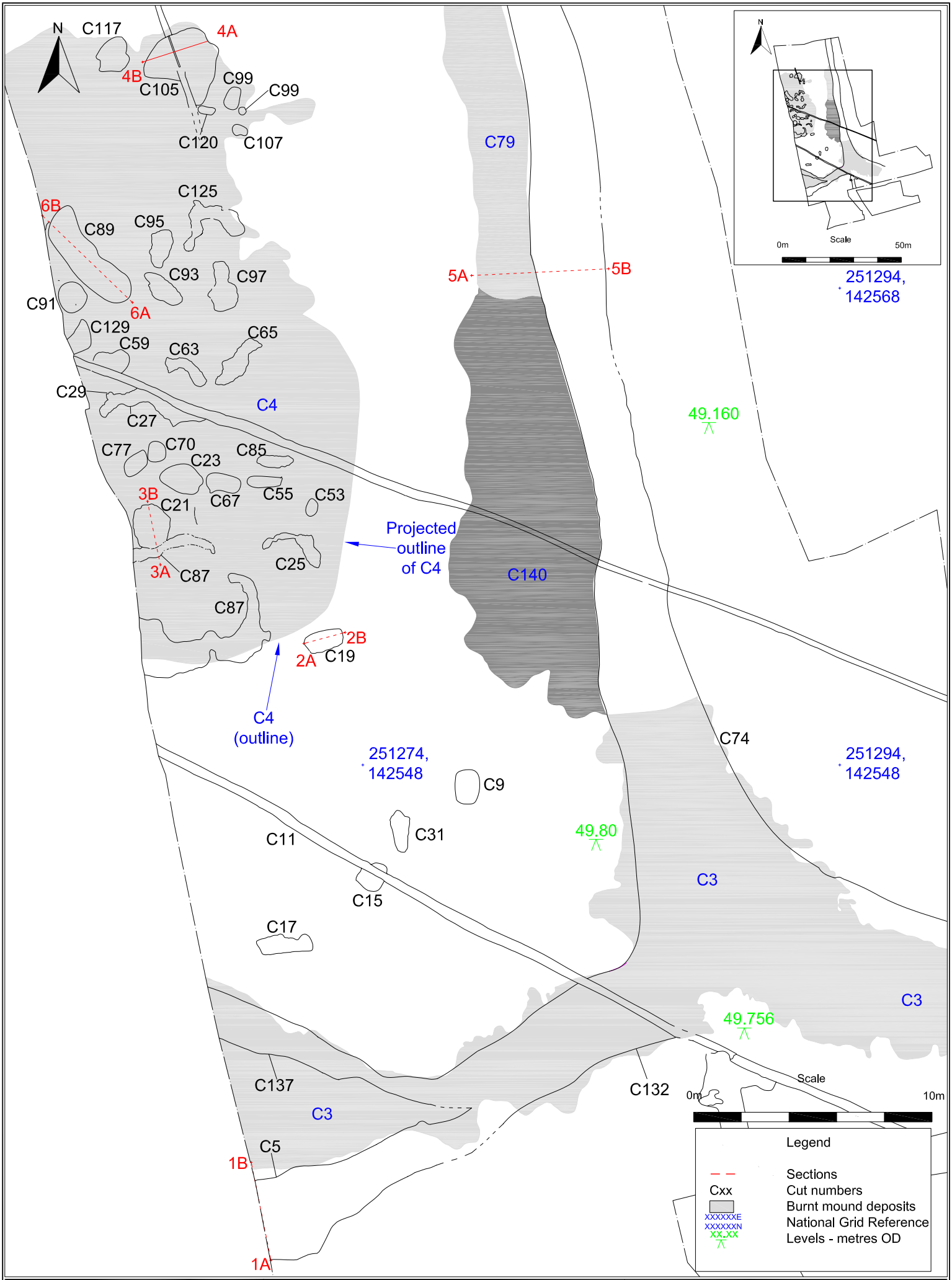

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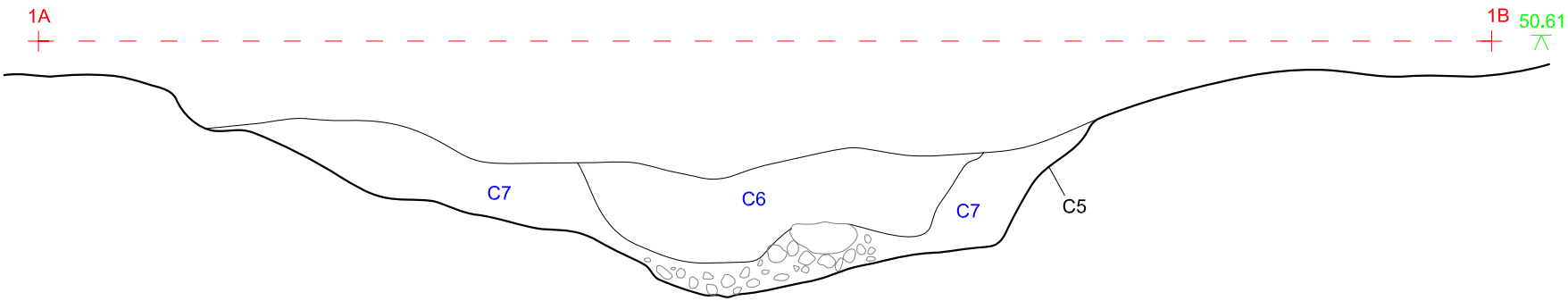
East facing section of C5



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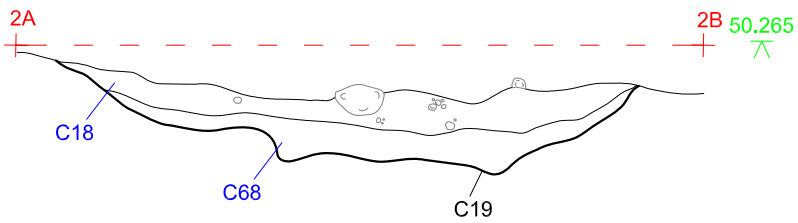

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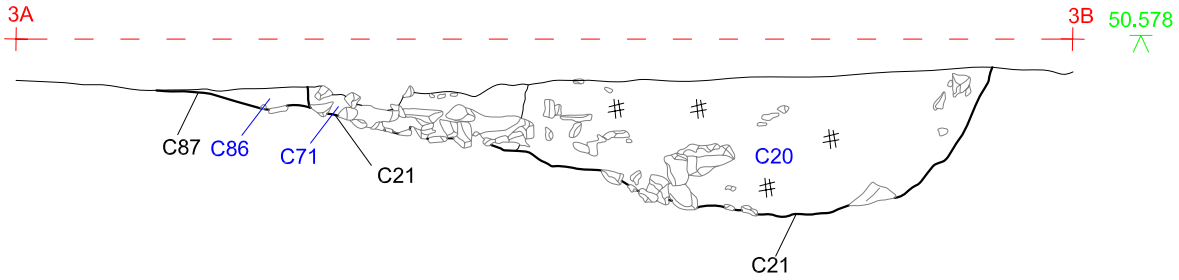
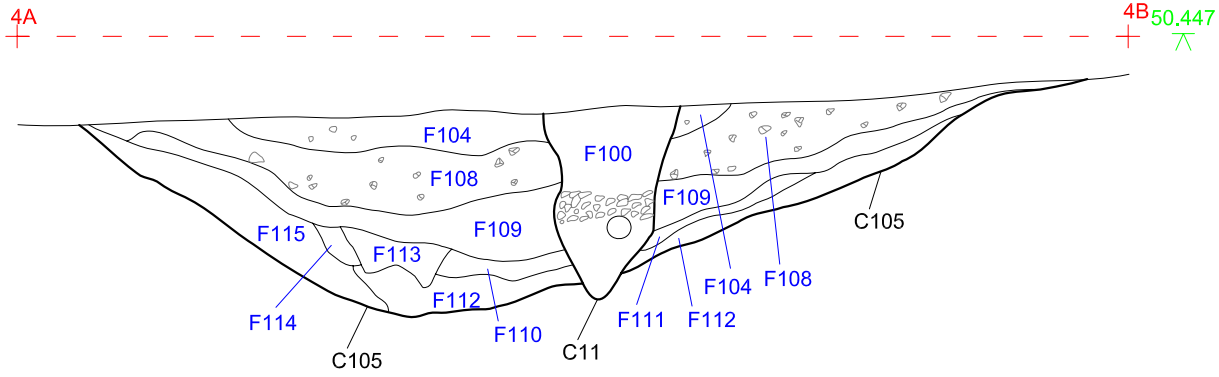


Northwest facing section of C105 and C111



Scale

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Legend

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

IAC Irish Archaeological Consultancy

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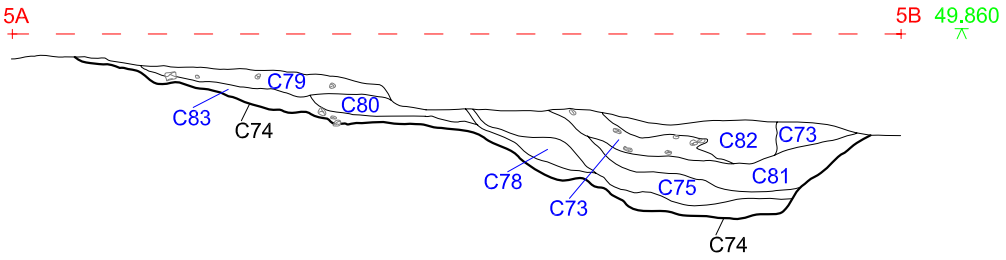
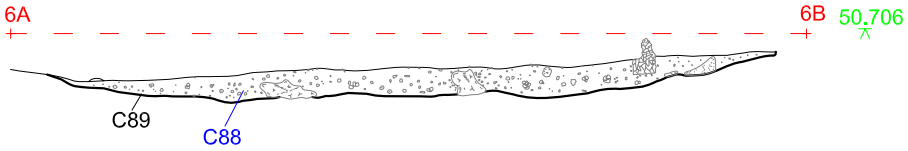
Project:	N9-N10 Phase 4: Knocktopher to Powerstown
Client:	Kilkenny County Council

Scale:	1:20 @ A4
Date:	10/05/10
Produced by:	G Kearney
Job No:	J2432
Figure No:	5

South facing section of C74



Northeast facing section of C89



Scale

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Legend

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Cxx	Fill numbers
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xx.xx	Levels - metres OD

IAC Irish Archaeological Consultancy

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Project:	N9-N10 Phase 4: Knocktopher to Powerstown
Client:	Kilkenny County Council

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Date:	10/05/10
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Job No:	J2432
Figure No:	6

PLATES

Plate 1: Pit C9, pre-excavation, facing east

Plate 2: Pit C31, mid-excavation, facing west

Plate 3: Pit C21, mid-excavation, facing south-west

Plate 4: Pit C89, mid-excavation, facing south-west

Plate 5: Trough C105 cut by drain C11, mid-excavation, facing south

Plate 6: Possible pit C65, post-excavation, facing north

Plate 7: Burnt spread, mid-excavation, facing NNW

Plate 8: Spread C140 being cut by ditch C74, mid-excavation, facing NNW

Plate 9: Ditch C132 and C5 (background), mid-excavation, facing west

APPENDIX 1CATALOGUE OF PRIMARY DATA

Appendix 1.1 Context register

Context	Fill of	L	W	D	Interpretation	Description	Context Below	Context Above
C1	N/A	N/A	N/A	N/A	Topsoil	Dark brown/black sandy clay		
C2	N/A	N/A	N/A	N/A	Subsoil	Pale grey to yellow silty clay		
C3	C132	_	4.15 max	0.45	Burnt mound like material filling ditch 132. May represent mound material ploughed or bulldozed into boundary/drainage ditch in modern times.	Soft dark brownish black clayey sand with burnt stone inclusions.	C139, C137, C32-C51, C56, C57	C133, C1
C4	N/A	16.5	11 max	0.15 max	Burnt mound, disturbed to a high degree by modern ploughing activity. Relates to C3.	Irregular spread of loose dark black silty sand with charcoal inclusions (80%) and heat shattered stones.	C71, C104, C66, C69, C76, C86, C88, C90, C92, C94, C96, C128, C22	C1
C5	N/A	_	3	0.5	Shallow drainage ditch of probable post-medieval date.	Cut of linear ditch extending beyond site. Mostly flat base, somewhat undulating, gradually sloping sides.	C2	C7
C6	C5	_	1.15	0.2	Secondary fill of drainage ditch C5.	Loose greyish brown silty sand.	C7	C1
C7	C5	_	2.7	0.25	Primary fill of ditch C5.	Loose light greyish yellow sandy silt with 50% stone inclusions.	C5	C6
C8	C9	1.35	1.1	0.17	Burnt mound like material filling shallow sub-rectangular pit	Loose black silty clay fill containing 50% stones and occasional charcoal	C9	C1
C9	N/A	1.35	1.1	0.17	Shallow pit associated with adjacent burnt mound.	Shallow sub-rectangular pit orientated NW-SE	C2	C84
C10	C11	_	0.4	0.47	Fill of modern drain with plastic pipe at its base. Acc to farmer placed in 1979.	Loose dark grey silty sand and clay with yellow and black mixed through.	C11	C1
C11	N/A	_	0.4	0.47	Modern field drain with plastic pipe at base. 1979.	Linear drain cut. Near vertical sides, pointed base.	C2	C10
C12	C13	_	1.35 max	0.36	Fill of modern drain with plastic pipe at its base. Acc to farmer placed in 1979.	Loose greyish brown silty sand.	C13	C1
C13	N/A	_	1.35 max	0.36	Shallow drainage ditch /boundary.	Linear ditch running N-S. Smoothly curving sides and gently rounded base.	C2	C128
C14	C15	1.27	1.17	0.13	Burnt mound like material filling shallow pit or natural depression	Loose black silty clay fill containing 40% stones and occasional charcoal	C15	C1

Context	Fill of	L	W	D	Interpretation	Description	Context Below	Context Above
C15	N/A	1.27	1.17	0.13	Shallow pit filled with burnt mound like material	Shallow oval pit with flat base	C2	C14
C16	C17	2.18	0.84	0.09-0.25	Fill of shallow pit.	Loose black silty clay fill with some stone inclusions.	C17	C1
C17	N/A	2.18	0.84	0.09-0.25	Shallow pit filled with burnt mound like material	Cut of shallow sub-rectangular pit with uneven base	C2	C16
C18	C19	1.5	0.8	0.1	Upper fill of sub-oval pit, similar to burnt mound material C3. Sealed lower fill C68.	Friable dark grey silty clay with sand, stones and charcoal (10%) inclusions.	C68	C1
C19	N/A	1.5	0.8	0.2	Shallow possible pit filled with burnt mound like material	Sub-oval shallow cut of pit with very gradual concave sides.	C2	C68
C20	C21	1.87	1.6	0.38	Fill of pit, very similar to burnt mound material.	Loose black stony fill of pit with charcoal inclusions.	C21	C71
C21	N/A	1.87	1.6	0.5	Irregular pit cut, filled by material similar to burnt mound C3.	Irregular pit cut.	C2	C20
C22	C23	1.55	1.42	0.42	Fill of pit, very similar to burnt mound material.	Softly compacted blackish brown clayey silt with burnt stone inclusions.	C23	C4
C23	N/A	1.55	1.42	0.42	Small pit filled with burnt mound like material.	Sub-circular concave pit cut with uneven base.	C2	C22
C24	C25	1.6	0.9	0.13	Pit fill similar to burnt mound material.	Loose black silty clay with stone inclusions (50%).	C25	C1
C25	N/A	1.6	0.6	0.2	Irregular pit cut, filled by material similar to burnt mound C3.	NW-SE oriented irregular pit with stepped sides and uneven base.	C2	C24
C26	C27	4.02	0.5	0.2	Silty clay burnt mound like fill of pit.	Firm dark grey heavily charcoal stained silty clay with sand and stone inclusions.	C27	C1
C27	N/A	4.02	0.5	0.2	Shallow linear possible pit	E-W oriented irregular possible pit	C2	C26
C28						Cancelled		
C29						Cancelled		
C30	C31	1.7	0.88	0.27	Burnt mound like fill of shallow pit	Loose dark grey silty clay with burnt stone inclusions (45%).	C31	C1
C31	N/A	1.75	0.92	0.3	Shallow pit filled with burnt mound like material	NW-SE oriented sub-oval shallow pit with gently sloping sides to E and vertical on W and an uneven base.	C2	C30
C32	C3	_	_	_	Natural depression	N/A Burnt mound material C3 sitting in natural depression.	C2	C3
C33	C3	_	_	_	Natural depression	N/A Natural depression filled with C3.	C2	C3
C34	C3	_	_	_	Natural depression	N/A Burnt mound material C3 sitting in natural depression.	C2	C3
C35	C3	_	_	_	Natural depression	N/A Natural depression filled with C3.	C2	C3
C36	C3	_	_	_	Natural depression	N/A Burnt mound material C3 sitting in natural depression.	C2	C3
C37	C3	_	_	_	Natural depression	N/A Natural depression filled with C3.	C2	C3

Context	Fill of	L	W	D	Interpretation	Description	Context Below	Context Above
C38	C3	0.5	0.4	0.08	Natural depression	N/A Silty clay deposit in natural hollow.	C2	C3
C39	C3	_	_	_	Natural depression	N/A Burnt mound material C3 sitting in natural depression.	C2	C3
C40	C3	0.6	0.58	0.08	Natural depression	N/A Burnt mound material C3 sitting in natural depression.	C2	C3
C41	C3	_	_	_	Natural depression	N/A Natural depression filled with C3.	C2	C3
C42	C3	0.4	0.38	0.1	Natural depression	N/A Burnt mound material C3 sitting in natural depression.	C2	C3
C43	C3	_	_	_	Natural depression	N/A Natural depression filled with C3.	C2	C3
C44	C3	_	_	_	Natural depression	N/A Burnt mound material C3 sitting in natural depression.	C2	C3
C45	C3	_	_	_	Natural depression	N/A Natural depression filled with C3.	C2	C3
C46	C3	_	_	_	Natural depression	N/A Burnt mound material C3 sitting in natural depression.	C2	C3
C47	C3	_	_	_	Natural depression	N/A Natural depression filled with C3.	C2	C3
C48	C3	_	_	_	Natural depression	N/A Burnt mound material C3 sitting in natural depression.	C2	C3
C49	C3	_	_	_	Natural depression	N/A Natural depression filled with C3.	C2	C3
C50	C3	_	_	_	Natural depression	N/A Burnt mound material C3 sitting in natural depression.	C2	C3
C51	C3	_	_	_	Natural depression	N/A Natural depression filled with C3.	C2	C3
C52	C53	0.88	0.5	0.22	Fill of suboval possible pit	Loose dark grey silty clay with burnt stone inclusions (25%).	C53	C1
C53	N/A	0.92	0.55	0.25	shallow pit	NW-SE oriented sub-oval shallow pit with concave sides and base filled with burnt mound like material	C2	C52
C54	C55	2.3	0.84	0.25	Fill of possible pit	Loose black sandy clay with a few stone inclusions and occasional snail shells.	C55	C1
C55	N/A	2.3	0.84	0.25	E-W oriented linear pit	E-W oriented linear pit.	C2	C54
C56	C3	_	_	_	Natural depression	N/A Burnt mound material C3 sitting in natural depression.	C2	C3
C57	C3	_	_	_	Natural depression	N/A Natural depression filled with C3.	C2	C3
C58	C59	1.5	1.04	0.1	Burnt mound like fill of shallow pit	Loose black silty clay with stone inclusions (45%).	C59	C1
C59	N/A	1.4	1	0.14	Shallow pit.	NW-SE oriented oval shallow pit.	C2	C58
C60	C3	_	_	_	Natural depression	Grey natural fill of hollow.	C2	C3

Context	Fill of	L	W	D	Interpretation	Description	Context Below	Context Above
C61	C3	_	_	_	Natural depression	N/A Natural depression filled with large stone and grey silty fill.	C2	C3
C62	C3	2.22	0.7	0.05	Natural depression	N/A Burnt mound material C3 sitting in natural depression.	C2	C3
C63	C3	2.22	0.7	0.05	Natural depression	N/A Natural depression filled with burnt mound like material	C2	C3
C64	C65	2.5	0.6	0.15	Fill of C65	Loose black silty sand with frequent stone inclusions	C65	C1
C65	N/A	2.5	0.6	0.15	Possible shallow pit or natural hollow	N-S oriented linear pit	C2	C64
C66	C67	2.9	2.4	0.07	Fill of c-shaped feature.	Soft white sandy silt.	C67	C4
C67	N/A	2.9	2.4	0.07	Possible linear pit.	Cut of c-shaped feature possible pit. Function if any is unclear.	C2	C66
C68	C19	1.5	0.8	0.1	Basal fill of sub-oval pit C19. Less charcoal than upper fill C18.	Friable/crumbly mid-dark brown sandy clay with silt and some sandstone inclusions.	C19	C18
C69	C70	1.38	1.1	0.1	Top fill of C70. Similar to burnt mound material.	Soft dark brownish grey clayey silt with burnt stone inclusions.	C72	C4
C70	N/A	1.38	1.1	0.22	Small pit filled with burnt mound like material.	Oval and concave small pit filled with some burnt mound like material.	C2	C72
C71	C21	0.57	0.58	0.15	Fill of circular pit.	Loose brown sandy clay with 90% stone inclusions	C20	C4
C72	C70	1.34	0.75	0.12	Basal fill of oval pit.	Soft greyish brown silty clay.	C70	C69
C73	C74	_	2	0.2	Dark fill of ditch C74.	Loose dark greyish black clayey sand.	C81	C82
C74	N/A	_	c.2	0.6	N-S oriented drainage/boundary ditch.	Cut of linear ditch extending beyond site. Mostly flat base, gradually sloping sides.	C2	C83
C75	C74	_	2.1	0.2	One fill of ditch C74.	Loose light greyish brown silty clay with shell inclusions.	C78	C81
C76	C77	3.17	2.92	0.08	Fill of shallow c-shaped feature, similar to C4.	Soft greyish brown sandy silt fill of c-shaped feature.	C77	C4
C77	N/A	3.17	2.92	0.08	Possible pit, function unknown.	Shallow C-shaped cut of possible pit.	C2	C76
C78	C74	_	0.8	0.16	Fill of ditch C74, concentrated on west side.	Loose black material within ditch C74.	C79	C75
C79	C74	14	2.2	0.15	Burnt mound like material filling the top of the west side of ditch C74. Probably ploughed or bulldozed to its current location.	Loose black clayey sand with charcoal inclusions (15%).	C80	C78
C80	C74	_	1.1	0.14	One fill of ditch C74.	Loose light grey clay with snail shell inclusions.	C83	C79
C81	C74	_	1.8	0.3 max	One fill of ditch C74, concentrated on east side.	Loose brown and grey clay.	C75	C73
C82	C74	1.1	1	0.3 max	Uppermost fill of ditch C74. Topsoil like.	Loose brown silty sand.	C73	C1
C83	C74	_	4.5	0.14	Basal primary fill of ditch C74. Appears to have filled from the west side mainly, ie the uphill side	Loose light grey and brown sandy clay with snail shell inclusions.	C74	C80

Context	Fill of	L	W	D	Interpretation	Description	Context Below	Context Above
					of the ditch.			
C84	C85	1.5	0.45	0.16	Fill of small sub-circular pit.	Loose black sandy clay with occasional stone inclusions.	C85	C1
C85	N/A	1.5	0.45	0.16	Possible pit, function unknown.	E-W oriented linear pit.	C2	C84
C86	C87	5.18	0.45	0.03	Shallow curvilinear feature extending outside CPO to the W.	Soft brownish grey clayey silt with stone inclusions.	C87	C4
C87	N/A	5.18	0.45	0.03	Curvilinear feature, possible structure?	C-shaped curvilinear shallow cut of possible feature/structure.	C2	C86
C88	C89	5	1.5	0.2	Burnt mound like fill of shallow pit or possible trough.	Loose black sandy silt with stone and charcoal staining.	C89	C4
C89	N/A	5	1.5	0.2	Possible shallow trough-like pit.	Linear pit cut, of possible trough like feature.	C2	C88
C90	C91	1.5	1.3	0.2	Fill of shallow pit sealing large stones *in situ*. Possible stone hearth?	Loose dark grey/black silt with stone inclusions.	C91	C4
C91	N/A	1.5	1.3	0.2	Possibly a stone-based hearth.	This cut is partially outside the CPO, and hence its shape is unknown, but sub-rectangular where exposed. Was cut onto large stone slabs sitting in the natural.	C2	C90
C92	C93	1.1	0.9	0.09	Top fill of oval/irregular pit.	Loose black sand with 30% stone inclusions.	C103	C4
C93	N/A	1.8	0.9	0.21	Possible pit, function unknown.	NW-SE oriented oval/irregular pit cut.	C2	C103
C94	C95	1.96	1.7	0.14	Fill of irregular possible pit, similar to burnt mound material.	Soft greyish black clayish sand with burnt stones and charcoal inclusions	C102	C4
C95	N/A	1.96	1.7	0.22	Possible pit, function unknown.	Irregular cut of shallow possible pit.	C2	C102
C96	C97	2.12	1.25	0.13	Fill of ovoid possible pit, similar to burnt mound material.	Soft brownish grey silty clay with occasional small stone inclusions.	C97	C4
C97	N/A	2.12	1.25	0.13	Possible pit, function unknown.	Linear concave cut of possible shallow pit.	C2	C96
C98	C99	1.73	1.65	0.37	Burnt mound like fill of possible pit or hollow.	Loose blackish brown to black silty sand with small to medium stone inclusions.	C99	C1
C99	N/A	1.73	1.65	0.37	Possible pit, function unknown.	Irregular cut of possible shallow possible pit.	C2	C98
C100	N/A	_	_	_	N/A	Linear natural depression with stones and greyish soil fill.	C2	C1
C101	N/A	_	_	_	N/A	Linear natural depression with stones and greyish soil fill.	C2	C1
C102	C95	_	0.8	0.08	Basal fill of irregular pit.	Soft grey silty clay with inclusions of shell fragments	C95	C94
C103	C93	1.3	0.9	0.14	Fill of possible pit	Compact grey soil, basal fill of possible pit.	C93	C92
C104	C105	1.9	1.39	0.12	Top fill of pit.	Soft greyish brown sandy silt with burnt stone inclusions.	C105	C4
C105	N/A	3.3	2.9	0.68	Large pit associated with burnt mound C004	SE-NW oriented sub-oval pit with uneven base and	C2	C104

Context	Fill of	L	W	D	Interpretation	Description	Context Below	Context Above
						smoothly sloping sides.		
C106	C107	0.39	0.2	0.17	Small pit or posthole.	Loose blackish brown to black silty sand with small to medium stone inclusions.	C107	C1
C107	N/A	0.39	0.2	0.17	Possible posthole.	Circular concave cut.	C2	C106
C108	C105	3	2.25	0.17	One fill of large pit.	Soft black clayey silt with burnt stone inclusions.	-	-
C109	C105	1.81	_	0.16	Fill of irregular large pit, possibly a natural sediment layer.	Soft greyish brown silty sand	-	-
C110	C105	0.26	_	0.055	Fill of pit, possibly as a result of natural sedimentation.	Soft dark grey silt with snail shell inclusions.	-	-
C111	C105	0.48	_	0.045	Fill of irregular large pit, possibly a natural sediment layer.	Soft dark grey silt.	-	-
C112	C105	1.4	_	0.12	Fill of irregular large pit, possibly a natural sediment layer.	Soft light grey silt.	-	-
C113	C105	0.29	_	0.11	Fill of irregular large pit, possibly a natural sediment layer.	Soft dark brownish black silty sand.	-	-
C114	C105	0.17	_	0.08	Fill of irregular large pit, possibly a natural sediment layer.	Soft light greyish yellow silty sand.	-	-
C115	C105	0.85	_	0.15	Fill of irregular large pit, possibly a natural sediment layer.	Soft light greyish white silty sand.	-	-
C116	C117	1.3	1.3	0.06	Top fill of pit.	Loose black stony clay.	C123	C1
C117	N/A	1.62	1.2	0.28	Possible shallow pit or natural hollow	E-W oriented sub-oval pit with gradual sloping sides and uneven base.	C2	C123
C118	N/A	8.7	1.3 max.	0.15	N/A	Naturally occurring linear depression filled by burnt mound material.	C2	C1
C119	C120	0.68	0.28	0.07	Fill of furrow.	Loose greyish brown silty sand.	C120	C1
C120	N/A	0.68	0.28	0.07	Furrow.	Shallow linear cut of furrow.	C2	C119
C121	C122	0.52	0.39	0.1	Burnt mound like fill of shallow square depression or pit. NA	Dark brown silty sand with 15% burnt stone inclusions.	C122	C1
C122	N/A	0.52	0.39	0.1	Probable natural depression.	Shallow sub-square cut of possible pit or natural depression.	C2	C121
C123	C117	0.8	1.3	0.15	Grey silty fill of possible shallow pit or hollow.	Compact silty grey soil with 5% stone inclusions.	C117	C116
C124	C125	4	0.67	0.25	Natural depression filled with burnt mound material.	Loose black silty sand with frequent inclusions of burnt stones.	C125	C1
C125	N/A	4	0.67	0.25	Probable non-archaeological irregular	L-shaped probably natural depression with uneven base.	C2	C124

Context	Fill of	L	W	D	Interpretation	Description	Context Below	Context Above
					depression.			
C126	N/A	_	_	_	Natural depression filled with burnt mound material. This context is cut by 100 and 110.	Natural depression filled by C4	C2	C1
C127	N/A	1	0.9	0.02	Natural non-archaeological deposit of silt. N/A	Irregular loose dark grey mottled sandy clayey silt.	C2	C128
C128	C129	1.2	0.62	0.15	Burnt mound like fill of C129.	Loose dark grey silty clay with 35% stone inclusions.	C129	C4
C129	N/A	1.22	0.69	0.17	Shallow possible pit filled with burnt mound like material	NE-SW oriented sub-oval shallow cut with flat base and gently sloping sides.	C2	C128
C130	N/A	1	0.9	0.03	N/A	Irregular deposit of loose black soil with 10% stone inclusions.	C2	C1
C131	N/A	_	_	_	Natural non-archaeological deposit of sandy clay. N/A	Irregular deposit of friable yellowish-white sandy clay.	C2	C1
C132	N/A	> 50	Up to 4.15	0.68	Boundary/drainage ditch.	Linear cut of large ditch with rounded base and concave sides.	C2	C134
C133	C132	> 50	1.48	0.46	Sediment layer within ditch C132.	Variable soft dark brown clayish silt with some peat inclusions.	C31	C1
C134	C132	> 50	3.6	0.31	Basal fill of ditch C132, sedimented by water flowing through ditch.	Soft light greyish brown clayey sand with occasional inclusions of snail shells.	C132	C138
C135						Cancelled		
C136	N/A	0.5	0.37	0.14	Natural deposit.	Irregular deposit of loose black and grey/yellow soil with 5% stone inclusions	C2	C1
C137	N/A	_	2.2	0.48	Boundary/drainage ditch.	Linear ditch cut. NW-SE oriented. Flat base and gradual sloping sides.	C2	C3
C138	C74	_	0.3	0.4	Organic fill of ditch C74.	Loose brown silty sand with some organic inclusions eg. waterlogged roots.	C134	C139
C139	C74	_	4.6 max	0.15	Organic fill of ditch C74.	Loose light brown silty sand with inclusions of organic material/roots.	C138	C3
C140	N/A	17.5	6 max	0.25 max	Disturbed (ploughed) burnt mound material moved during reclamation, and cut by ditch C74 and partially fallen into it also.	Spread of disturbed burnt mound-like material adjacent to, cut by and spilling into ditch C74. Loose dark brown/black silty sand with heat shattered stone inclusions.	C2	C1

Appendix 1.2 Catalogue of Artefacts

Registration Number	Context	Item No.	Simple Name	Full Name	Material	Description	No. of Parts
E3613:003:1	3	1	Rubbing-stone	Quartzite rubbing stone	Quartzite	A quartzite rubbing stone smoothened on one surface and had been had been burnt.	N/A
E3613:018:1	18	1	Chunk	Chert chunk	Chert	Chert chunk which had been burnt.	N/A
E3613:098:1	98	1	Hone-stone	Limestone hone stone	Limestone	A possible hone stone made of limestone and smoothened on all sides.	N/A
E3613:103:1	103	1	Flake	Flint flake	Flint	A flint flake produced on a bipolar-on-an-anvil core and is missing its proximal end. It displays traces of use-wear on its right edge and bears the remnants of cortex. The flake had been burnt.	N/A

Appendix 1.3 Catalogue of Ecofacts

During post excavation works specific samples were processed with a view to further analysis. Thirty soil samples were taken from features at Rathduff Upper 1 and eight of these 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 charcoal	Burnt animal bone	animal bone	human bone	metallurgical waste	Other
8	1		2.1g	0.1g					
71	8		3.1g						
86	16		0.1g						0.5g Shell
88	24		39.8g						
90	25		3.2g	<0.1g					
102	23		0.4g						3.6g Shell
103	21		0.3g						0.1g Shell
110	29								2.6g Shell

Appendix 1.4 Archive Index

Project: N9/N10 Phase 4 Knocktopher to Powerstown		
Site Name: AR070 Rathduff Upper 1		
Excavation Registration Number: E3613		
Site director: Ed Lyne		
Date: 14.07.10		
Field Records	**Items (quantity)**	**Comments**
Site drawings (plans)	14	4 pre-ex,1 mid-ex and 9 post-ex
Site sections, profiles, elevations	3	3 section sheets
Other plans, sketches, etc.	0	
Timber drawings	0	
Stone structural drawings	0	
Site diary/note books		
Site registers (folders)	1	
Survey/levels data (origin information)	492	
Context sheets	140	
Wood Sheets	0	
Skeleton Sheets	0	
Worked stone sheets	0	
Digital photographs	174	
Photographs (print)	0	
Photographs (slide)	0	
Security copy of archive	Yes	Digital copy

APPENDIX 2SPECIALIST REPORTS

Appendix 2.1 Lithics Report – Dr. Farina Sternke

Appendix 2.2 Charcoal and Wood Report – Ellen O' Carroll

Appendix 2.3 Plant Remains Analysis Report – Penny Johnston

Appendix 2.4 Radiocarbon Dating Results – QUB Laboratory

Appendix 2.1 Lithics Report – Dr. Farina Sternke

Lithics Finds Report for E3613 Rathduff Upper 1 (A032/082),
Co. Kilkenny
N9/N10 Road Scheme – Phase 4
Farina Sternke MA, PhD

Contents

List of Tables

Introduction

Four lithic finds from the archaeological investigations of a prehistoric site at Rathduff Upper 1, Co. Kilkenny were presented for analysis (Table 1). The finds are associated with the remains of two *fulachta fiadh* with associated pits.

Find Number	Context	Material	Type	Condition	Cortex	Length (mm)	Width (mm)	Thickness (mm)	Complete	Retouch
E3613:003:1	3	Quartzite	Rubbing Stone	Burnt		60	44	22	No	No
E3613:018:1	18	Chert	Chunk	Burnt	No	26	28	14	No	No
E3613:098:1	98	Limestone	Hone Stone	Weathered		123	106	29	Yes	No
E3613:103:1	103	Flint	Flake	Burnt	Yes	41	24	5	No	No

Table 1 Composition of the Lithic Assemblage from Rathduff Upper 1 (E3613)

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 are retouched or of specific significance, e.g. cores etc. The same is done with natural chunks.

Quantification

The artefacts are a flaked piece of flint, a flaked piece of chert, an utilised piece of quartzite and an utilised piece of limestone. All artefacts are larger than 20mm in length and width and were therefore recorded in detail.

Provenance

The finds were recovered from burnt spreads and pit fills.

Condition:

The lithics survive in burnt (E3613:003:1, E3613:018:1 and E3613:103:1) and weathered (E3613:098:1) condition. Three artefacts are incomplete (Table 1) and one artefact (E3613:103:1) bears the remnants of cortex.

Technology/Morphology:

The lithics are a flint flake (E3613:103:1), a chert chunk (E3613:018:1) and two macro tools (E3613:003:1and E3613:098:1).

FLAKES
The flake was produced on a bipolar-on-an-anvil core and is missing its proximal end. It displays traces of use-wear on its right edge and measures 41mm in length, 24mm in width and 5mm in thickness. The flake most likely dates to the second half of the Neolithic period based on its technology.

Macro Tools:
The macro tools are a quartzite rubbing stone (E3613:003:1) and a possible hone stone made of limestone (E3613:098:1). The rubbing stone is smoothened on one surface ad measures 60mm long, 44mm wide and 22mm thick It probably also dates to the Neolithic period.
The hone stone is smoothened on all sides. It measures 123mm long, 106mm wide and 29mm thick. It may be a late Neolithic/early Bronze Age artefact.

Dating:
The assemblage has to be regarded as technologically diagnostic and dates to the late Neolithic/early 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.

Discussion
The size and composition of the flaked assemblage is typical for Irish burnt mounds. Recent excavations in the south-east of Ireland revealed a similar pattern of very small assemblages found in associated *fulachta fiadh*, e.g. the N25 Waterford By-Pass (Woodman 2006). These assemblages are dominated by the use of local remanié or imported nodules of beach pebble flint which is often worked using the bipolar method (see also O'Hare 2005).

Conclusion
The lithic finds from the archaeological excavation at Rathduff Upper 1, Co. Kilkenny are a bipolar flint flake, a chert chunk, a quartzite rubbing stone and a possible hone stone made of limestone.
The assemblage is technologically diagnostic and most likely dates to the late Neolithic/early Bronze Age.

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

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Appendix 2.2 Charcoal and Wood Report – Ellen O' Carroll

Client – Irish Archaeological Consultancy Ltd
Site Name- Rathduff Upper 1
Excavation number –E3613 AR070
County – Kilkenny
Author- Ellen OCarroll

Date –4/9/09

Illustrations

Table & Figure

Introduction

Three charcoal samples were identified and analysed from excavations associated with burnt mound activity at Rathduff Upper 1 2, Co. Kilkenny as part of the resolution of the N9/N10 Kilcullen to Waterford Scheme, Phase 4 – Knocktopher to Powerstown. The site consisted of a burnt mound complex including a number of mostly irregular pits, some of which were sealed by the remainder of the burnt spreads. In all cases these features were filled by heat-affected stones and charcoal-rich soil. Two possibly worked pieces of flint and two possibly worked stones were recovered during excavation (Lynn 2008).

Charcoal analysis is an important component of any post-excavation environmental work as it can help in re-constructing an environment hitherto lost to us, although this must be done with caution as sufficient sample numbers are required for a complete and full understanding of the immediate environment. Keepax suggests 50 charcoal samples in a European temperate climate (Keepax 1988). Charcoal and wood are also analysed and identified to determine what species are used and selected for particular functions on site i.e. post-holes, wall posts, firewood, burnt remains of wattle and other structural uses.

The results of the analysis from Rathduff Upper 1 will later form part of an overall scheme-wide charcoal study for the N9/N10 (Lyons, O'Donnell & OCarroll forthcoming).

Methodology (After IAC Ltd)

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 fill 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 identification

The identification of charcoal material involves breaking the charcoal piece along its three sections (transverse, tangential and radial) so clean sections of the charcoal pieces can be obtained. This charcoal is then identified to species under a universal compound microscope reflected and transmitted light sources at magnifications x 10-400. By close examination of the microanatomical features of the samples, the

charcoal species are determined. Fifty fragments were identified from each sample, where possible.
A number of wood taxa cannot be identified to species or sub-species level anatomically. These include Sessile oak (Quercus petraea) and pedunculate oak (Quercus robur); Hairy birch (Betula pubescens Ehrh) and silver birch (Betula pendula Roth) and English elm (Ulmus procera) and wych elm (Ulmus glabra), all of which are native to Ireland. In addition, taxa referred to as pomoideae in this report include apple, pear, hawthorn and mountain ash, which cannot be identified microscopically. There are also over 13 species of willow (Salix sp) and these species can-not be differentiated microscopically.

Details of charcoal recording
Each species was identified, bagged together and then weighed and each fragment counted. Insect channels and holes as well as fungal hyphae were noted on the charcoal fragments identified, as this may indicate the use of dead or rotting wood used for fuel or other such functions. The distinction can sometimes be made between trunks, branches and twigs if the charcoal samples are large enough. This was noted where possible by the presence of strongly or weakly curved rings. When charcoal samples showed indications of fast or slow growth this was also recorded. Finally the annual rings present on each charcoal fragment were counted.

Results
Charcoal was examined from three pit fills C8, C71 & C88 and a range of native taxa was identified from the assemblage. The level of preservation within the charcoal assemblage was good and all fragments were identifiable. Some of the charcoal from the pit fill C8 was iron stained and more difficult to identify. The weight and fragment count identified from each taxa type at each site is represented below in Figure 1 and Table 1.
Eight wood taxa or trees were identified from the Rathduff Upper 1 samples. These were ash (Fraxinus excelsior), hazel (Corylus avellana), pomaceous fruitwood (Pomoideae), oak (Quercus sp), elm (Ulmus sp), alder (Alnus glutinosa) and blackthorn/cherry (Prunus spp) in order of representation. The results are dominated by ash, hazel, pomoideae and oak (Fig. 1). These results compare broadly with analysis carried out at a nearby excavated burnt mound site at Kellymount 2 and 3 where oak, ash, hazel, pomoideae and alder were more prevalent (OCarroll 2009h).

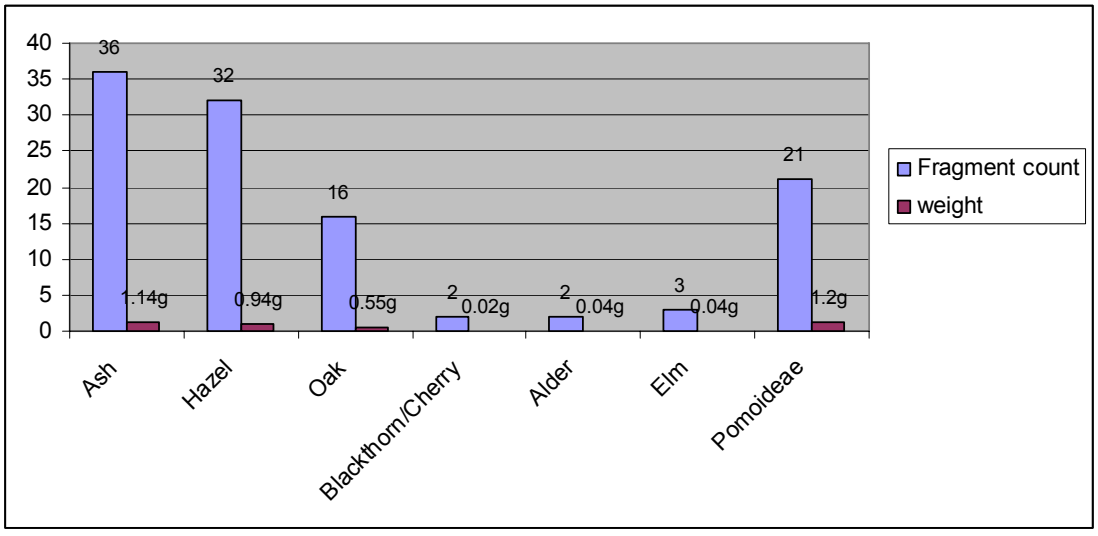

Fig. 1

Discussion

The wood identified from the burnt mound site excavated at Rathduff Upper 1 is most likely representative of firewood used at the burnt mound site.

Ash was identified in large quantities from the pit fills. Ash is a native species to Ireland preferring lime rich freely draining soils. It is not a very durable timber in waterlogged conditions but has a strong elastic nature and is easily worked. Ash appears to have colonised the open land after the first farmers removed much of the native woodland therefore it is frequently used as structural timber in the later Bronze Age periods. Ash is also abundant in native hedgerows and was quite common in the later historic period.

Thirty two fragments from the pit assemblage were identified as hazel. Hazel is a native species and was very common up to the end of the 17th century. McCracken (1971, 19) points out that "it was once widespread to a degree that is hard to imagine today". With the introduction of brick, steel and slate the crafts associated with hazel became obsolete, and today the woods that supplied hazel have diminished rapidly. Hazel is normally about 3-5m in height and is often found as an understory tree in broadleaf woods dominated by oak. It also occurs as pure copses on shallow soils over limestone as seen today in The Burren in Co. Clare and survives for 30 to 50 years. Its main advantage is seen in the production of long flexible straight rods through the process known as coppicing. Hazel also makes good fuel.

Pomoideae which includes apple, pear, hawthorn and mountain ash was also frequently identified from the pit fills. It is impossible to distinguish these wood species anatomically but as wild pear is not native and crab apple is a rare native species in Ireland, it is likely that the species identified from the sites at Rathduff Upper 1 is either hawthorn or mountain ash (rowan; Nelson 194–200, 1993). Hawthorn (Crataegus monogyna) is a native species, and is found in many hedgerows throughout Ireland. Mountain ash (Sorbus aucuparia) is also a common tree in Ireland growing particularly well in rocky and hilly mountainous places. . Both also make excellent fuel. C. monogyna is noted for being the hottest firewood (Gannon in Taylor 2006, 7).

Oak may have been deliberately selected for firewood at the burnt mound site due to its high calorific value and excellent burning qualities. Sessile oak (Quercus petraea) and pedunculate oak (Quercus robur) are both native and common in Ireland and the wood of these species can not be differentiated on the basis of their anatomic characteristics. Pedunculate oak is found growing in areas of heavy clays and loams, particularly where the soil is alkaline. Sessile oak is found on acid soils and often in pure stands. Unlike pedunculate oak, it thrives on well-drained soils but is tolerant of flooding (Beckett 1979, 40–41). Both species of oak grow to be very large trees (30–40m high). Oak charcoal was particularly important, as it burned hotter and cleaner than wood and was considered superior to wood. The density of oak wood makes for an optimum fuel. Oak woods were valued for their natural resource of timber for many requirements including raw material for metal working activities. Oak has excellent properties of great durability and strength and was frequently used throughout the medieval period for the production of large timbers, for charcoal production and for activities associated with metal working activities.

Only two fragments of alder were found in the assemblage. Alder is a widespread native tree and occupies wet habitats along stream and river banks. Though it certainly flourishes best where its main roots are just above the water, the alder is also tolerant of stagnant water. The wood of the tree is white when growing, but when it is cut, turns red. It is soft, with short fibres, giving it a homogeneous texture and of

moderate density. It is a very durable wood and was specially selected for boat-making and for dug-out canoes, as it is an easily worked and split timber and therefore quite commonly manufactured into planks. As fuel the alder is inferior in heating power to other woods, but for this reason, it is useful where a slow heat is required.

Wild cherry (Prunus padus) and blackthorn are more common in Ireland than bird cherry (Prunus avium). There is very little archaeological evidence for the use of cherry wood in Ireland although the wild cherry tree is commonly found in many hedgerows (Nelson 1993, 167). Cherry stones were found during the excavation of a Late Bronze Age crannóg in Co. Offaly (Mac Coitir 2006, 51).

English elm (Ulmus procera) and wych elm (Ulmus glabra) cannot be separated by their wood structure. As suggested by Mitchell (1986) elm declined (although would not have completely died out) with the advent of farming and possibly elm disease epidemic around 3700BC. It generally prefers damp woods particularly on limestone. Wych Elm does not reproduce by suckering (new trees growing from roots of the original tree) and is only spread by seed. Despite being one of Ireland's most common trees before the arrival of man, elm is rare in Ireland due to its tendency to occupy the most fertile soils which are the most sought after for agriculture. The species has also suffered from the effects of 'Dutch' Elm disease. Many different species of Elm are still very common in hedgerows throughout Ireland, but truly native trees are probably confined to rocky hillsides and remote valleys in the west of Ireland.

The results show that there was a mosaic of woodlands in the surrounding environment of Rathduff Upper 1. The wood identified from the samples could have originated from scrub-type woodland (cherry, pomoideae, hazel, blackthorn) or from mixed woodlands (oak, ash, elm and hazel) nearby. Alder prefers wetter ground.

Summary

Charcoal was examined from three contexts associated with pits at Rathduff Upper 2. Although there is no function attributed to the pit activity it is likely that the pits were used with activities at the burnt mound site and the charcoal is the remains of firewood used in various processes. Ash (Fraxinus excelsior), hazel (Corylus avellana), pomaceous fruitwood (Pomoideae), oak (Quercus sp), Ulmus sp (elm), alder (Alnus glutinosa), and blackthorn/cherry (Prunus spinosa/avium/padus) were identified in order of representation. The results are dominated by ash, hazel, pomoideae and oak.

The results of the analysis from Rathduff Upper 1 will later form part of an overall scheme-wide charcoal study for the N9/N10 (Lyons, O'Donnell & OCarroll forthcoming).

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Table 1 Charcoal identification details from Rathduff Upper 1

Context number	Sample number	Flot weight (grams)	Context description	Wood species	No. of fragments	Charcoal weight (grams)	Size of fragments (mm)	No. of growth rings	Comments
8	1	2.1g	Pit fill	*Fraxinus excelsior* (ash)	28	0.86g			Iron stained charcoal samples, small fragments
				Corylus avellana (hazel)	5	0.03g			
				Quercus sp. (oak)	2	0.07g	2-20mm	3-25 rings	
71	8	3.1g	Pit fill	*Prunus* sp (blackthorn/cherry)	2	0.02g	2-3mm	1-5 rings	
				Corylus avellana (hazel)	15	0.46g	2-5mm	2-6 rings	
				*Alnus glutinosa(*alder*)*	2	0.04g	1-3mm	3-5 rings	
				Ulmus sp (elm)	3	0.4g	3-6mm	8 rings	
				Pomoideae	6	0.23g	2-4mm	3-8 rings	
				Fraxinus excelsior (ash)	2	0.01g	2mm - 5mm	5-6 rings	
88	24	39.8g	Pit fill	*Fraxinus excelsior* (ash)	6	0.27g	2-4mm	2-3 rings	
				Corylus avellana (hazel)	12	0.45g	2-5mm	3-6 rings	
				Pomoideae	15	0.97g	3-7mm	3-10 rings	
				Quercus sp. (oak)	14	0.48g	2-4mm	3-5 rings	

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Appendix 2.3 Plant Remains Analysis Report – Penny Johnston

Client – Irish Archaeological Consultancy Ltd
Site Name- Rathduff Upper 1
Excavation number – E3613 AR070
County – Kilkenny
Author- Penny Johnston
Date – June 2009

The site was situated on the edge of an area of wetland and comprised two burnt spreads, both heavily disturbed by ploughing. Just two samples from this site contained plant remains. These were un-charred remains that are unlikely to have been archaeological material, but rather modern contaminants of the deposits.

Table 1: Identified plant remains from Rathduff Upper 1 E3613

Context	**8**	**90**
Sample	**1**	**25**
Fat-hen (*Chenopodium album* L.)	4*	
Oat floret bases, indeterminate species (*Avena* L. species)		1*

* Indicates un-charred seeds

Appendix 2.4 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: intcal04.14c

Context	Sample No	Material	Species id/ Weight	Lab	Lab Code	Date Type	Calibrated date ranges	Measured radiocarbon age (BP)	13C/12C Ratio ‰
C71, Fill of a pit	8	Charcoal	*Corylus avellana* / 0.1g	QUB	UBA 10996	AMS (Std)	2115–1959BC (1 sigma), 2134–1937BC (2 sigma)	3648±30	-28.8
C8, Fill of a pit	1	Charcoal	*Fraxinus sp.* / 0.05g	QUB	UBA 10997	AMS (Std)	2284–2144BC (1 sigma), 2341–2050BC (2 sigma)	3786±36	-30.0
C88, Fill of a pit	24	Charcoal	*Prunus spp.* / 0.1g	QUB	UBA 10998	AMS (Std)	1492–1429BC (1 sigma), 1497–1417BC (2 sigma)	3180±23	-24.9

References for calibration datasets:
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.

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 3LIST OF RMP IN AREA

RMP No	Description
KK027-033	Enclosure
KK027-034	Enclosure
KK027-045	Holy well
KK027-046001	Church
KK027-046002	Graveyard
KK027-046003	Grave slab
KK027-046004	Architectural fragment
KK027-047	Deserted Village

See Figure 2 for location.

APPENDIX 4LIST 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	E3546	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	E3468	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
Blanchvillespark 3	AR109	E3913	Tim Coughlan	260785/155653

Site Name	Site Code	E Number	Director	NGR
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