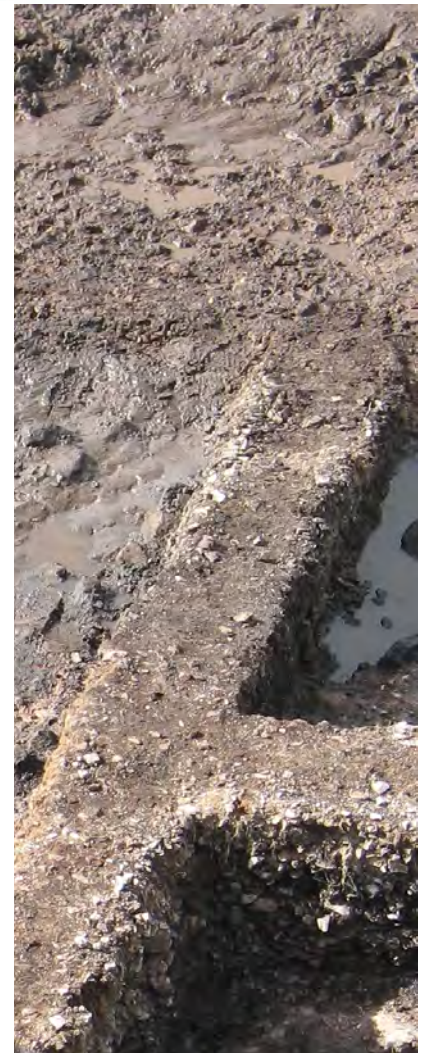


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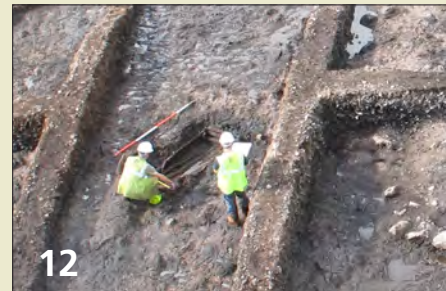


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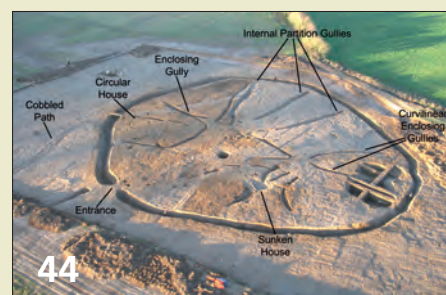
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## Production Team

### EDITORIAL TEAM

Michael Stanley (editor)  
Rónán Swan  
Sheelagh Hughes (copy-editor,  
Editorial Solutions Ireland Ltd)

PRODUCTION, LAYOUT AND DESIGN  
LSD Ltd

### PUBLISHER

National Roads Authority  
St Martin's House  
Waterloo Road  
Dublin 4

### WEBSITE

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Cover image: Archaeologists recording a timber-lined trough at Bockagh 4, Co. Roscommon, on the N5 Ballaghaderreen Bypass. (Photo: AirShots Ltd)

# Welcome to the Sixth Edition of *Seanda*

Fred Barry, Chief Executive of the National Roads Authority

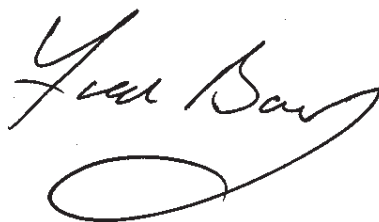


Fred Barry

Since its inception in 2006, *Seanda* magazine has been distributed annually to every public library and secondary school throughout the country. It has also been circulated to the archaeological profession and other heritage practitioners, historical and archaeological societies, members of the general public on the NRA mailing list, third level institutions and public representatives at local and national level. The magazine's readership has been wide indeed and numerous readers have been generous in sharing their positive view of the magazine with us over the years. They have also provided much appreciated feedback that has helped us and our many contributors to enhance the content from one edition to the next.

The latest issue marks a new departure in how the NRA realises the knowledge value of the archaeological discoveries made on national road schemes. In the past we have distributed tens of thousands of hard copies around the country while making an electronic version (PDF) of each magazine available to download from the NRA website: [www.nra.ie/Archaeology/Seanda-NRAArchaeologyMagazine/](http://www.nra.ie/Archaeology/Seanda-NRAArchaeologyMagazine/). However, given current financial constraints future editions of *Seanda* will now be solely available online, albeit with a number of functional enhancements to make the onscreen experience more interactive, user-friendly and enjoyable. This development is a pilot into online publishing and we would welcome your views on this new approach so as to gauge its success.

Those of you who particularly appreciate the printed page will be glad to read news of the latest archaeological publications from the NRA (see pp. 4 and 6). The first of these, *In the Lowlands of South Galway* by Finn Delaney and John Tierney, was published last June. It is the seventh of the NRA Scheme Monographs and describes the results of excavations on the N18 Oranmore to Gort road scheme in County Galway. The second of our new publications, *Past Times, Changing Fortunes* edited by Sheelagh Conran, Ed Danaher and Michael Stanley, was launched at the end of August. It presents the proceedings of the 2010 NRA National Archaeology Seminar and is the eighth volume to be published in the Archaeology and the National Roads Authority Monograph Series. Numerous other titles are expected in both monograph series over the next few years and we look forward to bringing you news of these in the new electronic incarnation of *Seanda*.



# NEWS

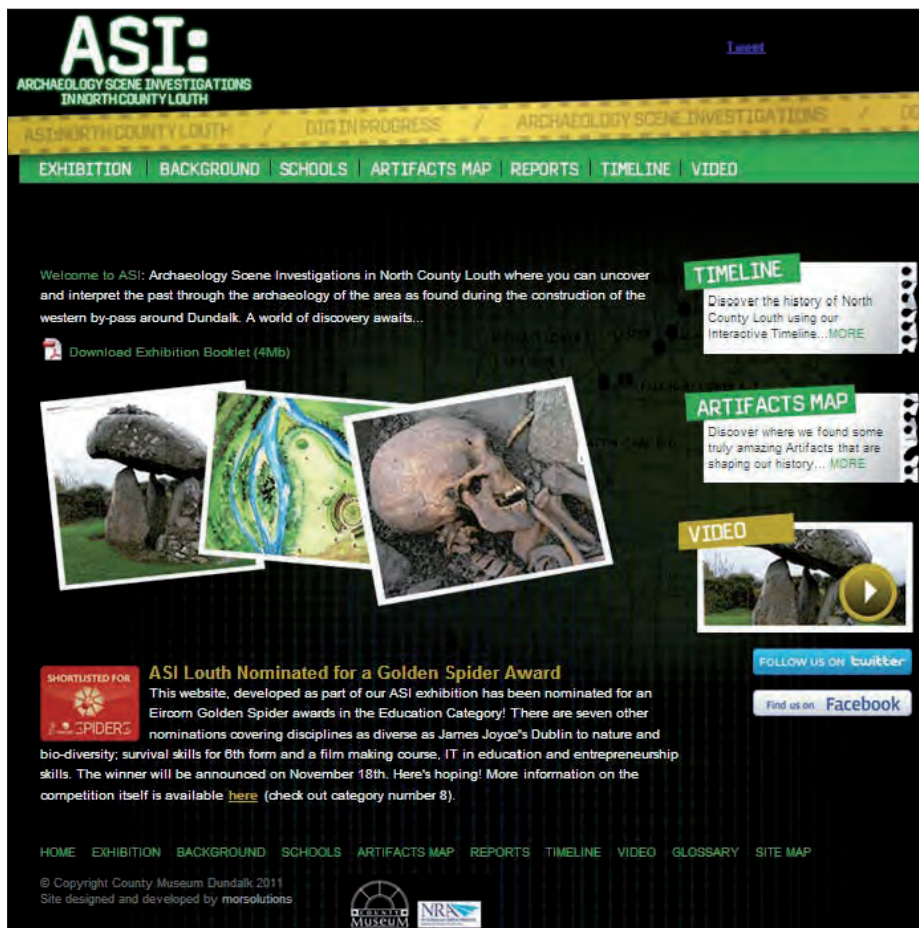
## Discovering Kilkenny's archaeological landscapes

*Monuments, Memory and Maps: discovering Kilkenny's archaeological landscapes*, a conference which examined the wealth of new information on the settlement of County Kilkenny generated by archaeological research in the past two decades, took place on 9–10 October 2010 at the Ormonde Hotel, Kilkenny City. The conference highlighted some of the less well-known aspects of Kilkenny's landscapes and archaeological heritage.

The construction of new motorways in particular has afforded archaeologists the opportunity to investigate parts of the county not previously the subject of archaeological research. This was reflected in papers given by Graeme Laidlaw, Headland Archaeology (Ireland) Ltd, and Dr Richard Jennings, Kilkenny Archaeology Ltd, dealing with the results of excavations on the Knocktopher to Powerstown section of the N9/N10.

The *Monuments, Memory and Maps* conference was an action of the Kilkenny Heritage Plan and was supported by Kilkenny Heritage Forum, the Councils of the City & County of Kilkenny, The Heritage Council and the NRA. The information presented at the conference will be the subject of a new book to be published by Kilkenny County Council in early 2012. Further details of the conference can be viewed at: [www.kilkennycoco.ie/eng/Services/Heritage/Monuments\\_Memory\\_and\\_Maps.pdf](http://www.kilkennycoco.ie/eng/Services/Heritage/Monuments_Memory_and_Maps.pdf)

Michael Stanley, NRA Archaeologist, NRA Head Office.



## Exhibition website wins international honour

A website charting the development of the area around north County Louth recently won the prestigious Museum and the Web 2011 award for small museums at an international event held in Philadelphia, USA, in early April. The website, [www.asi-louth.ie](http://www.asi-louth.ie), was developed to complement the NRA-funded exhibition on archaeological discoveries on the route of the western bypass around Dundalk—*ASI: Archaeological Scene Investigation in North Louth* (see *Seanda*, Issue 5 [2010], pp. 23–5). Developed by Mor Solutions of Drogheda, and the County Museum, Dundalk, the website highlights the wide variety of artefacts discovered during the construction of part of the M1–A1 road. The exhibition website not only features the new archaeology found in the area but also the manner in which archaeologists worked to identify sites and finds. With text, photographs and illustrations by NRA Archaeologist Niall Roycroft and the various archaeological consultancies involved, as well as a Google Maps section linking sites, images and reports, the website represents a fitting legacy to the project. One thing that the team wanted to achieve was to bring a new form of presentation and thinking to the area of history and archaeology. We are delighted that we successfully achieved this goal.

Brian Walsh, Curator, County Museum, Dundalk.





Left to right: Breda Lynch, Industry Programmes Manager, AIT, Jude Clancy, ITS, Sheila Tierney, ITS, Brenda Gaffey, Best AIT recipient, and Anita Watts, Office of Research, AIT. (Photo: Institute of Technology, Sligo)

## Poster award for Ballyhanna Research Project

The Ballyhanna Research Project is a research initiative funded by the NRA in partnership with the Institute of Technology, Sligo (ITS), Queen's University, Belfast, and Donegal County Council (see *Seanda*, Issue 1 [2006], pp. 60–5, and Issue 4 [2009], pp. 22–7). The project involves the study of human remains excavated from a medieval graveyard at Ballyhanna, Co. Donegal, from an archaeological and analytical scientific viewpoint. The various strands of research are due for completion this year and a forthcoming monograph will draw together the results from the various researchers to provide an insight into the life and death of an Irish medieval population. Last February Sheila Tierney, one of the Ballyhanna researchers based at ITS, participated in a postgraduate research 'posterfest' at Athlone Institute of Technology (AIT) and was awarded Best Overall Poster. Sheila's poster featured details of her research on ancient DNA analysis of the Ballyhanna bone assemblage.

*Deirdre McCarthy, NRA Assistant Archaeologist, North-west Team.*



The team of boat-builders on their visit to the Viking Age settlement site of Woodstown in April 2011. (Photo: James Eogan)

## Viking boat-builders visit Woodstown site

Waterford City Council, Waterford Chamber of Commerce and FÁS are co-operating on a project to build a replica Viking longboat. The team of boat-builders visited the Viking Age settlement site of Woodstown in April 2011, where the author gave them an overview of the archaeological evidence discovered here during test excavations in advance of the construction of the N25 Waterford City Bypass. The wide range of objects from the site include iron ships nails which indicate that Viking boats are likely to have been dismantled and/or repaired on the site in the ninth century AD. The Woodstown site was declared a National Monument and is preserved *in situ*. The Excavation Director Ian Russell and archaeologist Dr Maurice Hurley are currently writing a monograph about the Viking settlement at Woodstown. This work is being funded by the NRA and the Department of Arts, Heritage and the Gaeltacht, and will be published in 2012 under the auspices of the Waterford Museum of Treasures. Information about the boat-building project can be viewed at: [www.facebook.com/pages/Viking-Longboat-Project-Waterford/151810381543164?sk=info](http://www.facebook.com/pages/Viking-Longboat-Project-Waterford/151810381543164?sk=info).

*James Eogan, NRA Senior Archaeologist, Southern Team.*

## Woodstown objects on permanent display

The Viking Triangle Project in Waterford, Ireland's oldest city, will see three museums developed in the historic core of the city in an area known as the Viking Triangle. This small area, which can be traversed in 1,000 paces, contains a series of buildings which collectively illustrate the 1,000-year story of Waterford from its Viking origins right through to the 19th century.

The first phase, which was opened by Dr Leo Varadkar TD, Minister for Transport, Tourism and Sport, in June 2011, includes a display of the objects found at the Viking

Age settlement at Woodstown including the weapons found in the 'Viking' grave (see *Seanda*, Issue 2 [2007], pp. 9–11) which were discussed by Viking expert Dr Stephen Harrison at the NRA's recent Heritage Week seminar (see p. 7). The objects are displayed in a new exhibition in the 800-year-old Reginald's Tower. For further details see: [www.waterfordtreasures.com/reginalds-tower/index.htm](http://www.waterfordtreasures.com/reginalds-tower/index.htm).

*James Eogan, NRA Senior Archaeologist, Southern Team.*



# NEWS



John Tierney of Eachtra Archaeological Projects demonstrated how new technology allows archaeologists to be innovative and creative in communicating the results of their work.



Dr Michael Potterton of Four Courts Press during his presentation at the Communicating Archaeology Forum. (Photos: Michael Stanley)

## Communicating Archaeology Forum

Since the launch of the first antiquarian journals 200 years ago, printed pages have carried news of archaeological discoveries and recorded them for posterity. The readers were mostly professionals or amateurs with a life-long interest in the subject. The 21st century is different. Now, printed pages are only one way of delivering the message and there is, potentially, a mass popular audience for archaeological stories.

containing the relevant final excavation reports and other technical information. This handsome new volume was launched by Professor Noël Wilkins, current President of the Galway Historical and Archaeological Society.

*Jerry O'Sullivan, NRA Archaeologist, North-west Team.*

This amounts to a major culture change in archaeology. The implications and opportunities arising from this were discussed at a very dynamic public forum, jointly hosted in Galway on 16 June 2011, by the NRA and the Institute of Archaeologists of Ireland. The speakers were Jerry O'Sullivan (NRA Archaeologist), Dr Michael Potterton (Four Courts Press), John Tierney (Eachtra Archaeological Projects) and Peigin Doyle (freelance journalist). But most of the time was reserved for contributions from the very lively audience, who all had something to say about their ideas and experiences, so that the forum truly was a shared learning experience for all who attended.

Appropriately enough, the proceedings were brought to a close with the launch of NRA Scheme Monograph 7, *In the Lowlands of South Galway*, by Finn Delaney and John Tierney. Regular readers will know that this was not merely a rearguard stand by the printed book, as all of our scheme monographs are accompanied by CDs



Professor Noël Wilkins launching *In the Lowlands of South Galway*.



Co-author of *In the Lowlands of South Galway* Finn Delaney (left) with freelance journalist Peigin Doyle (right).



Authors Finn Delaney and John Tierney of Eachtra Archaeological Projects.





# Archaeological investigation in the 21st century

On 24 August 2011 an invited audience of professional archaeologists and members of the public gathered at the City Wall Space, Wood Quay Venue, Dublin Civic Offices, for a keynote address delivered by Professor Martin Carver entitled *Archaeological Investigation in the 21st Century: buying it, doing it and giving it status*. In the space of an hour Professor Carver (Editor of the renowned journal *Antiquity* and emeritus professor of the University of York) set out an analysis of archaeological endeavour in over 20 countries across the world, focusing on the role of archaeologists, their methodologies, the scale and resolution of their inquiry and the theoretical basis of their work. Professor Carver also set out his vision for archaeology in the future, with the discipline becoming increasingly focused on science, knowledge and interpretation.

Furthermore, Professor Carver placed the archaeological work of the NRA within a global context, illustrating some key strengths of the NRA approach, including multi-vocal planning and design, extensive area excavation, in-depth analysis enlarging the research dividend, imaginative, people-friendly synthesis, and timely and accessible publications.

This keynote address marked the 10th anniversary of the appointment of project archaeologists by the NRA to manage archaeology on national road schemes. Over 2,000 individual archaeological excavations have been carried out on more than 80 road schemes in the intervening 10 years.

Rónán Swan, NRA Head of Archaeology (acting), NRA Head Office.



Professor Carver treated the audience to a wonderful, globe-spanning archaeological journey.



Professor Martin Carver at the opening of his address, discussing the archaeological work of the NRA within a global context. (Photos: Michael Stanley)



Rónán Swan, NRA Head of Archaeology (acting), and Professor Carver during the discussion that followed his keynote address.



## Latest NRA seminar proceedings

*Past Times, Changing Fortunes*, a theme reflecting current economic concerns, seemed an appropriate topic for last year's NRA National Archaeology Seminar held at the Gresham Hotel, Dublin, on 26 August 2010. The speakers were invited to address the archaeological and palaeoenvironmental evidence of how the fortunes of the Irish landscape and people have changed over millennia. The proceedings of the *Past Times, Changing Fortunes* seminar were launched on 24 August 2011 by Professor Martin Carver, following his keynote address marking the 10th anniversary of the appointment of NRA project archaeologists (see previous page).

The new book, edited by Sheelagh Conran, Ed Danaher and Michael Stanley, is the eighth volume to be published in the Archaeology and the National Roads Authority Monograph Series. *Past Times,*

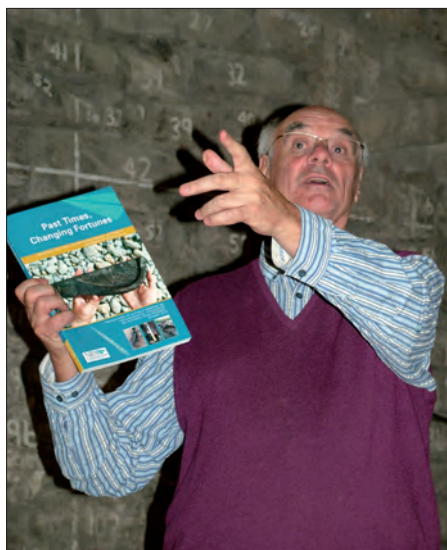
*Changing Fortunes* contains nine papers written by a range of archaeologists and specialists working in the private and public sector. The NRA greatly appreciates the time and commitment that the authors have given to the seminar and the subsequent publication, particularly in these challenging times, and would like to express its gratitude to them all. The multiplicity of archaeological and palaeoenvironmental evidence for the many transformations experienced on this island and the resilience of its inhabitants throughout history is amply demonstrated in the latest proceedings.

*Past Times, Changing Fortunes* is published by the NRA and is available through bookshops or directly from Wordwell Book



Sales, Media House, South County Business Park, Leopardstown, Dublin 18 (tel: +353 1 2947860; e-mail: helen@wordwellbooks.com).

Michael Stanley, NRA Archaeologist, NRA Head Office.



Professor Martin Carver launching *Past Times, Changing Fortunes* and encouraging people to buy a copy. (Photos: Michael Stanley)



Some of the contributors to the new book: (left to right) Eileen Reilly, Mícheál Ó Droma, Joanne Hughes, Sheelagh Conran (co-editor), Scott Timpany and Mick Monk.





# Encounters Between Peoples

The 2011 NRA National Archaeology Seminar, entitled *Encounters Between Peoples*, took place on 25 August 2011 at the City Wall Space, Wood Quay Venue, Dublin Civic Offices. The seminar, one of a multitude of Heritage Week events held by various organisations throughout the country, sought to investigate contact with other peoples as a driving force behind societal change. Speakers were asked to address a number of questions on this theme with close reference to archaeological discoveries on Irish national road schemes over the last 10 years or more.

Can evidence of Ireland's long history of conquest, colonisation and migration be traced in the archaeological record? How have trade, migration or imported ideas and technologies shaped changing human communities in our past? When in the past have different peoples shared the island? Speakers also adopted their own novel perspectives in response to the theme, in addition to those prompted by the questions posed above.

The full seminar programme can be viewed on the NRA website at: [www.nra.ie/](http://www.nra.ie/)



Frank Prendergast presenting his paper on the Iron Age post enclosure excavated at Lismullin, Co. Meath, on the M3 motorway. (Photos: Michael Stanley)

Archaeology/ArchaeologySeminar2011/. The proceedings of the *Encounters Between Peoples* seminar will be published by the NRA in August 2012.

Michael Stanley, NRA Archaeologist, NRA Head Office.



James Lyttleton describing the limited archaeological evidence associated with natives and newcomers in plantation-era Ireland (16th–17th centuries) that has come to light on road schemes.



Brian Mac Domhnaill argues the case for the investigation of post-medieval settlements as a means of bringing us closer to the people of the recent past.



Some of the speakers at the *Encounters Between Peoples* seminar: (left to right) Paul MacCotter, Jerry O'Sullivan, Derek Gallagher, Stephen Harrison, Paul Stevens, Colm Flynn, Brian Mac Domhnaill and Jacinta Kiely.



# A long tradition of cereal production

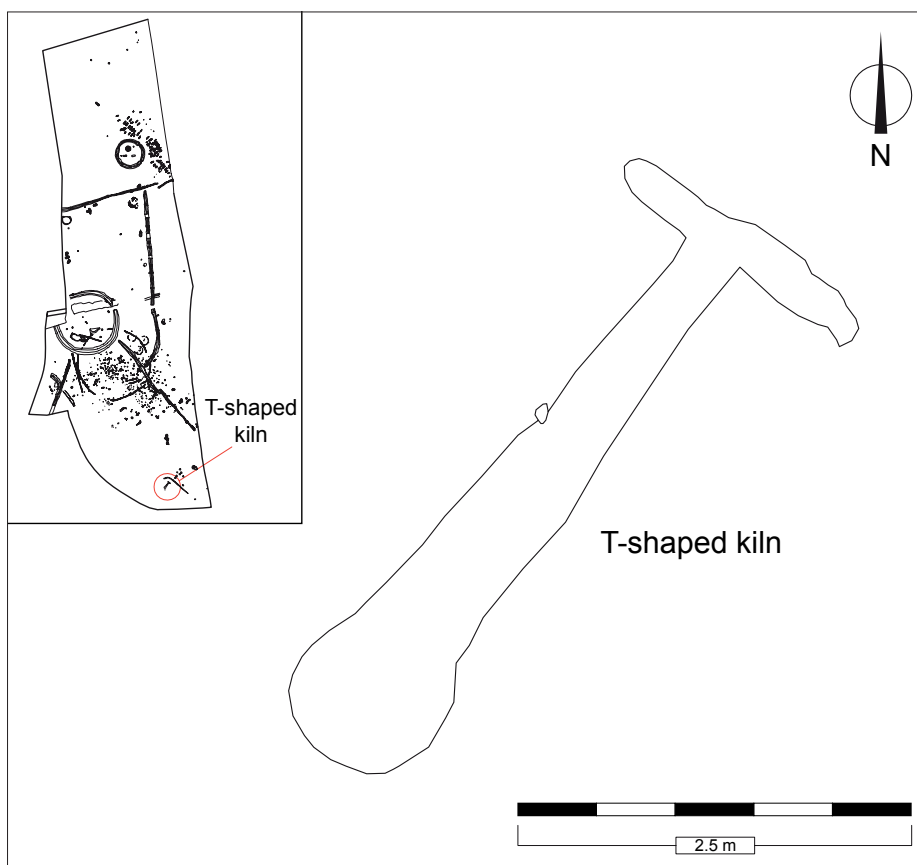
**Excavation at Baysrath has provided a fascinating insight into the history of cereal farming in County Kilkenny.**

*By Meriel McClatchie, a freelance environmental archaeologist*

County Kilkenny is an area renowned for the production of high-quality cereal crops, but it is less well known that cereal cultivation has been practised here for thousands of years. A recent archaeological excavation in the townland of Baysrath has revealed new evidence for a very long tradition of crop cultivation in County Kilkenny, with the earliest remains dating from the Neolithic period (c. 4000–2400 BC) when farming was first introduced into Ireland. As time progressed, different crops were farmed at different times, reflecting changing social and economic circumstances over several millennia.

## **Excavation at Baysrath**

The site at Baysrath was discovered as part of archaeological works associated with the N9/N10 road scheme and the excavation was carried out under the direction of archaeologist John Channing of Valerie



Plan of a T-shaped kiln at Baysrath, Co. Kilkenny, with the overall site plan inset. (Drawing: Valerie J Keeley Ltd)





Charred chaff fragments of spelt wheat from Baysrath—this chaff would have been attached to the grain at its base. Top left: spikelet fork; top right and below: glume bases. (Photo: Meriel McClatchie)

J Keeley Ltd. This site was a focus for activity from the Neolithic up to the early medieval period (c. AD 450–1169), with the site's inhabitants involved in a variety of domestic, industrial and funerary pursuits. A remarkable range of archaeological features, in terms of both date and function, was uncovered during the excavation.

In order to investigate the evidence for ancient plant remains at Baysrath, a comprehensive soil sampling strategy was established during the excavation, guided by discussions between the excavation team and the relevant specialists. Detailed discussions again took place when post-excavation analyses commenced, with the aim of better targeting deposits that were considered to be potentially informative. This approach enabled detailed investigation of spatial and temporal differences in cereal use at Baysrath, as well as the recovery of short-lived plant species for radiocarbon dating.

All of the cereal remains recorded in deposits at Baysrath were preserved as a result of charring. The cereals may have come into contact with fire when being dried before storage, or as part of cooking and food-preparation activities. Charring occurs during a burning event when the supply



Charred grains of possible spelt wheat from Baysrath. (Photo: Meriel McClatchie)

of oxygen is insufficient for combustion to occur and the plant material is transformed into a chemically inert carbon. If they are charred, cereal grains and chaff can survive in the ground for thousands of years.

### Changing crop choices

The earliest evidence for cereal remains at

Baysrath was found within Neolithic and Early Bronze Age (c. 2400–1600 BC) pits, which contained a small quantity of wheat grains. A Middle–Late Bronze Age (c. 1600–600 BC) cremation pit also contained a small number of cereal grains, perhaps representing foodstuffs associated with the burial ceremony.





Harvested spelt wheat. (Photo: Meriel McClatchie)

Iron Age (c. 600 BC–AD 450) deposits at the site contained much larger quantities of cereal remains. Wheat and barley grains were found in a range of features, including drying kilns, a palisade structure and a ring-ditch. Early medieval deposits also contained a large quantity of cereal remains, but oat became the focus of cereal production at this time, often accompanied by smaller quantities of wheat and barley. The range of crops recorded at Baysrath was further extended by the recovery of a flax seed in an early medieval drying kiln.

#### A remarkable find of spelt wheat

Perhaps the most interesting find at Baysrath was the discovery of substantial spelt wheat deposits in two different areas of the site. A post-hole located in an area of Iron Age activity contained several hundred wheat grains, many of which had the appearance of spelt wheat. The presence of spelt wheat was confirmed by the identification of associated chaff, which is a much more reliable indicator of wheat species. More than 150 spelt wheat grains, along with spelt wheat chaff, were also found in a T-shaped kiln elsewhere on the site. In this case, the grains were radiocarbon-dated to the transition between the Iron Age and early medieval period. These two features contained one of the largest spelt wheat assemblages

ever found at any archaeological site in Ireland. Spelt assemblages of comparable size are more often found at Iron Age and Roman sites in Britain. Interestingly, one of the archaeological features at Baysrath containing spelt wheat—the T-shaped drying kiln—is also more commonly recorded in Roman Britain, perhaps reflecting links across the Irish Sea at this time.

The consumption of spelt wheat has seen somewhat of a revival in Ireland during recent years. Although spelt wheat is closely related to bread wheat, modern spelt food-products are often less processed than bread-wheat products, which may explain why spelt wheat is viewed as more of a ‘health food’. Spelt wheat can tolerate poorer soils and less intensive management systems than the more commonly grown bread wheat, which is reflected in the increasing popularity of spelt wheat among organic growers. There is also an important difference in how grain is separated from chaff in each case. Bread wheat is a free-threshing wheat and is easily separated from its enclosing chaff. Spelt wheat is, by contrast, a hulled wheat, whereby the chaff is fixed firmly to the grain and is therefore more difficult to remove. Although de-husking would have been a time-consuming activity in the past, spelt chaff does give the grains protection in

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*These two features contained one of the largest spelt wheat assemblages ever found at any archaeological site in Ireland.*

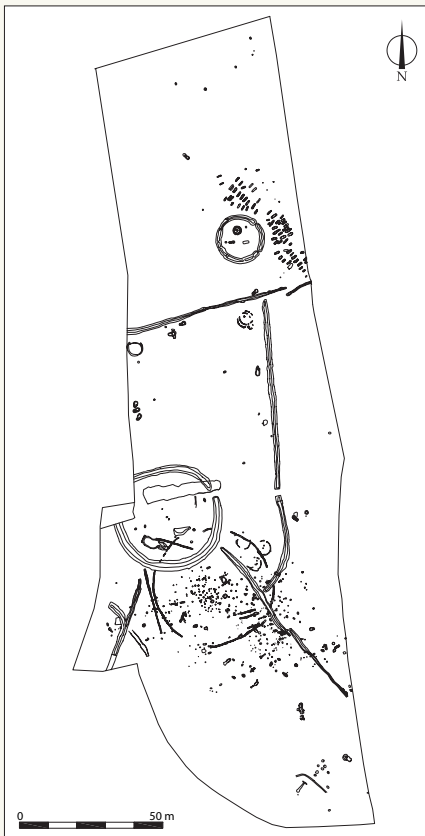
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the field and in storage, providing a useful barrier against water and insect damage. Archaeological evidence indicates that spelt wheat was introduced into Ireland during the Bronze Age, several thousand years after the introduction of other hulled wheats, such as emmer wheat. Spelt wheat is likely to have had a number of uses in the past, including its incorporation into food products, such as bread, as well as in brewing and perhaps as animal fodder.

#### Conclusions

The excavation at Baysrath has provided a fascinating insight into the long tradition of cereal farming in County Kilkenny. Prehistoric communities at this location tended to focus upon wheat and barley production, but a shift towards oat cultivation occurred during the early medieval period. The discovery of a large quantity of spelt wheat remains at Baysrath is an important find, providing new evidence for the use of this cereal type thousands of years ago.





Plan of the excavated features at Baysrath, Co. Kilkenny. (Drawing: Valerie J Keeley Ltd)

## 3,000 years of human activity

Baysrath, from the Irish *Ráth an Bháthaigh*, lies on the route of the new N9/N10 motorway in County Kilkenny immediately west of Knocktopher, itself a 12th-century manorial settlement. Human activity on the site spanned more than 3,000 years, and remains were preserved there from the first farmers to the Norman arrival. Activity at Baysrath evolved from occasional settlement and burial to constant occupation within substantial circular wooden houses and later a circular palisade enclosure, and, finally, a ringfort.

The large area excavated revealed a broad picture of a life centred on agriculture with 19 separate kilns for processing cereals and 10 furnaces to repair and manufacture tools. Livestock were present and corralled by ditches and wooden fences. The development of these boundaries and subsequent integration of the palisade and ringfort tells the story of an evolving settlement and landscape, preserved by the line of an Iron Age ditch—now a townland boundary—that runs over the site.

The ancestors kept watch over this community, who would eventually join them through rites of cremation and later inhumation to rest in a complex of superimposed ring-ditches and a linear cemetery on the edge of the settlement.

The unusual T-shaped kiln containing spelt wheat was contemporary with a change in burial rite from cremation to inhumation, reflecting a period of upheaval with the spread of Christianity and the wane of the Roman Empire. The community remained undisturbed, living on the same site that their ancestors inhabited in the Early Iron Age, and using the same ancestral cemetery. But change came, initially with the need for a palisade enclosure, which was soon replaced by a ringfort and perhaps the Baysrath settlement was abandoned as Norman Knocktopher grew in influence.

*John Channing, Excavation Director, Valerie J Keeley Ltd.*



Aerial view of excavated features at the northern end of the Baysrath site, showing evidence for archaeological activity over several millennia. The large circular enclosure is an Iron Age ring-ditch, which in turn enclosed a Bronze Age pit and internal ring-ditch (towards right of interior), and Iron Age to early medieval drying kilns (towards left of interior). A large number of early medieval graves can also be seen below the Iron Age ring-ditch. (Photo: AirShots Ltd)

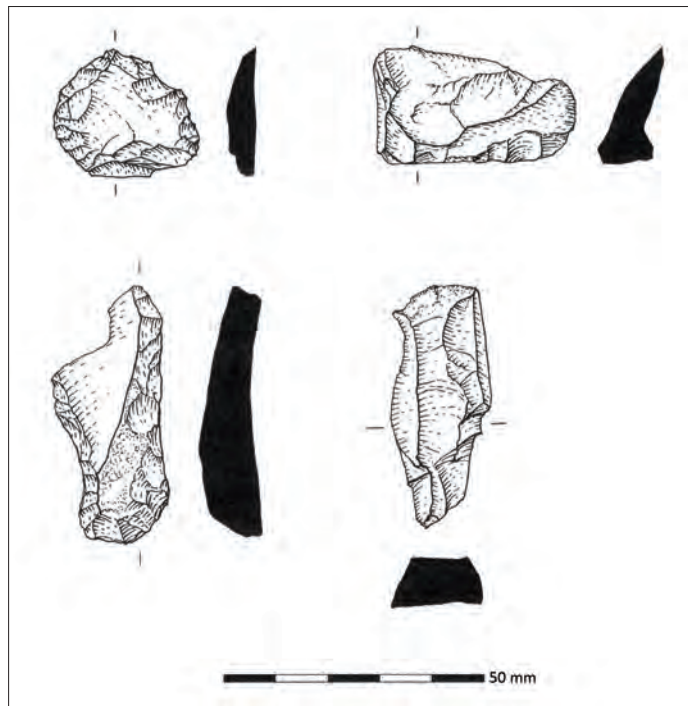


# Marginal land

Recent discoveries made on the N5 Ballaghaderreen Bypass in County Roscommon indicate that this area has been occupied since early prehistory.

By Shane Delaney, Senior Archaeologist with Irish Archaeological Consultancy Ltd

Between August and October 2010 Irish Archaeological Consultancy Ltd (IAC Ltd) carried out archaeological test-trenching and excavations along the route of the 13.6-km-long Ballaghaderreen Bypass, north of Ballaghaderreen Town, Co. Roscommon. The road scheme traverses the following townlands (from west to east): Currinah, Cashelcolaun, Bohalas, Tonregee, Bockagh, Coolaghtane, Derrynagur, Ballyoughter, Toobrackan, Magheraboy, Tullaghanrock, Banada, Keelbanada, Ballinphuill, Teevnacreeva, Ratra and Rathkeery. Fourteen areas were excavated along the route and the excavations were directed by archaeologists James Kyle, David Bayley and Tom Janes.



Stone artefacts from the Ballaghaderreen Bypass: (top) a flint scraper and a chert bipolar core from Ballinphuill 1, (bottom left) a flint concave and convex end scraper from Bockagh 3 and (bottom right) a chert bipolar core from Toobrackan 1. (Drawing: Alva MacGowan, IAC Ltd)

## The sites

The earliest archaeological evidence identified along the bypass was at Toobrackan 4. Here, on relatively flat land north of a tributary of the Lung River, a series of pits and post-holes was excavated. They did not form any discernible pattern but were probably associated with activity beyond the road corridor. Some of the pits were interpreted as hearths owing to the presence of scorched clay and charred hazelnuts. Prehistoric pottery was also recovered from the site and represents fragments of at least two carinated bowls (identified by prehistoric pottery specialist Dr Eoin Grogan), which date from the Early Neolithic period (3900–3500 BC). Further pits and hearths were identified downslope of the tributary on a site to the south (Toobrackan 1) and charcoal from these features produced radiocarbon dates ranging from 2861–2576 cal. (calibrated) BC to 2113–1900 cal. BC. This site also produced a small number of chert and flint items that were produced using both platform and bipolar

technology. These techniques are different ways of creating flakes that can then be modified as tools; platform technology involves creating a platform on a prepared flint core and striking it to produce a flake whereas bipolar flakes are produced by striking from above a core placed on an anvil stone, with the impact producing flakes from both ends. The assemblage did not appear to represent tool production at the site itself, but rather the deposition of finished implements into pit/post-holes. The source of the chert is more than likely local but flint, a non-local resource, would have been imported into the area. Another Neolithic site was identified at the eastern end of the bypass at Ballinphuill 1. A radiocarbon date of 2460–2150 cal. BC was





Elevated view of two Bronze Age timber-lined troughs beneath a mound of burnt stone at Bockagh 4. (Photo: AirShots Ltd)

returned from charred hazelnut shell from a curvilinear feature identified on the site. The entire area was crossed with plough marks and furrows and was obviously heavily truncated in the more recent past. It is likely that the deposits here represent the remnants of a habitation site, which appears to have been located on the edge of a shallow wetland. An assemblage of stone tools recovered here represents Neolithic/Bronze Age activity, with the use of platform and bipolar technology, as well as pressure flaking, and appears to represent manufacture of stone implements on this site. Pressure flaking was used for shaping tools and creating finer edges or serrations and was achieved by applying pressure with the narrow



Remains of an Early Bronze Age timber-lined trough at Bockagh 2. (Photo: James Kyle, IAC Ltd)





Recording one of the timber-lined troughs at Bockagh 4. (Photo: AirShots Ltd)

end of a wooden, antler or bone tool on the edge of a flake or blade to modify it as a tool.

Seven burnt mounds were excavated in the townland of Bockagh. They were located on marginal land between a wetland area and a drier slope to the north. They were all situated roughly along the same contour 150 m above sea level. Generally, they were identified as kidney-shaped mounds of heat-shattered stone, waste material that had been used to heat water in associated rectangular troughs, some of which were wood-lined.

At Bockagh 1 alder was selected to line the trough while alder, oak, hazel and holly were used as stakes. It is possible that alder was selected deliberately for its waterproof qualities. The radiocarbon



Close-up of a trough at Bockagh 4. (Photo: James Kyle, IAC Ltd)

date range for the site was 1489–1317 cal. BC to 1299–1059 cal. BC. A timber trough was also found at Bockagh 2 and analysis by wood specialist Ellen O’Carroll identified toolmark evidence for the use of a number of axeheads, including narrow bladed ones, to work the wood. This site was dated to 1900–1740 cal. BC.

Three burnt mounds were identified at Bockagh 3. Unlined troughs were evident at two of these but most of the third mound lay outside the road corridor. The mounds appeared to have been levelled in the recent past; a modern drain running across the site represents a period of land reclamation and disturbance. Charcoal from one of the mounds produced a radiocarbon date of 1208–1012 cal. BC. A small assemblage of flint from the topsoil indicates that knapping (breaking or chipping stone with sharp blows to make tools) took place in the area in later prehistory.

Three troughs with two associated burnt mounds were identified at Bockagh 4. The largest mound sealed a substantial timber-lined trough and what appeared to be an associated cistern or pit. Probably associated with this, but on a more elevated location, was a second trough and pit. The third trough was sealed beneath a mound to the south-west. Alder, hazel, willow and oak were selected to line the troughs and a date range of 2461–2209 cal. BC to 1041–911 cal. BC was returned from the wood.

Three burnt mounds were identified in close proximity to one another, south of the Lung River—one at Banada and two at Keelbanada. Two troughs were sealed beneath the mound at Banada 1. The base of the main trough was built using planks of oak and ash, two split alder roundwoods and stakes of ash and hazel. The site produced a date of 2009–1771 cal. BC. Keelbanada 1 comprised of a burnt spread—a deposit representing a disturbed burnt mound. The





Elevated view of the medieval ditches excavated at Toobrackan 1, adjacent to a ringfort. (Photo: AirShots Ltd)

### *Limekilns were an important feature of the post-medieval rural landscape.*

thin spread of heat-shattered material was roughly horseshoe shaped and no evidence of a trough, hearths or associated features was identified. It produced a date of 2018–1774 cal. BC. Keelbanada 2 was a severely truncated burnt mound with two unlined troughs and pits. It produced a date of 2195–1979 cal. BC.

A site at Teevnacreeva 1 revealed two pit features; both were shallow and contained charcoal. One pit contained burnt animal bone and has been radiocarbon-dated to the Late Iron Age: cal. AD 20–220. It may have been a single-use cooking pit. No other finds were recovered from across the site.

A possible medieval cooking pit, dated to cal. AD 1048–1218, was identified at Toobrackan 3. The pit was 1.4 m in diameter and 0.2 m deep and contained heat-fractured stones and charcoal-rich clay. It was in relative isolation; however, medieval settlement evidence has been identified in the wider landscape, including medieval ditches (cal. AD 1023–1155) at Toobrackan 1, c. 600 m to the south-east. These ditches were excavated adjacent to a known ringfort and may represent activity within the immediate radial field system of that settlement.

Limekilns were an important feature of the post-medieval rural landscape. They were used to produce lime from limestone, which was used in farming to increase the productivity of the soil and in construction for mortar and whitewash, and many are depicted on early maps of this area. An example of a drystone-built, keyhole-shaped kiln was excavated at Bockagh 6. Although this kiln was not illustrated on the first-edition Ordnance Survey six-inch maps there



Elevated view of the drystone-built, keyhole-shaped limekiln at Bockagh 6 (Photo: AirShots Ltd)

are approximately six limekilns located along the local roads, c. 300 m to the north and north-west of the site. Limekilns were built and used extensively during the 18th and 19th centuries as landowners sought to improve their land, however, the industrial boom of the 19th century caused many of these small-scale kilns to be abandoned.

### **Conclusion**

This section of the N5 crossed poor and marginal land, which was mostly bog. The excavations mainly revealed Bronze Age burnt mounds that would have been sited deliberately on the edge of wetlands to avail of access to the high water table. It is likely that settlement evidence for this period is located beyond the road corridor on the better drained surrounding slopes. Where the route crossed better drained land it did reveal evidence, albeit patchy, of Neolithic, Iron Age and early medieval activity and settlement, indicating that this area of Roscommon has been occupied since early prehistory.





Elevated view of Kilnacranra Site 1, Co. Tipperary, during excavation. (Images: Headland Archaeology (Ireland) Ltd)

# The Kilnacranra kilns

An interesting series of cereal-drying kilns has been identified in association with an enclosed settlement at Kilnacranra, Co. Tipperary, on the M7 motorway.

By Colm Moloney, Managing Director with Headland Archaeology (Ireland) Ltd

Kilnacranra Site 1 was situated on arable land overlooking the Kilmastulla River, in the shadow of the Silvermines Mountains of north Tipperary. Excavations in advance of the construction of the M7 Nenagh–Limerick motorway revealed a complex

site that appears to have been established during the transitional period between the end of the Iron Age and beginning of the early medieval period. Initially, it consisted of a single enclosed settlement (Phase 1), which appears to have been occupied by

a relatively affluent farming community. Probably during the seventh century the settlement was restructured into a more complex ‘double enclosure’ farmstead (Phase 2), a possible indication of changing trends in vernacular architecture, which may in turn be indicative of a changing social and political environment. The Kilnacranra farmstead appears to have been abandoned by the ninth century.

Between Phases 1 and 2, a total of seven kilns were identified; one of these was largely destroyed by the construction of a later kiln. The remaining six kilns, however, were well preserved and allow comparisons to be drawn between the form and function



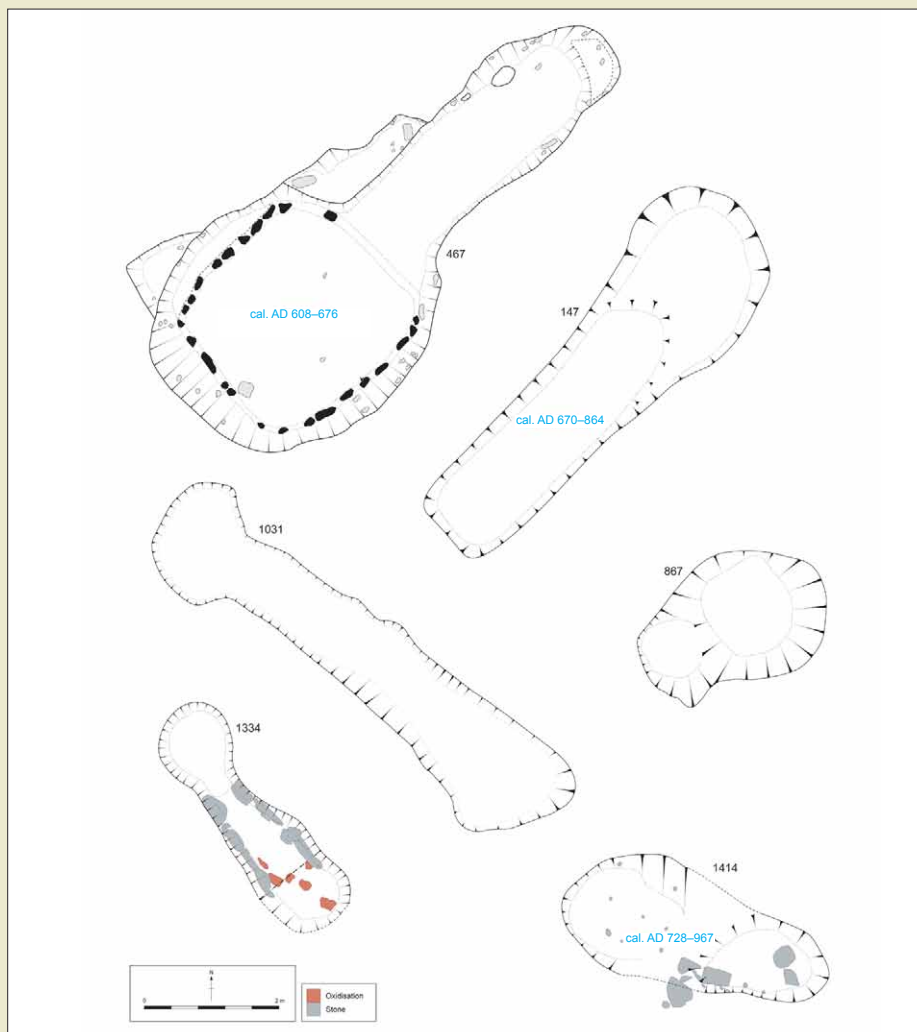
of early medieval kilns in the locality. Both dumb-bell and keyhole-shaped kilns are represented in Phases 1 and 2 and it is likely that the same general technology was available to the inhabitants of the area throughout the early medieval period. It is striking how much variety there is between the various kilns, all of which are believed to have served as cereal-drying kilns.

*The orientation of the kiln and location of the chamber would have been key factors in controlling its efficiency through the control of draught and the movement of hot air along the flue.*

All the excavated examples comprised a flue and bowl (the drying chamber). Both of the Phase 1 kilns (467 and 867) and one of the Phase 2 kilns (147) were aligned north-east/south-west. The flues for kilns 147 and 867 had the bowls at the north-east, while kiln 467 had the bowl on the south-west side. The remaining Phase 2 kilns were all aligned north-west/south-east, with the bowls on the north-west. This same axis of alignment was also noted for kilns excavated at the nearby settlement site in Gortybrigane. Flues varied in length from 1.2 m to 6m, with an average of 3.4 m. A definite fire spot was identified in kiln 1334, but fire spots were less obvious in the other kilns.

The orientation of the kiln and location of the chamber would have been key factors in controlling its efficiency through the control of draught and the movement of hot air along the flue. The local prevailing wind direction is from the south-west, which would suggest that more intense heat was required for kilns 147 and 867; moderate heat was required for kilns 1031, 1334 and 1414. The flue for kiln 467 was constructed to face away from the prevailing wind, which may indicate that very low temperatures were required for the process involved; a fact that is supported by the use of timber as an internal superstructure for the drying chamber.

The kilns excavated at Kilnacranra Site 1 and on other sites along the M7 have added significantly to the body of evidence for early medieval cereal processing in the locale. Further information about these kilns will be published in a forthcoming monograph about the archaeology of the M7 motorway.



Plans of six of the seven cereal-drying kilns identified at Kilnacranra Site 1.



Kiln 147 during excavation. ►



# Medieval Landscape

The discovery of a medieval farmstead in Landscape, Co. Wexford, provides an exciting opportunity to examine a rare facet of Anglo-Norman settlement in Ireland.

By James Hession, Excavation Director with Headland Archaeology (Ireland) Ltd



Elevated view of the medieval farmstead at Landscape 2A, Co. Wexford, looking east. (Photo: AirShots Ltd)

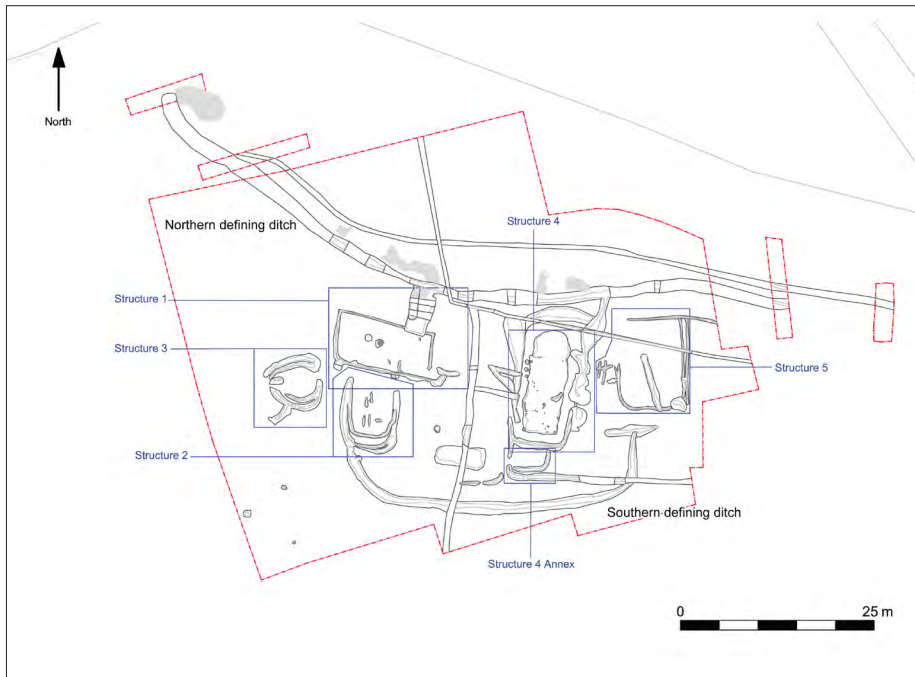
A number of exciting archaeological discoveries were made during pre-construction testing on the N25 New Ross Bypass in 2010 (see *Seanda*, Issue 5 [2010], 36–7). Among the findings was a medieval farmstead, dating from the late 12th to 13th century, uncovered in the townland of Landscape, 3.5 km south of New Ross. The site, designated Landscape 2A, consisted of an undefended settlement characterised by a discontinuous enclosure containing five structures.

The enclosed space, measuring 37 m east/west by 25 m north/south, was

subrectangular. The farmstead was defined on the south by a curvilinear enclosing ditch and to the north by a roughly east/west ditch. The preliminary evidence suggests that the farmstead was a planned settlement and that the five structures were contemporary. Structure 1 was of timber sill-beam construction, with a possible sod or thatched roof. It was rectangular and appeared to be divided into two rooms—a living space to the west, characterised by a central double hearth, and a byre to the east. As such, it was a type similar to the Anglo-Norman long house and has been

interpreted as the farmsteads main domestic building. An adjacent barn (Structure 2), of possible mud-wall construction and sod or thatch roof, was located south of Structure 1 and a circular feature (Structure 3) was identified to the west of Structures 1 and 2. Structure 4, identified east of Structure 1, was characterised by a rectangular plot similar in overall size—but morphologically different—to Structure 1. Although not clearly divided into dwelling- and byre-type rooms, the internal space did appear to be divided into two separate areas of activity. The primary area centred on the southern





Plan of Landscape 2A showing the principal structures within the medieval farmstead. (Drawing: Headland Archaeology (Ireland) Ltd)

extent of the plot, which was defined by a rectilinear slot-trench. A series of post-and stake-holes was also identified within this area and suggests that a rectangular timber sill-beamed building, with a possible porched entrance, existed at this location. This building fronted onto the secondary area of activity located to the north, which may have functioned as a paddock or open area associated with the roofed structure identified to the south. No evidence of a hearth was identified in either area. A small rectangular annexe was also identified to the south of Structure 4 and has been interpreted as a possible byre or sty. The fifth building, Structure 5, was a possible animal enclosure identified to the east of Structure 4.

Some 1,353 sherds of medieval pottery, provisionally identified as Leinster Cooking Ware and local Wexford-type Ware by pottery expert Clare McCutcheon, were recovered during the excavation. The assemblage includes four complete Leinster Cooking Ware oil lamps, which were based on medieval stone cresset lamps. Oil lamps were recovered from Structures 1 and 3, with two smaller lamps found in features associated with Structure 4.

An initial examination of the pottery assemblage suggests that the farm was occupied for a relatively short space of time, probably by English peasants associated with the Anglo-Norman colonisation of the New Ross area during the 12th century. More detailed analysis of the finds and environmental samples, along with scientific dating of key features, is needed to confirm this hypothesis and to provide an insight into the socio-economic status of the

farmstead. It is hoped that a more definitive site interpretation can be offered on completion of the post-excavation analyses.

Archaeological evidence for Anglo-Norman undefended farmsteads is extremely rare, even within counties Dublin, Kildare and Meath, where the settlement pattern is more fully understood. Until relatively recently very little was known about the wider Anglo-Norman colonisation process outside of the main urban centres within County Wexford. The discovery of the farmstead in Landscape contributes to the wider picture of Anglo-Norman settlement in County Wexford and the south-east region, adding to a number of rural medieval structures discovered on road schemes, such as houses excavated at Moneycross Upper, Co. Wexford, and Monadreela and Twomileborris in County Tipperary. Such sites provide an exciting opportunity to examine this rare facet of Anglo-Norman settlement in Ireland.



A mid-excavation view of Structure 1, looking north-west. (Photo: Headland Archaeology (Ireland) Ltd)



Elevated view of medieval house excavated by Holger Schweitzer at Moneycross Upper, Co. Wexford, on the N11 Gorey-Arklow Link. (Photo: John Sunderland)



The excavation of vernacular structures (buildings constructed using local materials and local architectural styles) of the post-medieval or early modern periods (c. AD 1650–1850) is seen as a pointless exercise by some archaeologists and heritage workers. Many struggle to understand why such sites are excavated when historical records, maps and pictures exist and when standing ruins from the period can still be seen scattered throughout the landscape. This recorded information, however, is not as comprehensive or extensive as one might think and the location or existence of many of these structures is often not recorded at all.

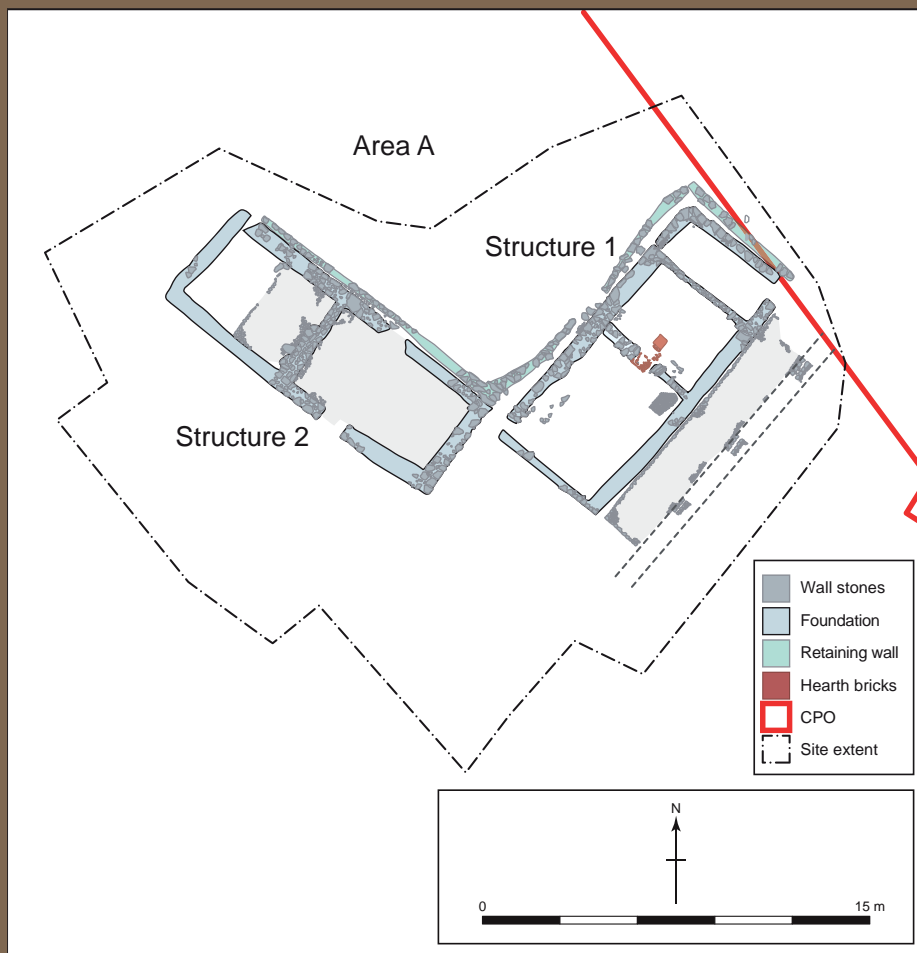
The post-medieval and early modern periods in Ireland were turbulent eras, during which many pivotal events occurred: the Great Famine, industrial and agrarian revolutions and numerous conflicts and popular risings. These events would have had an immense effect on the landscape and the people inhabiting it, and this is often reflected in the archaeological evidence. This period of Ireland's more recent history is also consistently of interest to the general public, particularly those living close to excavation sites where their ancestors may have lived. Recent excavations carried out by Headland Archaeology (Ireland) Ltd in advance of the construction of the M17 Galway (Rathmorrissey) to Tuam motorway unearthed a series of post-medieval and/or early modern structures, enclosures and associated roads in the townlands of Annagh, Annagh Hill and Kilskeagh.

### Annagh

The site at Annagh 1, located immediately north of the existing N63 road and lying roughly halfway between Tuam and Athenry, consisted of the remains of three rectangular, stone-built houses. Two of these (Structures 1 and 2) were clearly associated and formed an L-shaped arrangement. There was evidence of cobbled surfaces outside the houses, which may have been outer courtyards or a road surface, perhaps even a precursor to the modern N63 that was eventually built over it. The third house (Structure 3) was located c. 75 m south-west of these in the same field.

The houses were constructed in what is regarded as the traditional vernacular style. Structures were generally three-roomed and the walls had cores of mortar-bonded rubble and were faced (both internally and externally) with roughly dressed stone. A fireplace was commonly situated in one of the internal dividing walls. Floor surfaces consisted of layers of mortar or small stone cobbles (as was the case with the excavated examples here) or of beaten clay.

One of the houses in the L-shaped arrangement was three-roomed, with the remains of hearths visible in the interior



Plan of Structures 1 and 2 at Annagh 1, Co. Galway. (All images: Headland Archaeology (Ireland) Ltd)

# Forgotten houses and lost villages

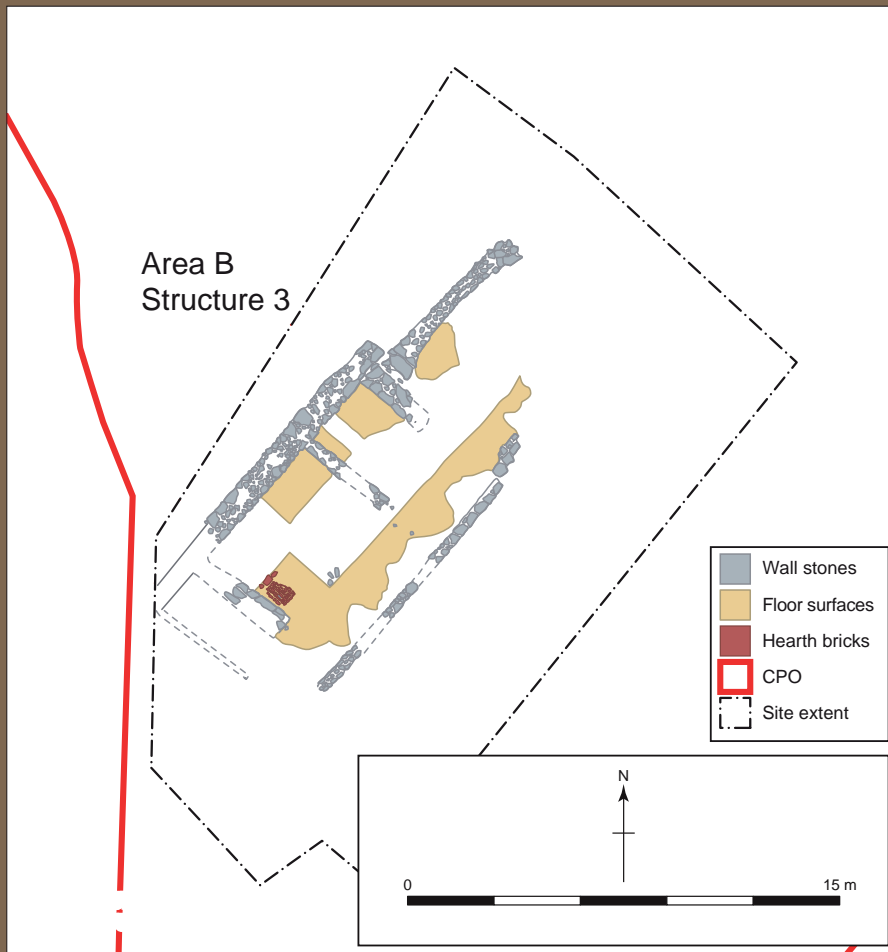
## Is there any value in excavating post-medieval and early modern vernacular structures?

By Liam McKinstry, Mary Healy and Noirín Hurley of Headland Archaeology (Ireland) Ltd

walls. The associated house was two-roomed though a stone-built extension (a possible store) was noted at the building's northern end. The third house was also three-roomed (though the remains of a stone-built extension were visible here also) and contained a single fireplace.

A number of finds of apparent 18th- or 19th-century date were recovered during the excavations. These included numerous pottery fragments, broken clay pipes, metal items and building material such as bricks, iron nails and slate roofing tiles.





Plan of Structures 3 at Annagh 1.

The remains were not visible above the ground surface and when exposed during excavation rose to a maximum of two courses above the foundations. Local residents and landowners who visited the site during the excavations were surprised by the discovery as there was no record or memory in the locality of any houses having been in the field. Examination of the first- and second-edition Ordnance Survey (OS) six-inch maps revealed that only the first two structures were depicted and only in the first-edition map.

### Annagh Hill

Structural remains, possibly houses, were also found at the nearby site of Annagh Hill 3, c. 700 m to the south-east. These represented at least three phases of activity, the earliest of which consisted of the very fragmentary remnants of a mortared floor surface and a fireplace constructed using mortar, stone and terracotta tiles.

Later activity at the site is indicated by one or two large, stone-built structures and finds made during excavation point to a 17th-century date for these. The artefacts included a small, copper-alloy trade token (locally produced coins made of lead or tin and used primarily as small change) issued by Dominick French of 'Gallway' in March 1664 and sherds of imported North Devon



A representative sample of the 18th- or 19th-century pottery recovered at Annagh 1.



Gravel Ware, datable to AD 1680–1750. Again, locals were unaware that these structures existed and no record of them could be found on the first- or second-edition OS maps.

### Kilskeagh

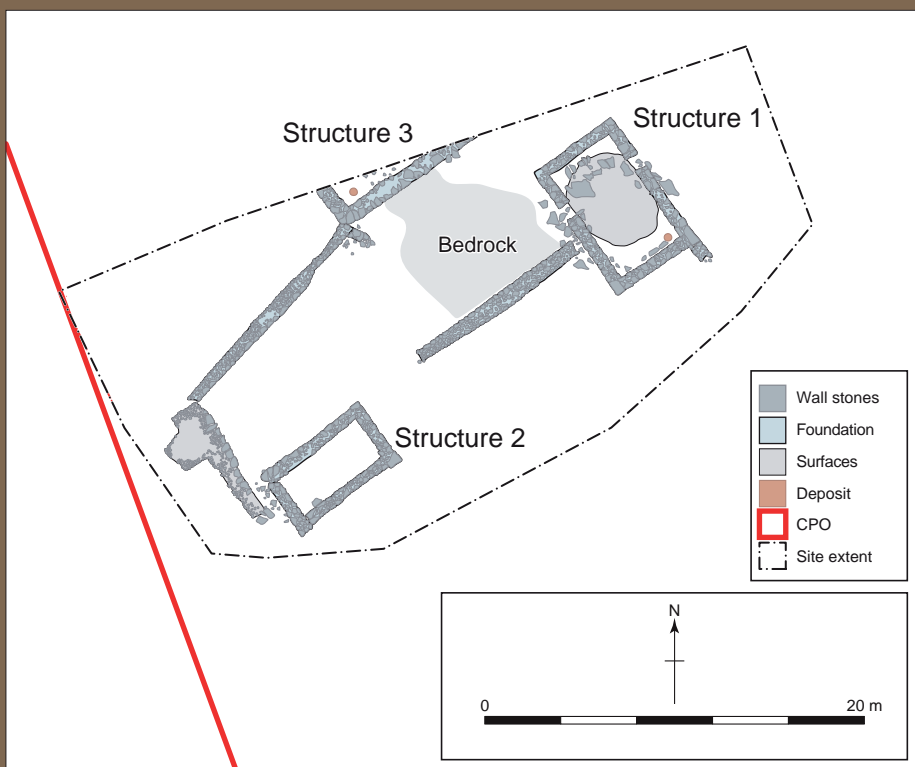
A number of structures were excavated on a plateau on the side of Kilskeagh Hill, c. 4.5 km south-east of Annagh Hill. Today Kilskeagh townland is thinly populated without any discernible ‘village centre’ but the location of these ruins seems to coincide strongly with a post-medieval hamlet or village known locally as ‘Old Kilskeagh’. There is no surviving historical evidence for this settlement but local people retain the tradition that Old Kilskeagh was a market centre and even had a public house (see [www.kilskeagh.com](http://www.kilskeagh.com)). This story seems to be supported by the archaeological investigations, which revealed a layer of settlement evidence not recorded in maps and other sources.

The area excavated as part of the recent works contained three distinct groups of structures, closely spaced over a distance of 160 m or so and all serviced by a small disused road. The first and northernmost of these (Kilskeagh 4) consisted of three stone-built, rectangular structures with associated drystone walls. The second (Kilskeagh 2) consisted of a similarly arranged compound, but with larger and more substantial stone buildings and walls, spread over a much larger area. The third and final area (Kilskeagh 5) consisted of a single, partly destroyed, rectangular, stone-built structure enclosed by a drystone wall.

Other ruined structures were visible, beyond the excavation area, at either end of the disused road, showing that, at its height, the village at Kilskeagh may have contained some 15 buildings constituting at least six individual farmsteads. A narrow laneway off the disused road was located c. 18 m north-west of the Kilskeagh 5 structure and led to a large stone limekiln (also outside the



The copper-alloy trade token issued by Dominick French of ‘Gallway’ in March 1664 recovered from Annagh Hill 3, Co. Galway.



Plan of Structures 1–3 at Kilskeagh 4, Co. Galway.

excavation area), which may have been used initially for the construction of the buildings within the village.

The buildings at Kilskeagh, like those at Annagh and Annagh Hill, were well built. The walls were faced and bonded with lime-mortar and the walls and floors were surfaced with mortar. Structure 2 at Kilskeagh 2 contained a large hearth lined with brick and cobble stones. The hearth also incorporated a small stone and clay oven to one side, which was constructed using a corbelling technique.

As well as the usual quantities of 18th- or 19th-century pottery, clay pipes and building material found throughout the site, one unusual artefact was recovered from the building debris around the Kilskeagh 2 compound. The find consisted of a piece of tile with part of a sundial carved into it.

### Question answered

This work comprehensively illustrates that, no matter how recent a site may be, new and interesting information can always be

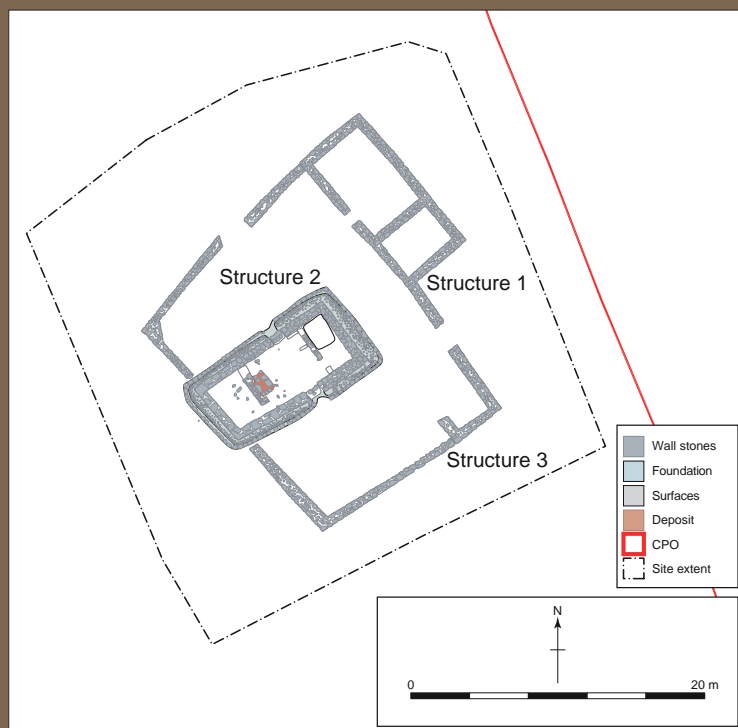


The sundial fragment from Kilskeagh 2.





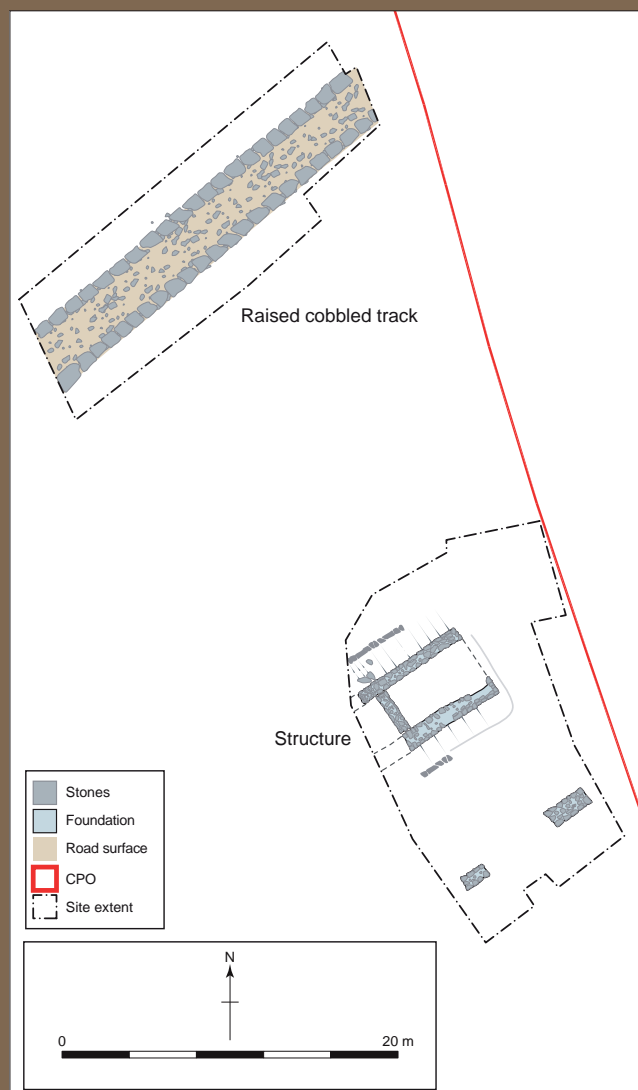
Elevated view of Kilskeagh 4, looking SSW.



Plan of Structures 1-3 at Kilskeagh 2.

gained through excavation and analysis. Post-excavation analysis of the material from Annagh, Annagh Hill and Kilskeagh is ongoing and involves documentary and cartographic research, finds examination and environmental work. It is anticipated that this work will add yet more to the knowledge of these sites as well as of other similar sites across north Galway.

Plan of the structure and laneway at Kilskeagh 5.







Mid-excavation view of pit on Site 18 in Boscabell, dated to 537–400 cal. BC. (Photo: JCNA Ltd)

# Beyond the Rock

**Archaeological discoveries on the N8 Cashel Bypass and N74 Link are further evidence of Iron Age settlement in Munster.**

*By Mícheál Ó Droma, a co-Director of Wolfhound Archaeology*

Recent archaeological excavations in advance of road construction have revealed extensive evidence for Iron Age (600 BC–AD 400) settlement, burial and industry in Munster (see *Seanda*, Issue 3 [2008], pp. 51–3). Until relatively recently this region had been seen as an ‘Iron Age desert’, with little settlement evidence of any kind. This stood in contrast to the relatively plentiful range of artefacts and the iconic ritual sites known in the northern half of the country. Recent discoveries have shown that Munster was widely settled in the Iron Age and sites identified on the Cashel Bypass in 2003 have revealed further aspects of life in this enigmatic period.

## Clusters of activity

Two clusters of Iron Age activity were noted on the new road that sweeps around the eastern and southern sides of Cashel. The eastern cluster was represented by Sites 18 and 20 in Boscabell and Sites 25ii–iv in Hughes’-Lot East; the western cluster by Sites 36ii and 38 in Windmill. Analysis of the dates obtained from features in both clusters shows that two contemporary communities were in existence in the Cashel area. Some 31 Iron Age radiocarbon dates were obtained from 27 features throughout the scheme, the majority coming from the sites mentioned. Early Iron Age dates were obtained from several sites including dates of 748–404 cal.

(calibrated) BC and 728–401 cal. BC from a deposit and a pit on Site 36ii.

This Early Iron Age activity follows on from extensive Late Bronze Age remains identified on the scheme and suggests considerable local continuity. Much of the dated Iron Age material clusters in the period from the second century BC to the second century AD, and includes a circular structure (Site 20) dated to 51 cal. BC–cal. AD 75. After the start of the second century AD there is an apparent absence of activity in the Cashel area until the sixth century AD.

Many of the features were simple pits situated in apparent isolation on sites with extensive Bronze Age activity. One such pit on Site 18 in Boscabell was dated to 537–400 cal. BC. Given the number of Iron Age features from the scheme, a full description





Elevated view of the ringfort at Site 25ii, Hughes'-Lot East, showing the location of the Iron Age pits (inset). (Main photo: Richard O'Brien, inset: JCNA Ltd)



Post-excavation view of western pit on Site 25ii. (Photo: JCNA Ltd)

of the remains is beyond the scope of this article so a selection of findings of particular interest is presented here.

### Some intriguing pits

An intriguing pair of pits dated to around the turn of the first century AD, were excavated on Site 25ii, a double-ditched, early medieval ringfort, in Hughes'-Lot East. The base of each pit contained a thick layer of red, oxidised subsoil—evidence of *in situ* burning. The western pit was subrectangular, had steep to gradual concave sides, a flat base and measured 1.35 m by 0.93 m and 0.15 m deep. Four post-holes were situated in a linear arrangement at the base and contained charcoal-flecked silty fills, although the oxidation layer was noticeably absent from these fills. A distinct sandy silt fill sealed the post-holes and hazel charcoal from this was radiocarbon-dated to 90 cal. BC–cal. AD 48.

The eastern pit was 1.47 m east of the western pit. It was subrectangular, had a flattish base and measured 1.55 m by 0.95 m and 0.21 m deep. Three post-holes were noted at the base, each contained red,



compact silty clay, with occasional heat-shattered stone and charcoal flecks. Deep red silt, with occasional charcoal flecks and heat-shattered stone, filled the pit and sealed the post-holes. A date of 89 cal. BC–cal. AD 54 was obtained from yew charcoal retrieved from this deposit, which also contained two fragments of burnt animal bone.

A very similar pattern of activity was noted to have occurred at both pits. Although the presence of animal bone may indicate an association with cooking or food preparation, the complex arrangement of internal post-holes, the intense *in situ* burning and the presence of a pair of near identical contemporary features in close proximity suggest a more specialised, albeit unknown, function. No parallels for these features were present elsewhere on the scheme.

On the same site, a pit c. 30 m to the south, initially used in the Middle Bronze Age (c. 1600–1100 BC), had been reused around the time the burnt pits were in use. A date of 39 cal. BC–cal. AD 75 was obtained from hazel charcoal from this feature. Iron Age activity on sites formerly used in the Bronze Age is an emerging trend both on this scheme and elsewhere in Ireland. Another pattern was noted in Cashel where early medieval enclosures were constructed at three of the four sites with extensive Iron Age activity.



Mid-excitation view of eastern pit on Site 25ii. (Photo: JCNA Ltd)

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*The discovery of widespread Iron Age remains throughout Munster has significantly added to our understanding of a region that was previously considered to be something of a blank in this period.*

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Test-trenches in Windmill, looking towards hilltop enclosure TS061-072 from the find spot of the iron artefacts. (Photo: Richard O'Brien)

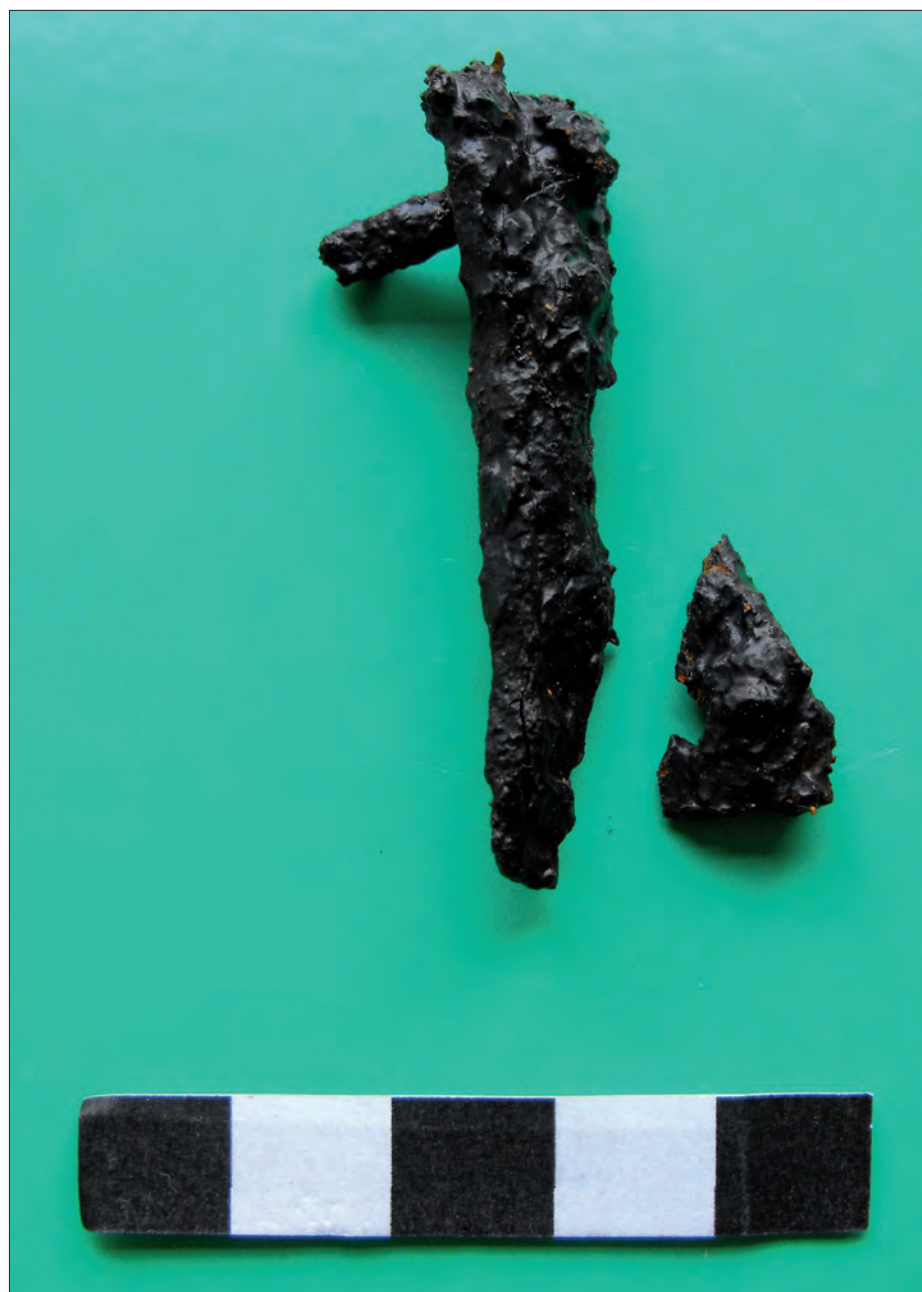


### La Tène period metal-work

A pit on Site 38 in Windmill produced that rarest of things—Iron Age iron. The pit, one of five Iron Age features in an area measuring 30 m by 10 m, was situated on the eastern slope of a low hill facing the nearby Windmill hilltop enclosure (Sites and Monuments Record No. TS061-072). The pit was subrectangular, measured 1.39 m by 0.92 m and 0.2 m deep, and contained a clay fill. A flat, iron blade fragment and a riveted, iron link-type object were retrieved from this deposit. A date of 179–40 cal. BC was obtained from hazel charcoal within the fill. The presence of iron objects from securely dated Iron Age contexts is extremely rare. Animal bone (of indeterminate species) was recovered from this pit and it is thought that this feature represents a domestic refuse pit. Other pits in the vicinity included many with evidence for *in situ* burning. Of interest was a nearby



Iron blade fragment from the Iron Age pit on Site 38 in Windmill. The scale bar is 5 cm long. (Photo: Richard O'Brien)



Riveted, iron, link-type object from the Iron Age pit on Site 38 in Windmill. The scale bar is 5 cm long. (Photo: Richard O'Brien)

pit that produced evidence for Bronze Age metal-working. Dated to 1123–906 cal. BC it produced a piece of metal-working residue.

The reuse, and indeed continued occupation, of Bronze Age sites in the Iron Age is an established phenomenon. At Ballydrehid, Co. Tipperary, on the N8 Cashel–Mitchelstown, two Middle Bronze Age houses were excavated. Iron Age houses were discovered immediately south of these. At Twomileborris, Co. Tipperary, metal-working residues of Early Iron Age date were dumped into a largely infilled enclosure ditch which had been constructed in the Late Bronze Age.

### Discussion

Iron Age sites account for approximately 10% of the findings from archaeological excavations on NRA road schemes. The discovery of widespread Iron Age remains throughout Munster has significantly added to our understanding of a region that was previously considered to be something of a blank in this period. On the N8 Cashel–Mitchelstown 12 sites yielded evidence for Iron Age activity. Approximately 14% of radiocarbon dates obtained from the Cashel Bypass were Iron Age. The 'Iron Age desert' that was Munster 20 years ago can now be shown to have similar levels of population to the northern half of the country.

Nonetheless, a dichotomy in terms of the material culture used in the northern and southern halves of the country continues to hint at regional differences at this time. The 'invisible people' of the Iron Age have appeared, they just remain silent on many subjects. The discovery of La Tène period metalwork in Cashel may shed further light on the nature of contacts between the north and south of the island, and the material culture in use in each.



# Archaeology and the National Roads Authority Monograph Series

## *Past Times, Changing Fortunes*

**Edited by Sheelagh Conran,  
Ed Danaher and Michael Stanley**

Published August 2011

*Past Times, Changing Fortunes*, a theme reflecting current economic concerns, seemed an appropriate topic for the 2010 NRA National Archaeology Seminar at which speakers were invited to address how the fortunes of the Irish landscape and people have changed over millennia. The multiplicity of archaeological and palaeoenvironmental evidence for the many transformations experienced on this island and the resilience of its inhabitants throughout history is amply demonstrated in the latest seminar proceedings.



## *Creative Minds: production, manufacturing and invention in ancient Ireland*

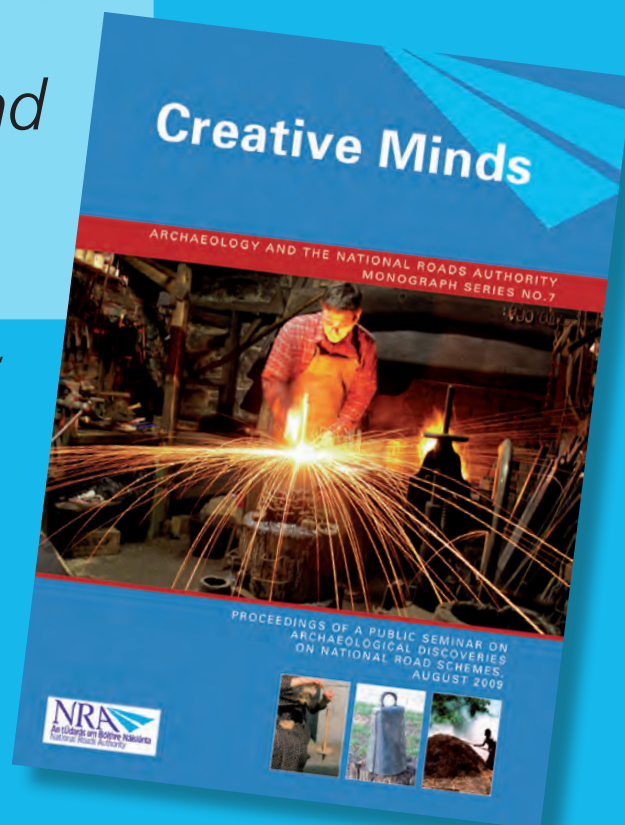
**Edited by Michael Stanley, Ed Danaher and  
James Eogan**

Published August 2010

Another welcome distillation of results from NRA-funded fieldwork, this attractive, lavishly-illustrated and accessible book ... is full of fascinating nuggets and insights and will be of lasting value for researchers and the public alike ... the NRA is to be congratulated and encouraged to keep up its excellent work of dissemination.'

Dr Alison Sheridan, National Museum of Scotland, in *British Archaeology Magazine*

*Past Times, Changing Fortunes* and *Creative Minds* are available through bookshops, or directly from Wordwell Book Sales, Media House, South County Business Park, Leopardstown, Dublin 18 (tel: +353 1 2947860; e-mail: [helen@wordwellbooks.com](mailto:helen@wordwellbooks.com))







Neolithic stone axehead from Manor East 1.  
(Photo: Farina Sterneke)

# Ancient imprints of life and death

**Preliminary results of excavations on the N22 Tralee Bypass in County Kerry have revealed much new archaeological evidence.**

*By Patricia Long, Senior Project Manager with Headland Archaeology (Ireland) Ltd*

Settlement, industrial and ritual evidence spanning millennia were all encountered during recent archaeological investigations in the Kingdom of Kerry. Excavation of 36 sites on the route of the N22 Tralee Bypass/ Tralee to Bealagrellagh road scheme, to the east and south of the town, was undertaken by Tony Bartlett and James Hession of Headland Archaeology (Ireland) Ltd between January and April 2011. A good range of archaeological sites was identified but the numbers of associated artefacts were low.

## Settlement

Direct evidence for occupation and settlement of the area in the Neolithic, Bronze Age, medieval and post-medieval periods was identified. At Manor East 1, c. 1 km east of Tralee, a range of pits, post- and stake-holes were found over a large area. The recovery of a Neolithic stone axehead and a small amount of Neolithic pottery indicates at least some of this activity dates to that period (c. 4000–2400 BC).



Double-ditched enclosure at Ballinorig West 2. (Photo: Aerialphoto.ie)

Several roundhouses were identified along the route and are likely to date from the Bronze Age (c. 2400–600 BC). A site at

Knockawaddra Middle 2, 1.4 km north-east of Tralee, had three roundhouses clustered together on the side of a hill, while a



roundhouse in Ballingowan 1, 1 km east of Tralee, was found at the northern end of a large multiperiod site.

A double-ditched enclosure at Ballinorig West 2, c. 1 km north-east of Tralee, was initially thought to be early medieval (c. AD 450–1169) in date but the only material recovered during the excavation was prehistoric pottery, so the radiocarbon dating results for this site are eagerly anticipated. A ditched enclosure at Clashedmond 1, c. 2 km south-east of Tralee, is likely to be early medieval in date though no artefacts were recovered. It was located close to an upstanding enclosure (Sites and Monuments Record No. KE038-018) beyond the road corridor.

Post-medieval settlement was also identified at a number of sites including Lismore 1, 2.7 km north-east of Tralee, where a road and the remains of several stone structures related to an early 19th-century demesne house at Lismore were excavated. A stone structure related to a townland boundary was uncovered at Clashedmond 1.

### Subsistence and industry

Features relating to subsistence and industry were found throughout the scheme. A total of 13 sites had features related to burnt mound activity of probable Late Neolithic to Late Bronze Age date. These were especially



Aerial view of Clashedmond 1 enclosure, with enclosure KE038-018 to the south-east. (Photo: Aerialphoto.ie)



Post-medieval limekiln excavated at Lismore 1. (Photo: Headland Archaeology (Ireland) Ltd)

concentrated on the edge of the flood plain of the River Lee and on the southern side of the road scheme where the land is prone to intermittent waterlogging.

*Brick production using brick clamps began in Ireland at the end of the 17th century.*

Evidence for metal-working was found on two large, multiperiod sites: Ballinorig West 4, 400 m east of Tralee, and Ballingowan 1. Furnaces, pits and charcoal-production kilns were identified along with quantities of slag. Apparently isolated charcoal-production pits were found at two other locations: Dromthacker 2, 200 m north-east of Tralee, and Gortbrack East 1, 4.4 km south-east of Tralee.

Several kilns were identified along the bypass. Two of these may be related to early medieval cereal-drying, although analysis of environmental samples will be required to confirm this. Six of the kilns were post-medieval limekilns. Earth-cut, unlined limekilns were located at Lismore 1, Knockawaddra Middle 1 (1.5 km north-east of Tralee) and Dromavally 1 (3.3 km south-east of Tralee). These were associated with very large waste pits and a post-hole structure was also found at Dromavally 1.





Brick clamp during excavation at Camp 1. (Photo: Headland Archaeology (Ireland) Ltd)

A square, stone limekiln was located against a natural slope at Ballanorig West 4 while the impression of a large kiln, from which all the stone had been robbed out, was found at Ballindooganig 2, 3.6 km south-east of Tralee.

Evidence for post-medieval brick production, in the form of two brick clamps and a waste pit, was found at three locations in the clay-rich, southern flood plain of the River Lee. Brick clamps were large rectangular structures that were used to fire large quantities of clay to make bricks. This

method of brick production began in Ireland at the end of the 17th century and became widespread during the 18th century.

### Burial and ritual

Cremation burials were identified on three sites and are the only evidence of funerary practices along the bypass. At Manor East 1 three cremations were found in different parts of the site. One of these was contained within a Bronze Age urn. At Ballinorig West 3, 700 m east of Tralee, another Bronze Age urned cremation was found along with a possible pennanular ring-ditch. Nearby, at Ballinorig West 4, a total of 22 cremations and a ring-ditch containing cremated bone were excavated, two of the cremations were found to contain tiny, blue glass beads which could indicate an Iron Age date (c. 600 BC–AD 450).

A double row of pits/post-holes identified at Ballingowan 1 is reminiscent of avenues associated with timber circles on Neolithic and later prehistoric sites. No artefacts were recovered to date these features, and radiocarbon determinations will be important in assessing what these rows represent. They appeared to continue beyond the eastern side of the road corridor and may be associated with a ceremonial monument in this area, though this was not apparent from a geophysical survey carried out in the adjacent field.

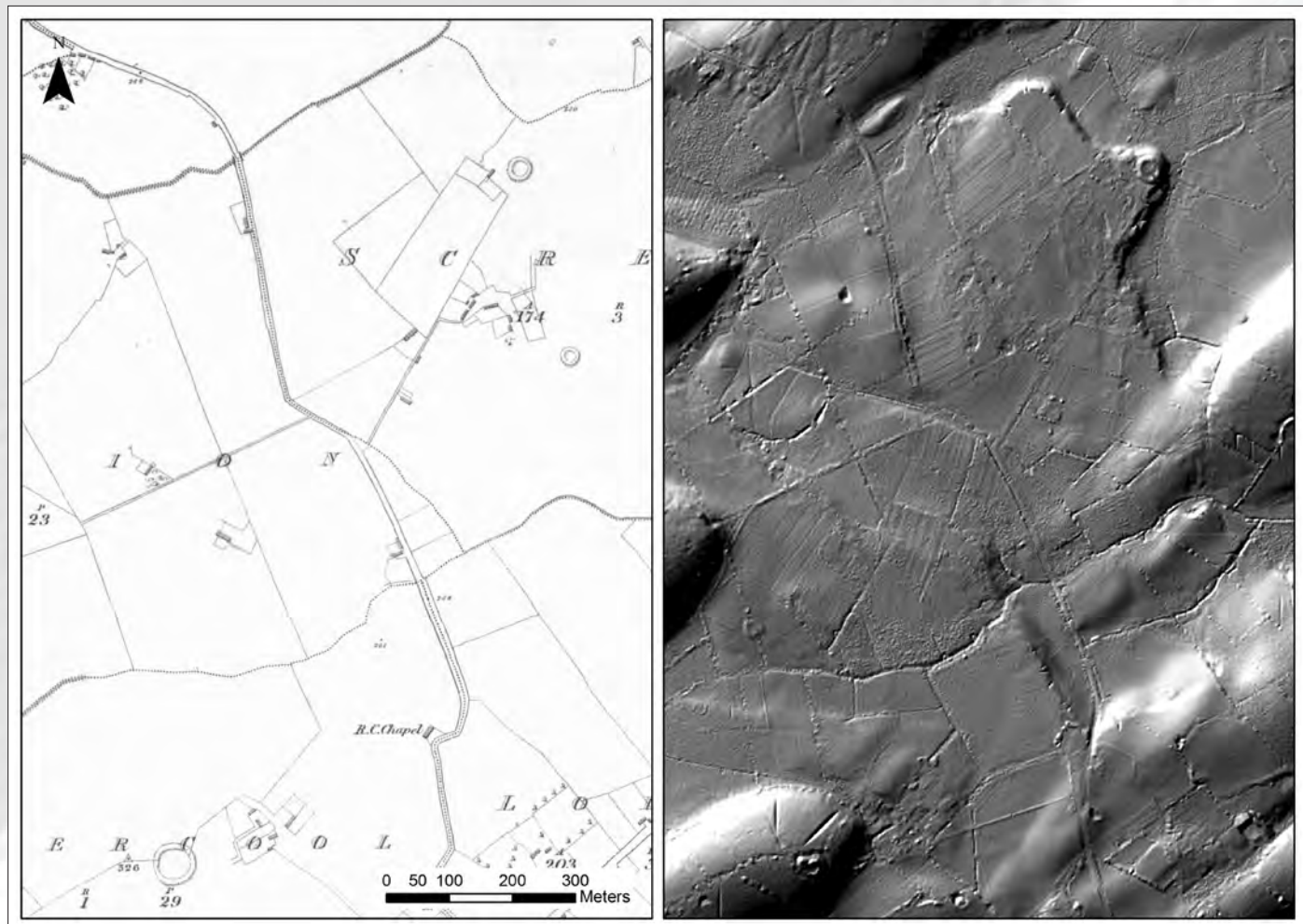
Post-excavation work is currently ongoing for all the sites excavated on the Tralee Bypass and plans are in place for the excavation results to be published in a scheme monograph. This will contribute greatly to the archaeological record of the Tralee area.



Double row of pits/post-holes at Ballingowan 1, facing east. (Photo: Headland Archaeology (Ireland) Ltd)



# Etched in the landscape



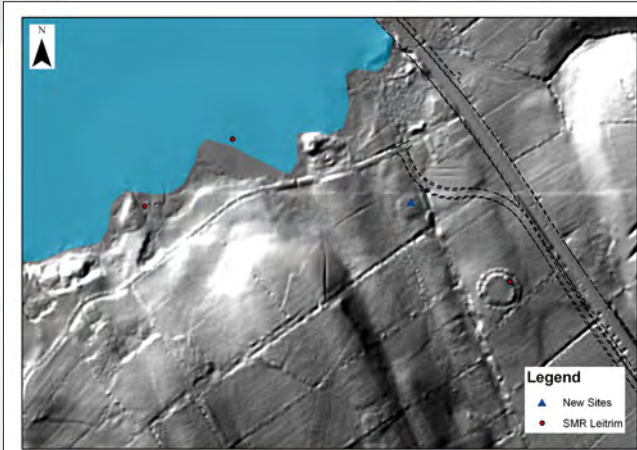
First-edition Ordnance Survey six-inch map (left) and 2 m-resolution LiDAR image (right) showing ploughmarks and old field boundaries not recorded on the map. (Images: Will Megarry).

**Some very positive results have been achieved by the use of LiDAR on the N4 Carrick-on-Shannon to Dromod road scheme.**

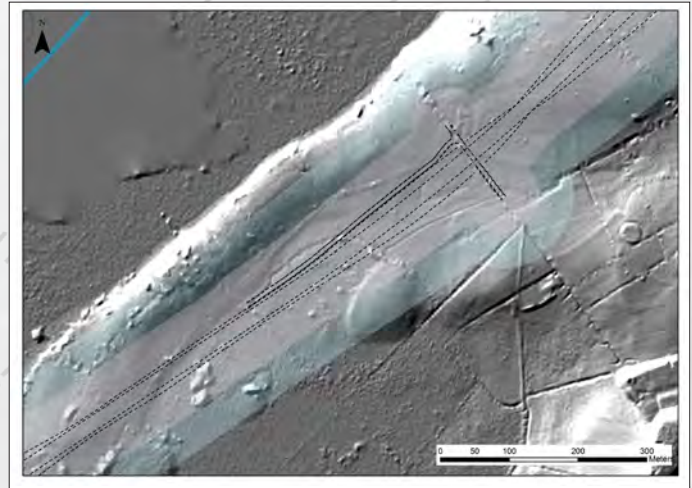
*By Will Megarry, a Geographical Information System specialist and PhD scholar based in the School of Archaeology, University College Dublin*

In recent years, LiDAR (Light Detection and Ranging) data have become an important tool in the archaeologist's toolkit. By scanning the earth's surface from low-flying aircraft, LiDAR returns a high-resolution elevation model of a landscape, picking up subtle topographical variations not visible in traditional aerial photography. By manipulating the data gathered—producing a visual representation of the landscape and controlling the direction and angle of simulated sunlight across it—hillshade models can be made that record archaeological features in stunning detail. The laser pulses used by LiDAR have the added benefit of penetrating foliage, providing a surface model of the bare topography and capturing features hidden in forests and wooded areas. It is a technology ideally suited to Ireland, where past activity is etched and scraped across the landscape, and remains visible below modern activity.





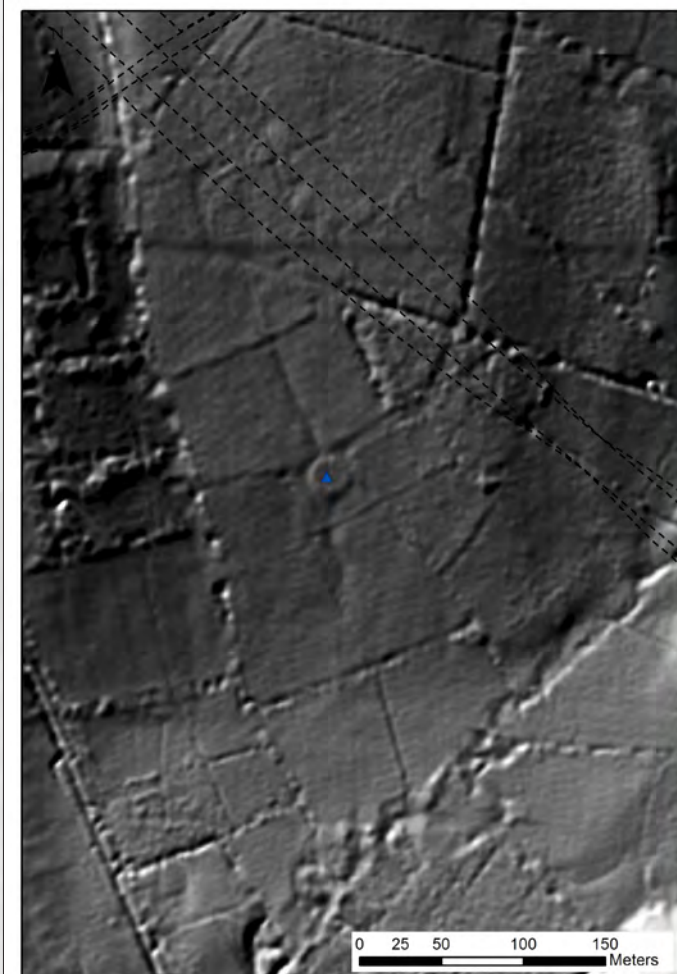
LiDAR image and proposed route (top) and OSi aerial photograph (bottom) of Carrick townland showing recorded SMR sites and a newly identified ringfort.



Proposed route for the N4 Carrick-on-Shannon to Dromod road scheme (dotted line), 50 m and 100 m buffers (shaded), and LiDAR image.

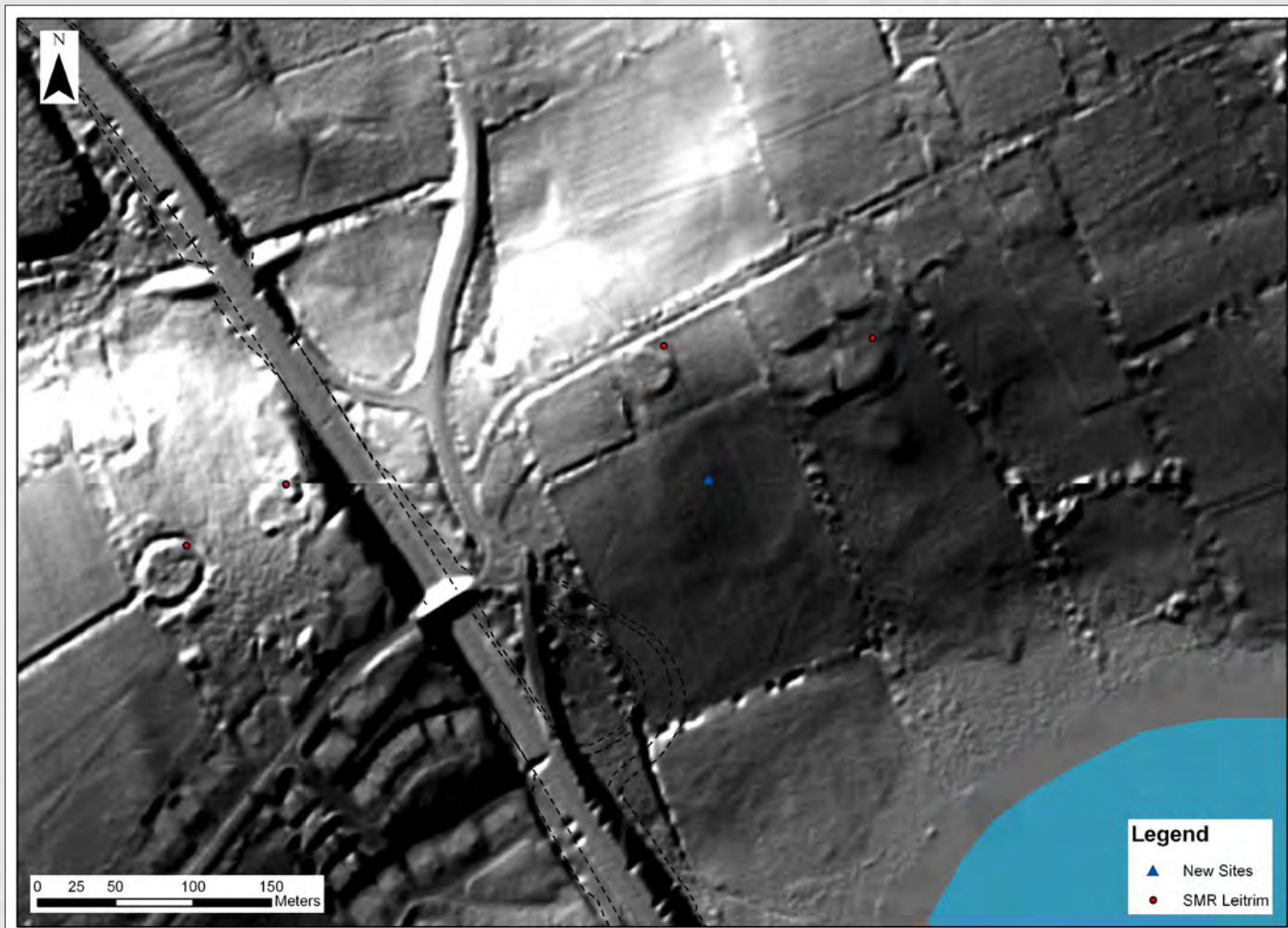
### The project

During the consultation phases for the proposed N4 Carrick-on-Shannon to Dromod road scheme, a LiDAR study was commissioned by Leitrim County Council and the NRA to explore potential archaeological features within the area of the proposed route. Using 2 m-resolution LiDAR data produced by Ordnance Survey Ireland (OSi), relevant sections of the route were processed and imported into a Geographical Information System (GIS), alongside other data including aerial photography, modern and historical mapping, Geological Survey of Ireland data sets and the Sites and Monuments Record (SMR). LiDAR is a powerful tool; however, it is most effective as part of a greater toolkit incorporating as wide a range of spatial data as possible. Buffers were generated at



LiDAR image and OSi aerial photograph showing old field boundaries, ploughmarks and a newly identified ringfort in Garvlough townland.





LiDAR image showing large circular enclosure above Spa Lough in Gortconnellan townland.

50 m and 100 m around the proposed route and potential sites were identified within these buffers. New sites were recorded by townland and given a unique label. Their spatial relationship to the proposed route was also recorded.

### Some results

In total 41 townlands were surveyed and 12 new potential sites identified within 100 m of the proposed route. Many of these sites were situated close to ancillary access roads and not the main route itself. The LiDAR data were particularly effective in detecting large circular features in the landscape like enclosures and ringforts. As it can only detect features which leave some (albeit slight) topographical signature, there were mixed results from low-lying alluvial areas or boggy regions. Nine ringforts (enclosed early medieval farmsteads) were identified ranging from 20 m to 40 m in diameter. Many of these were located under tree cover or had very low-lying relief. Some were at the centre of complex ancient field systems which remain preserved in the topography. Other sites were partly obscured by field boundaries.

*LiDAR data provide a high-resolution record of the elevation of a landscape and this data can be used for a number of purposes.*

A large circular enclosure was also identified in Gortconnellan townland close to four SMR-listed ringforts. It is situated below a ridge on a gently sloping hill overlooking Spa Lough and a crannog (SMR No. LE032-051), and has a diameter of over 100 m. The relationship between ringforts and larger enclosures was evident throughout the area, with entire complexes visible in the LiDAR data.



LiDAR image and aerial photo of complex in Lisnagat townland.

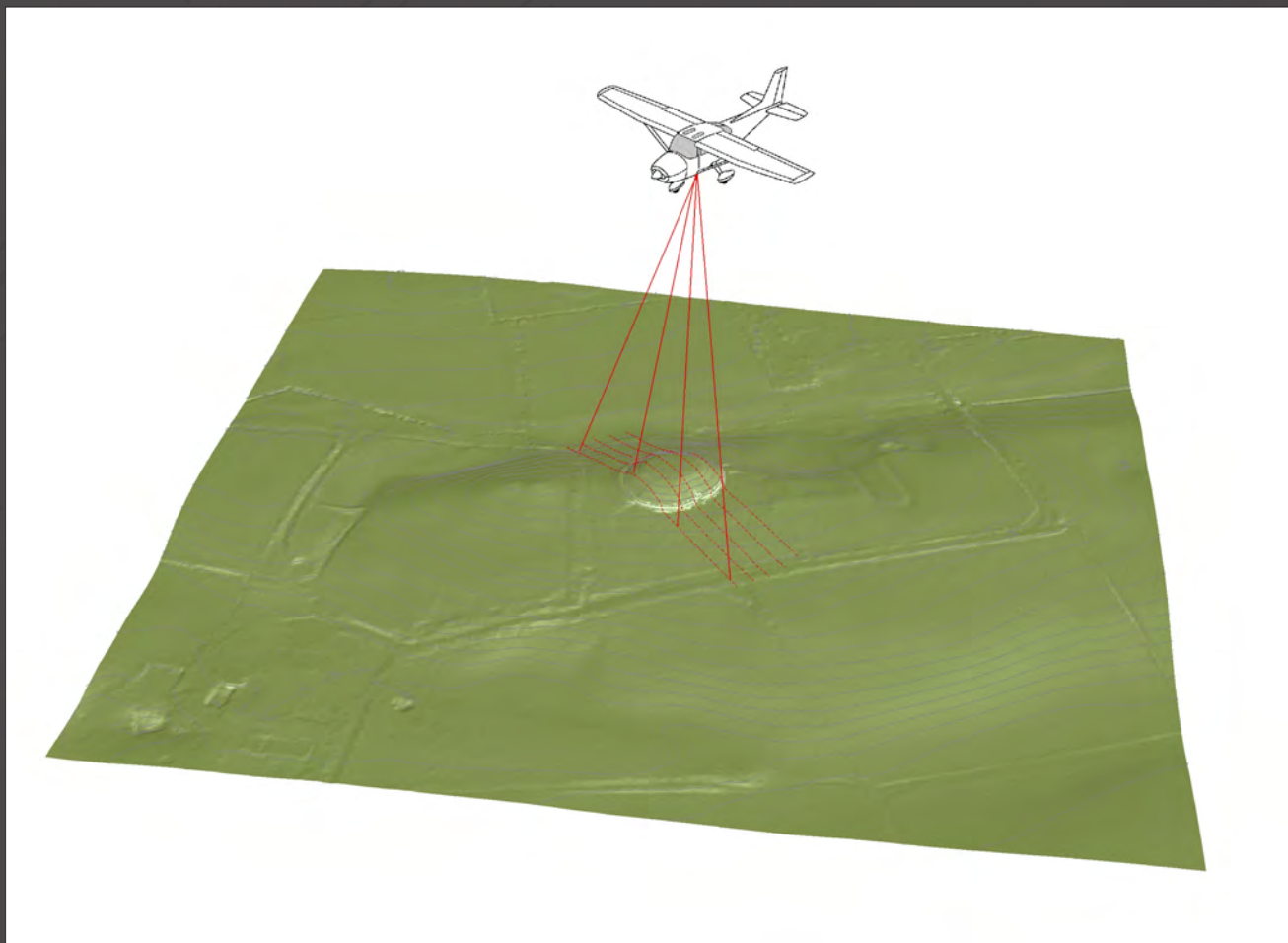


In such cases, individual ringforts were often identified as SMRs, while outer enclosures were not. One very good example is visible at Lisnagat where three ringforts are enclosed by an outer earthwork.

As mentioned above, LiDAR data provide a high-resolution record of the elevation of a landscape and this data can be used for a number of purposes. It can form the backdrop for detailed three-dimensional imagery and help archaeologists explore more theoretical questions surrounding landscape occupation. The project also looked at the hydrological properties of the landscape, exploring the relationship between drainage, the proposed route and archaeology in the region. The results are interesting, indicating that the vast majority of ringforts in the region are situated on watershed boundaries, as are the preferred routes for road schemes.

## Conclusions

While the LiDAR resolution used in the study was quite coarse, the results were very positive. Twelve significant new archaeological sites were identified in the landscape. Some of these sites were in close proximity to the proposed or ancillary routes. On a national level, the project showed the effectiveness of using pre-existing LiDAR data in site identification (avoiding the need to commission a project-specific LiDAR survey). Over 30% of the country is covered by high-resolution LiDAR data and many commercial schemes now commission LiDAR capture for engineering and design purposes. Using this data for archaeological survey requires minimum extra effort, is inexpensive and can save future testing and excavation costs.



## In Brief: LiDAR

LiDAR is an acronym which stands for Light Detection and Ranging. Using laser scanners mounted on low-flying aircraft, LiDAR captures landscape elevation and topography in high resolution. This resolution varies and can range between <10 cm and several metres. These lasers measure the distance between the aircraft and the ground, producing a series of points recording the geographical position and elevation at set distances in the landscape. They have the added benefit of being able to penetrate foliage, recording topography in forested areas. Ground-based scanners can also be used to record smaller areas and upstanding features like buildings.

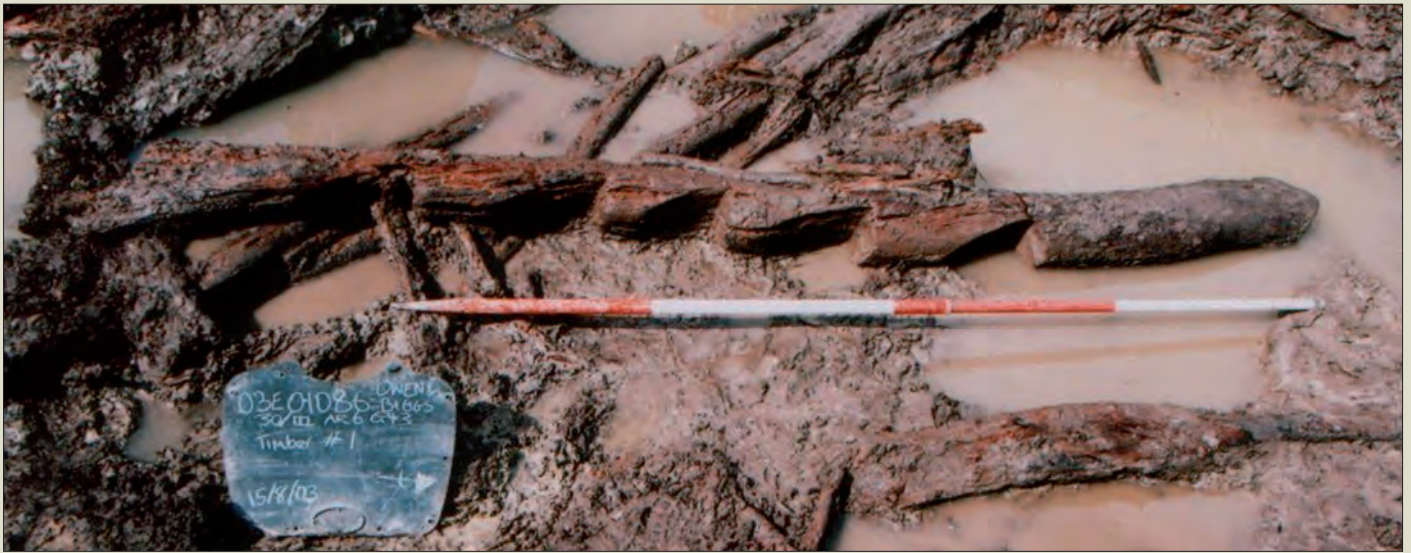
LiDAR is a technology ideally suited to archaeological prospection in the Irish landscape. The often slight signatures left by earthworks can remain invisible both to the naked

eye and in aerial photography. LiDAR enables us to look at the landscape differently, highlighting certain patterns and exaggerating the subtle elevations which represent past human activity.

LiDAR data have become increasingly popular in recent years, and are now widely used in forestry, agriculture, mineral prospection and by insurance companies modelling flood risk in riverine regions. The costs involved in commissioning new LiDAR data for a specific region can seem prohibitive to archaeology. Fortunately, data has already been collected for large parts of the country and can be obtained at more reasonable costs from bodies like Ordnance Survey Ireland.

*Will Megarry, School of Archaeology, University College Dublin.*





The possible alder ladder during excavation. (Photo: Leigh Barker)

# An update on Cashel's earliest wooden artefacts

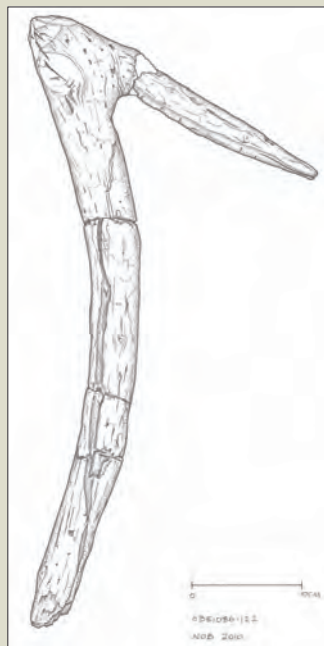
**Two significant wooden artefacts found during excavations on the N8 Cashel Bypass in 2003 have undergone conservation works.**

*By Joanne Hughes, a co-Director of Wolfhound Archaeology*

The discovery of a hand pick and a ladder at a site excavated in Owen's and Bigg's-Lot, Co. Tipperary, was reported in a previous edition of *Seanda* (Issue 3 [2008], p. 33). The site in question was a cluster of seven *fulachtaí fia* burnt mounds set in wetland on the eastern edge of Windmill Hill, the dominant landmark south of the Rock of Cashel.

As previously reported, the possible hand pick, made from blackthorn/cherry, was radiocarbon-dated to 2440–2140 cal. BC. The possible ladder, made from alder, was dated to 1,000 years later (1390–1120 cal. BC), illustrating the constant use of this landscape in the past. Aside from these artefacts over 30 other pieces of wood from the same site were analysed by wood specialist Ellen O'Carroll; the species identified consisted of alder, willow, blackthorn and apple-type.

The ladder can be paralleled with an antiquarian find from Derrycarhoon, Co. Cork, reported in 1861. The Derrycarhoon find was associated with copper mining and was described as 'a ladder 18 feet in length, formed of a single piece of black oak, with 13 steps cut into it on one side'. In addition, the hand pick discovered in excavations in Mine 3 at Mount Gabriel, Co. Cork, has close parallels with the Cashel hand pick. Do these objects suggest a mining story in Bronze Age Cashel? What other uses could these artefacts have



The possible hand pick made from blackthorn/cherry. (Drawing: Niamh Ó Broin)



The hand pick following conservation. (Photo: Stellar Photography)

served? Recently, the author has seen a similar ladder used in a children's playground.

The artefacts have undergone conservation works in the National Museum of Ireland. Unfortunately, owing its size and fragile condition, the ladder could not be reconstructed. It was, however, possible to conserve and reconstruct the hand pick. This work was undertaken in Collins Barracks by conservators Kasia Bernaciak and Carol Smith. The next step will be the deposition of the hand pick in the South Tipperary County Museum in Clonmel where it will go on temporary display. It is fitting that at least one of these wooden objects, the earliest from Cashel, should return to the county and be enjoyed by all.



Playground ladder. (Photo: Joanne Hughes)



# The blacksmith's rest



Reconstruction of an early medieval iron-working workshop excavated at Lowpark, Co. Mayo, on the N5 Charlestown Bypass. Darkened areas were often used by smiths as the colour of the heated metal and the flame indicated readiness for welding or hammering. (Drawing: Fergus Niland)

## Evidence of a possible early medieval blacksmith's workshop has been uncovered recently on the N11 Gorey North Motorway Service Area in County Wexford.

By Gill McLoughlin, an Excavation Director with Irish Archaeological Consultancy Ltd

While some early medieval farming settlements are known to have practised their own small-scale metal-working, itinerant blacksmiths are also thought to have served the metallurgical needs of the rural community of the period. Pre-construction archaeological testing on the N11 Gorey North Motorway Service Area resulted in the discovery of a possible temporary workshop serving such a blacksmith in the townland of Ballyellin, Co. Wexford, 9 km north-east of Gorey. Full excavation in August 2010 uncovered the remains of a subrectangular building defined by a slot-trench on three sides. Alder charcoal recovered from the lower fill of the slot-trench has been radiocarbon-dated to cal. AD 890–1030, the later part of the early medieval period.

The structure at Ballyellin 1 measured c. 7 m by 6 m and the slot-trench was a maximum of 0.4 m deep and 0.5 m wide. Two fills of sandy silt within the slot-trench suggested that it silted up after the building had been abandoned. Both fills contained evidence of metallurgical activity in the form of large quantities of waste products or slag, 41 kg in total, the majority of which was concentrated along the eastern side of the structure. The slot-trench had steep sides and a flat base and it is possible that it could have held plank walling, which was removed on abandonment of the site. It is also possible that the trench acted as a drain around a building with clay/sod walls. There was a gentle slope from south-east to north-west and the



The possible metal-working structure excavated at Ballyellin, Co. Wexford. (Photo: Irish Archaeological Consultancy Ltd)

combination of the slope and the lack of any trench on the north-west side may support the latter theory.

The slag indicated that the metallurgical activity being undertaken at Ballyellin 1 was iron-working or smithing. More specifically, the assemblage included slag known as smithing hearth cakes suggestive of secondary smithing (the end use of iron for the manufacture or repair of artefacts) as the main activity rather than primary smithing or bloom-processing (the refining of raw iron blooms). Blooms are unrefined, spongy masses of iron from which impurities (slag) must be beaten out by the blacksmith.

The Ballyellin structure was most likely associated with small-scale iron-working over a hearth. Although there was no definite evidence of a hearth at the site, it is quite possible that one could have been removed by later agricultural activity. It is also possible that the slag may not have been directly associated with the use of the structure, however, the fact that the slot-trench was open when the slag was deposited implies an association. The building may have functioned as a temporary shelter for a travelling blacksmith, carrying out repairs in one locality before moving on to ply his trade further down the road.



# Ten years of archaeogeophysics

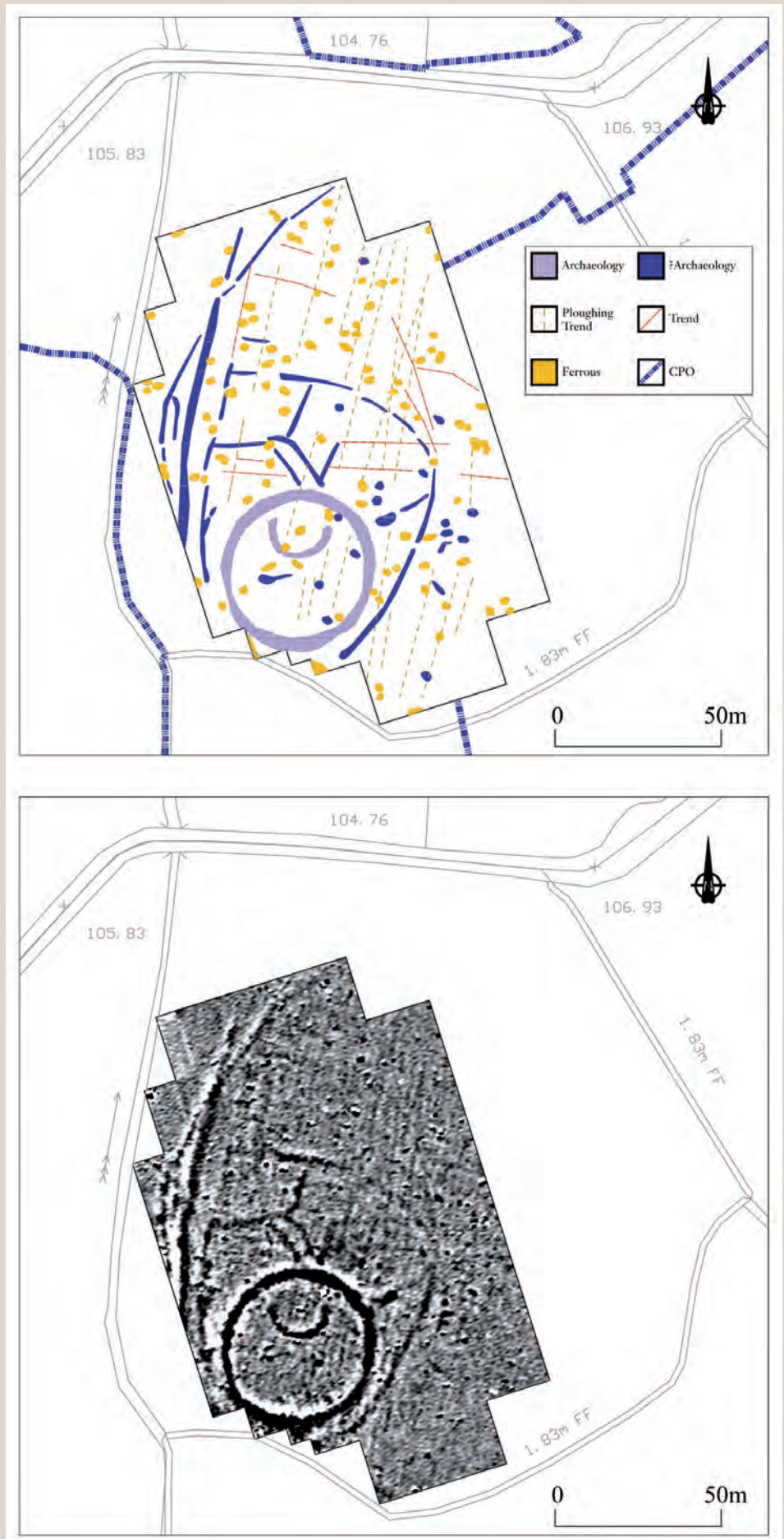
**The use of archaeogeophysics on road schemes over the last decade is being reviewed as part of the NRA Fellowship Programme.**

*By James Bonsall, an archaeological geophysicist currently undertaking research for a PhD at the University of Bradford*

Geophysical survey consists of a range of methods for exploring below the ground surface, allowing archaeologists to 'see beneath the soil' by means of remote sensing. This form of non-invasive prospection operates by measuring differences, or anomalies, in the magnetic, electrical and other properties of the earth capable of being detected by instruments. Such anomalies can be caused by the presence of ferrous artefacts and a range of archaeological features and structures.

Between 2001 and 2010, the NRA managed 241 road schemes in various stages of planning, construction and completion. Of these, 71 separate schemes were assessed with archaeogeophysical surveys, culminating in 171 unique geophysical reports. In the last issue of *Seanda* (Issue 5 [2010], p. 5), Rónán Swan (NRA, acting Head of Archaeology) announced a review of these surveys as part of the NRA Fellowship Programme. The review is being carried out by James Bonsall, Dr Chris Gaffney and Prof. Ian Armit from the University of Bradford in the UK. Irish company Earthsound Archaeological Geophysics is acting as the university's industrial partner in the research. The review will closely examine the use of archaeogeophysical surveys with respect to their initial objectives and to what extent such surveys have been of benefit to the NRA over the last decade. Geophysical survey is regularly used to identify or map archaeological sites at an early stage in the planning process and is one of many methods used by the NRA to help mitigate and minimise the impact of a road scheme.

Of the 171 geophysical assessments, 79% were subsequently excavated by professional archaeological consultants. This data is currently being used to determine the success



Magnetometer survey results (top: interpretive drawing, bottom: grayscale image) from Baronstown 1, Co. Meath, an early medieval ringfort identified on the M3 Clonee–North of Kells motorway scheme. The Dunshaughlin–Navan section of the M3 had a 79% success rate for identifying archaeological sites via geophysical survey. (Image: GSB Prospection Ltd)



or otherwise of archaeogeophysics on NRA schemes. While the data review is at an early stage, some preliminary statements can be made from a 272 km sample of road corridor surveys across the country. The techniques used included magnetometry (366 hectares), magnetic susceptibility (94 km) and earth resistance (5 hectares). Archaeological geophysics identified about 50% of excavated archaeological sites (either in part or in whole) in the 272 km sample of road corridor.

A countrywide analysis of the data shows that:

- geophysical surveys were used in 23 counties in Ireland, giving very good coverage across variable landscapes and soils.
- 60% of the surveys were carried out in Leinster. This reflects the large number of investigations along the M3 (a scheme which is represented by 26 geophysical assessments in all, accounting for 15% of the NRA data across Ireland), the M7/M8 and the N9/N10.
- 27% were from Munster. Most of these were from the N25 Waterford City Bypass and a number from the proposed M20 Cork–Limerick motorway.
- 11% were from Connacht. This includes a 163-hectare assessment—an area the size of 125 Gaelic football pitches laid end-to-end—from the M6 Galway–Ballinasloe, which is the largest geophysical survey area that has since been excavated.
- 2% of geophysical surveys were carried out in Ulster.
- Irish companies carried out 77% of all geophysical surveys for the NRA, the remainder were UK contractors. In recent years, fewer UK contractors have carried out work for the NRA owing to the presence of new Irish companies.



NRA archaeologists Martin Jones and Paul O'Keeffe learn how to use Ground Penetrating Radar from Heather Gimson during a workshop hosted by Earthsound Archaeological Geophysics. (Image: NRA Fellowship Programme, Earthsound Archaeological Geophysics).



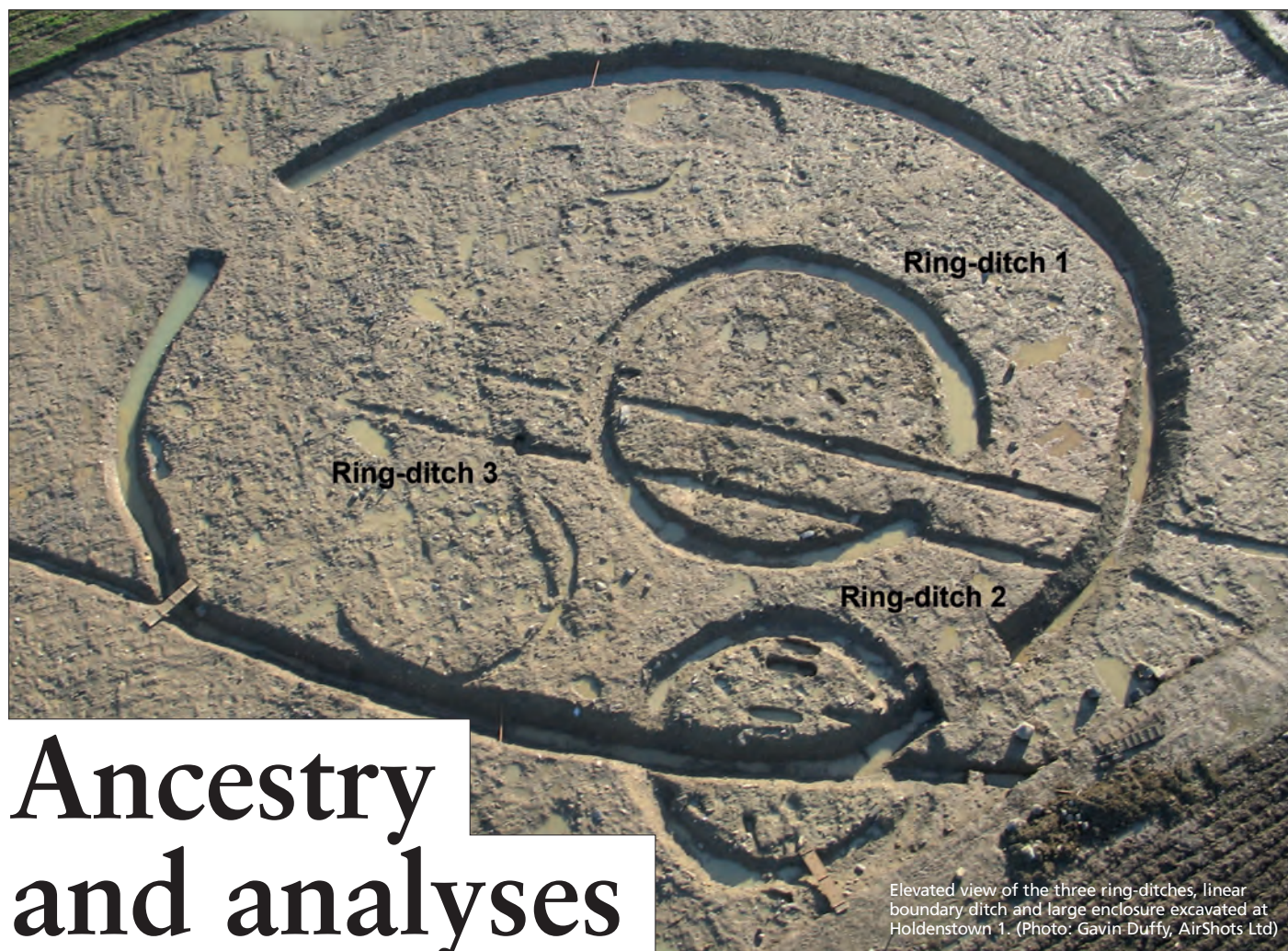
The latest technology—in this case a new electromagnetic device—being used by the author to assess its suitability for road schemes. (Image: NRA Fellowship Programme, University of Bradford)

As well as reviewing the legacy data from the last decade, the NRA Fellowship Programme has also collected new data. This includes 35 new geophysical surveys across the country to investigate the effect of variables such as climate, geology and landscapes upon archaeological features. We are also assessing the very latest in geophysical technology. The fieldwork has given NRA archaeologists the opportunity to assist in and observe geophysical surveys as well as learning about the latest developments and instruments.

There have been considerable technological and methodological advances in archaeogeophysics over the last decade. Just one example of change that directly benefited the NRA was the addition of different types of geophysical instruments that can be mounted on to a single vehicle or platform. These have created a cost-effective, three-fold increase in survey speed and coverage since 2001. What do the next 10 years have to offer? We are examining the use and development of the very latest technologies and trends to see how these can be applied to road schemes today and in the near future. We are assessing instruments that measure magnetic and electrical properties of the soil simultaneously; wireless Bluetooth connections between geophysical instruments, computers and GPS (Global Positioning Systems) that can help to create instant data analysis in the field; articulated and motorised equipment that can increase productivity and survey resolution, as well as 3D technologies to help predict the depth of a site as well as its areal extent.

The review will also disseminate the results of the surveys to the public. A small collection of geophysical reports have been available for a number of years on the M3 scheme website ([www.m3motorway.ie/Archaeology](http://www.m3motorway.ie/Archaeology)); the majority of all NRA reports are publicly available (i.e. they are held by the National Museum of Ireland and the National Monuments Service Archive), but are not easily accessible. To rectify this, part of our review will see the creation over the next year of a publicly accessible web database of NRA geophysical surveys and reports from across the country. The review will be completed in October 2012 and we will continue to report our progress in future issues of *Seanda*.





Elevated view of the three ring-ditches, linear boundary ditch and large enclosure excavated at Holdenstown 1. (Photo: Gavin Duffy, AirShots Ltd)

# Ancestry and analyses at Holdenstown

**Analyses of Late Iron Age/early medieval burials excavated on the N9/N10 Kilcullen–Waterford Road Scheme: Knocktopher to Powerstown, have offered a glimpse into the geographical origins of the Holdenstown community.**

*By Maeve Tobin, an Osteoarchaeologist with Irish Archaeological Consultancy Ltd*

The townland of Holdenstown, about 3 km north-east of Bennettsbridge, Co. Kilkenny, is defined by gently rising hills above the River Nore, which flows 1 km to its west. A cluster of burial sites was excavated here by Yvonne Whitty in 2007–8 (see *Seanda*, Issue 4 [2009], pp. 19–21) and seemed to represent a burial landscape spanning the transition between the Iron Age and early medieval periods. An ancestral burial ground, or *ferta*, at Holdenstown 1 contained eight burials, five of which were located within the intersection of a ring-ditch (Ring-ditch 2) and a linear boundary. Two further ring-ditches (Ring-ditch 1 and 3) and a large penannular enclosure were also excavated here. Holdenstown 2, 550 m north of Holdenstown 1, comprised a larger cemetery containing the remains of 94 individuals. A known ecclesiastical enclosure and church site (Sites and Monuments

Record No. KK024–020) was located c. 90 m west of this. A high-status early medieval site was recorded at Kilree 3, approximately 3 km south-west of Holdenstown and across the River Nore. Burial 4 at Kilree 3, dating from the 7th–9th century AD, was used as a control sample in the analyses described below.

## Dating results

Radiocarbon dating of Ring-ditch 1 and the large enclosure at Holdenstown 1 returned Iron Age dates of 203–53 cal. BC and 91 cal. BC–cal. AD 53 respectively. (The sample material for the Ring-ditch 1 date came from the primary fill of the ditch.) The enclosure date must be viewed with caution as the construction of the enclosure is clearly the last stratigraphical phase on the site and the dated material may be intrusive and relate to the ring-ditch activity (see pp.

44–7, this issue, for further detail). A re-cut of Ring-ditch 1 has been dated to the early medieval period (cal. AD 426–546), which is contemporary with the dated burial activity (cal. AD 429–558 for Burial 8 and cal. AD 551–646 for Burial 2).

At Holdenstown 2 there was very little intercutting of graves suggesting that there was one main phase of extended cemetery use. Radiocarbon dating provided a date range spanning the early fifth to mid seventh centuries AD for the burial activity at Holdenstown 2. Interestingly, juvenile remains appear to represent the later interments on the site (sixth–seventh century).

Burial 59, a young adult male accompanied by a piece of antler, produced the earliest dated burial activity at Holdenstown 2 (cal. AD 427–544). The contemporaneity of this burial and Burial 8 at Holdenstown 1 may suggest that the antler was associated with 12 antler picks recovered from Ring-ditch 1. It may be that this piece of antler was transferred from Holdenstown 1 and placed deliberately into what was possibly the foundation burial at Holdenstown 2 in order to emphasise a link between the sites.

## DNA and strontium isotope analysis

Analysis of ancient DNA was undertaken by Keri A Brown of the University of Manchester





Burial 59 from Holdenstown 2, a young adult male buried with a piece of antler and dated to cal. AD 427–544. (Photo: IAC Ltd)



A juvenile (Burial 40) placed on the chest of an earlier adult inhumation (Burial 39) at Holdenstown 2. Analysis indicates that there was no maternal link between these individuals. (Photo: IAC Ltd)

for six individuals: one from Holdenstown 1 (Burial 2), four from Holdenstown 2 (Burials 35, 39, 40 and 59) and one from Kilree 3 (Burial 4). A piece of long bone and a single tooth were removed from each skeleton. The preservation of DNA at Holdenstown 1 was poor and as such retrieval of data for Burial 2 was minimal. DNA sexing confirmed the identification of Burial 59 as male and Burial 4 as female, and identified juvenile Burial 35 as female.

It had previously been considered that the seemingly purposeful placing of a juvenile (Burial 40) on the chest of an earlier adult inhumation (Burial 39) at Holdenstown 2 possibly represented a familial link. Analysis has proved, however, that there was no maternal link between these individuals (i.e. this was not a mother and child burial). Unfortunately, it was not possible to determine the sex of Burial 39 therefore a different type of relationship (paternal or other social convention) may have existed, which raises questions about identity and roles in society.

Strontium analysis to investigate the geographical origins of four individuals from these sites was undertaken by Janet Montgomery and Julie Milns of the University of Bradford. The chemical element strontium (an alkaline earth metal) is incorporated into dental enamel at the time of mineralisation (i.e. during childhood),

providing an enduring link to the rocks in the region where an individual obtained their food and drink. By comparing this result with the local signature it may be possible to identify a pattern or influx of peoples to the Holdenstown area at the time of the cemeteries' establishment. Samples of molar teeth were retrieved from four individuals—Burial 2 and 8 from Holdenstown 1, Burial

59 from Holdenstown 2 and Burial 4 from Kilree 3. The two individuals from the *ferta* at Holdenstown 1 have very different strontium isotope ratios, which indicate quite disparate origins. Burial 8, a young adult male, returned a signature indicating a local origin (carboniferous limestone); however, Burial 2, which was located at the intersection of Ring-ditch 2 and the boundary ditch, does not represent a locally sourced diet. Interestingly, Burial 59 (the young adult male with the antler) from Holdenstown 2 does not originate from this or any other limestone region. The control individual from Kilree 3, a female adult, also seems to be an incomer to the area. Future research possibilities include analysis of the oxygen isotope values of these individuals which will, in combination with the strontium results, provide a more accurate geographical origin.

### Conclusion

The results to date confirm our original interpretation of the two sites. The small cemetery at Holdenstown 1 seems to represent a *ferta* probably linking an incoming community with a pre-existing sacred landscape. Holdenstown 2 appears to represent the familial burial ground of a community as it expanded into the early medieval period. This community later transferred to the church lands located to the west as burial rites became more standardised.



Burial 8 from Holdenstown 1, a young adult male dated to cal. AD 429–558. (Photo: IAC Ltd)



# Bridges to the recent past



**Bridges on the disused Midland Great Western Railway Cavan Branch Line are fascinating remnants of Cavan's 19th-century industrial heritage.**

*By Niall Roycroft, NRA Archaeologist with the Eastern Team*

As part of the realignment of the N55 at Dundavan, west of Kilcogy, Co. Cavan, two protected railway bridges on the disused Midland Great Western Railway (MGWR) Cavan Branch Line were surveyed. The bridges were CV37003: Railway Bridge Dundavan (South), where there is to be no impact, and CV37004: Railway Bridge Dundavan (North), which is due to be delisted, recorded and demolished.

In 1845 the Midland Great Western Railway Act was passed by parliament and two years later, in 1847, the MGWR's first line opened from Broadstone, Dublin City, to Enfield, Co. Meath. By 1851 the railway had extended as far as Athlone and in 1856 a new branch line to Cavan town opened. This line diverged from the main MGWR line at Inny Junction in County Westmeath and carried passengers until 1947, then livestock and goods until 1960.



Railway running rails reused as crash barrier on top of Dundavan Bridge (South).

At the time of closure the tracks, sleepers, stoning and any associated signal and other poles were taken up. The railway is crossed by several deep culverts. Most of these culverts had vertical, stone-faced walls with no covering. The railway seems to have crossed the culverts with iron girder-bridges. All of these iron girders had been taken up and bunds of soil dumped on either side

The heavily overgrown Dundavan Bridge (South) now lies adjacent to the realigned N55. (Photos: Niall Roycroft)

of the culverts to prevent accidental entry. The railway running surface had been constructed with a series of cuts and steep embankments with lateral ditches up to 3 m deep. Parts of some embankments and cut zones have now been incorporated into present-day field systems but the line is still visible on aerial photographs.





Typical 1960s barn in County Tipperary, with a framing of reused running rails. Inset: the inscription reads 'G.N.R.Co Ireland', indicating that the rails were manufactured for the Great Northern Railway Company.

*Railway features such as level crossings, gates, signals and other structures are all worthy of meticulous record.*

### CV37003: Dundavan Bridge (South)

This bridge is named 'Dundavan Bridge' on the third edition of the Ordnance Survey (OS) six-inch map and was crossed by the previous N55, rising up and over it. The bridge survives as an overgrown cut-off structure beside the present widened and realigned N55. The bridge displays the standard type of construction used on the Cavan Branch Line consisting of opposing abutments faced with cut limestone and quoins. There are no wing walls to retain the road embankment but the abutment quoins flare out slightly to form buttresses. The N55 was carried across the bridge on six parallel iron H-girders (forged in Dublin Foundry). Between each girder is a tie-bar and a red-brick jack-arched vault. The parapet walls consist (externally) of a single projecting course of ashlar and then the walling rising above to the parapet course. The parapet walling only occurs over the bridge itself and the road embankment approaches were and are hedged.

A very interesting feature is the 'crash' barriers that have been erected, presumably in the 1960s, on the sides of the rising and falling N55. As the original design only had a hedge between the road and the embankments, a safety measure was to put barriers alongside the road. The materials used for these crash barriers are the old railway running rails that have been cut and bolted together to form a strong fence. These are reminiscent of the very many farm sheds erected around the time of the dismantling of the railways that are framed with reused running rails. Reused sleepers are commonly

found as gate jambs and field boundaries all over the country.

### CV37004: Dundavan Bridge (North)

Dundavan Bridge (North) carries a local road over the railway. There are two stone-faced abutments of random ashlar in a series of regular lifts, with slightly flaring buttress quoins. There are two wing walls on the eastern side to support the road embankment. The road is carried on a series of six parallel iron H-girders, with tie-bars and brick jack-arch vaults. The parapet walls are of a single line of projecting ashlar and then three courses of large ashlar blocks capped with the parapet course. The northern parapet appears to have been recently repaired and has been hit by turning traffic on the western end. An OS bench mark (a horizontal line with an arrow pointing up from below) survives on the southern parapet. These marks were cut by OS staff to provide a network of points at which height has been precisely measured (to the centre of the horizontal line) above sea level.

A semi-circular culvert runs underneath the road approaching Dundavan Bridge (North). The culvert is made of cut masonry and has stone-faced voussoired (wedge shaped) arches at either end. The culvert passes in a straight line under the road embankment and projects a small distance from it to the north. There have been several small stone collapses along the length of this culvert.

### Conclusion

Most 19th-century Irish railways had a relatively short history for passenger



Details of running rail crash barrier.



Inspecting Dundavan Bridge (North) with Paul McGovern of Cavan County Council.



The culvert under the road embankment adjacent to Dundavan Bridge (North).

transport and their overgrown remains are scattered all over the country, but care and attention was put into their construction. Railway features such as level crossings, gates, signals and other structures are all worthy of meticulous record.



Early medieval enclosures excavated on the N9/N10 in counties Carlow and Kilkenny give an insight into the domestic and funerary activities of the period.

By Tim Coughlan, a Senior Archaeologist with Irish Archaeological Consultancy Ltd

The discovery of substantial early medieval enclosures has been a hallmark of a number of road schemes in Ireland in recent years. These previously undocumented site types have significantly altered our understanding of settlement forms and burial practices during the earlier first millennium AD. Irish Archaeological Consultancy Ltd undertook excavations along the N9/N10 Kilcullen–

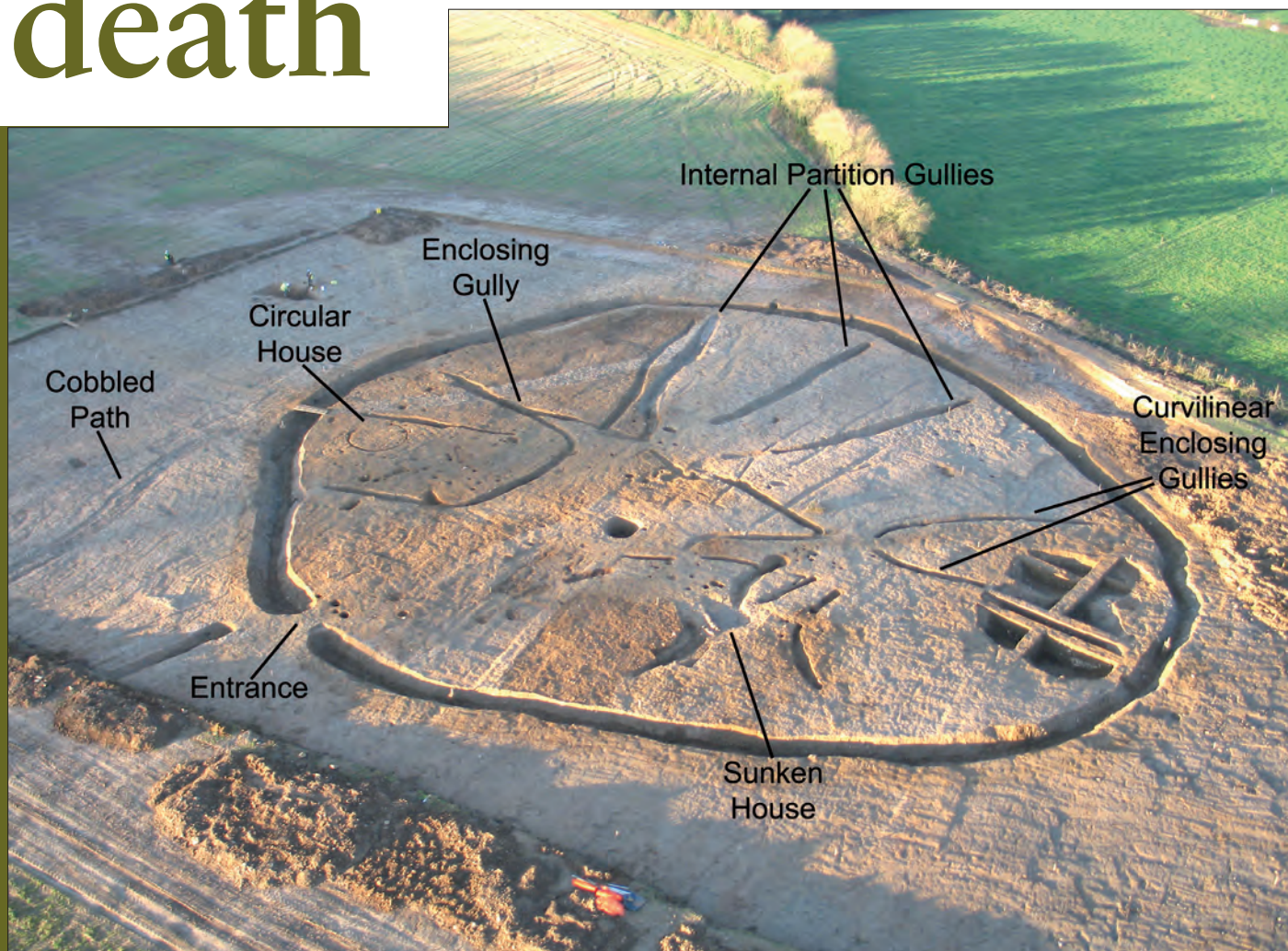
Waterford Road Scheme: Knocktopher to Powerstown between May 2007 and April 2008 and investigated four such enclosures: Knockadrina 2, Kilree 3, Holdenstown 1 and Coneykeare 1.

#### Knockadrina 2

Knockadrina 2, excavated by James Kyle, was located on a gentle, west-facing slope

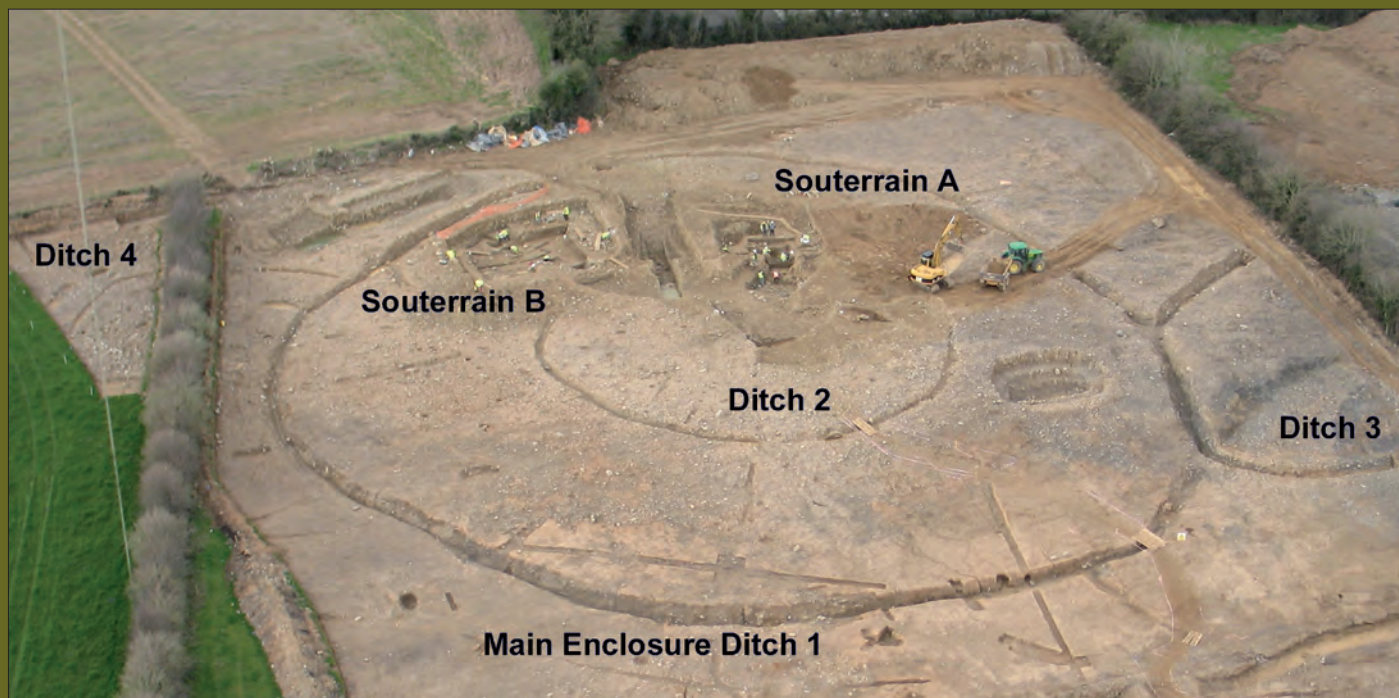
on the northern spur of Knockadrina Hill, near Knocktopher, Co. Kilkenny. The earliest feature consisted of a possible Neolithic hut defined by a series of slot-trenches, post-holes and a large pit. This was to the south of the later enclosure. A cobbled roadway/pathway (75 m long and 1.6 m wide) ran south-east/north-west across the southern half of

# Delineating early medieval life and death



The enclosure at Knockadrina 2, Co. Kilkenny, looking south-west. (Photos: Gavin Duffy, AirShots Ltd)





The enclosure and souterrains at Kilree 3, Co. Kilkenny, looking north-west.

the site and was truncated by much of the southern extent of a later enclosure ditch and the features within it. Linear depressions resembling wheel ruts were identified along the path, but these were probably drainage features.

The main enclosing ditch delineated an internal area of 65 m north/south by 58 m east/west and had a causewayed entrance opening to the south-east. The upper layers of the ditch fill yielded the shank of a copper-alloy ringed pin. This shank most likely belonged to a plain-ringed, loop-headed pin and would have been in use from the fifth century AD onwards.

The internal area of the enclosure was partitioned into three distinct zones by an arrangement of linear and curvilinear gullies. The shank of an iron ring-headed pin was recovered from the middle fill of one of these gullies. These zones may have had different functions such as habitation, agriculture and industry, which could have been reordered at different times during the site's occupancy. While a definitive bank was not identified, most of the internal divisions did not extend as far as the enclosing ditch suggesting the former existence of an internal bank.

A 4.1 m-diameter slot-trench in the south-east quadrant indicated the location of a circular house, with several post-holes possibly defining the entrance. The house was enclosed by a curvilinear gully and the main enclosing bank/ditch. A partly sunken rectangular house was identified in the north-east quadrant. This comprised a partly intact cobbled floor and walling and several large post-holes. The fill of a

post-hole associated with this rectangular house has been radiocarbon-dated to cal. AD 650–766. Slot-trenches and small pits containing iron slag were also recorded in the vicinity of the structure. Other features on the site returned radiocarbon dates ranging between AD 650 and AD 890.

### Kilree 3

Kilree 3, excavated by Patricia Lynch, was located on an east-facing slope overlooking the Nore Valley, north of Bennettsbridge, Co. Kilkenny. The main enclosure (Ditch 1) consisted of a roughly circular ditch c. 90 m in diameter. There was no evidence of an internal or external bank. At the centre of this enclosure was a concentric enclosure (Ditch 2) c. 38 m in diameter. A possible entrance to Ditch 2 was evident to the east, while a later annex to the north-east (Ditch 3) appeared to obscure the exact location of the entrance into the main enclosure. The primary ditch fills were the result of natural slumping and siltation indicating that the ditch had remained open for some time, while the upper fills suggest that the ditch had been backfilled deliberately. Two smaller annexes were uncovered to the north-east (Ditch 3) and south-west (Ditch

4) of the main enclosure, but no significant features were recorded within these. Several later drainage ditches were identified across the site.

An earth-cut souterrain (Souterrain A) was found in the west of the main enclosure. It consisted of a drop-hole shaft in the east that sloped into a 14-m-long passage with two 90° turns. The passage ended in a square chamber that measured 16 m<sup>2</sup>. The chamber contained upright wooden posts, along with several collapsed oak roof planks. The passageway had evidence of decayed upright posts, indicating that it had been reinforced with timber. A partly metallised floor surface was evident in both the chamber and the passageway and a date of cal. AD 659–772 has been returned for the floor surface of this passageway. An iron billhook and a small iron anvil were found within the fills of the souterrain.

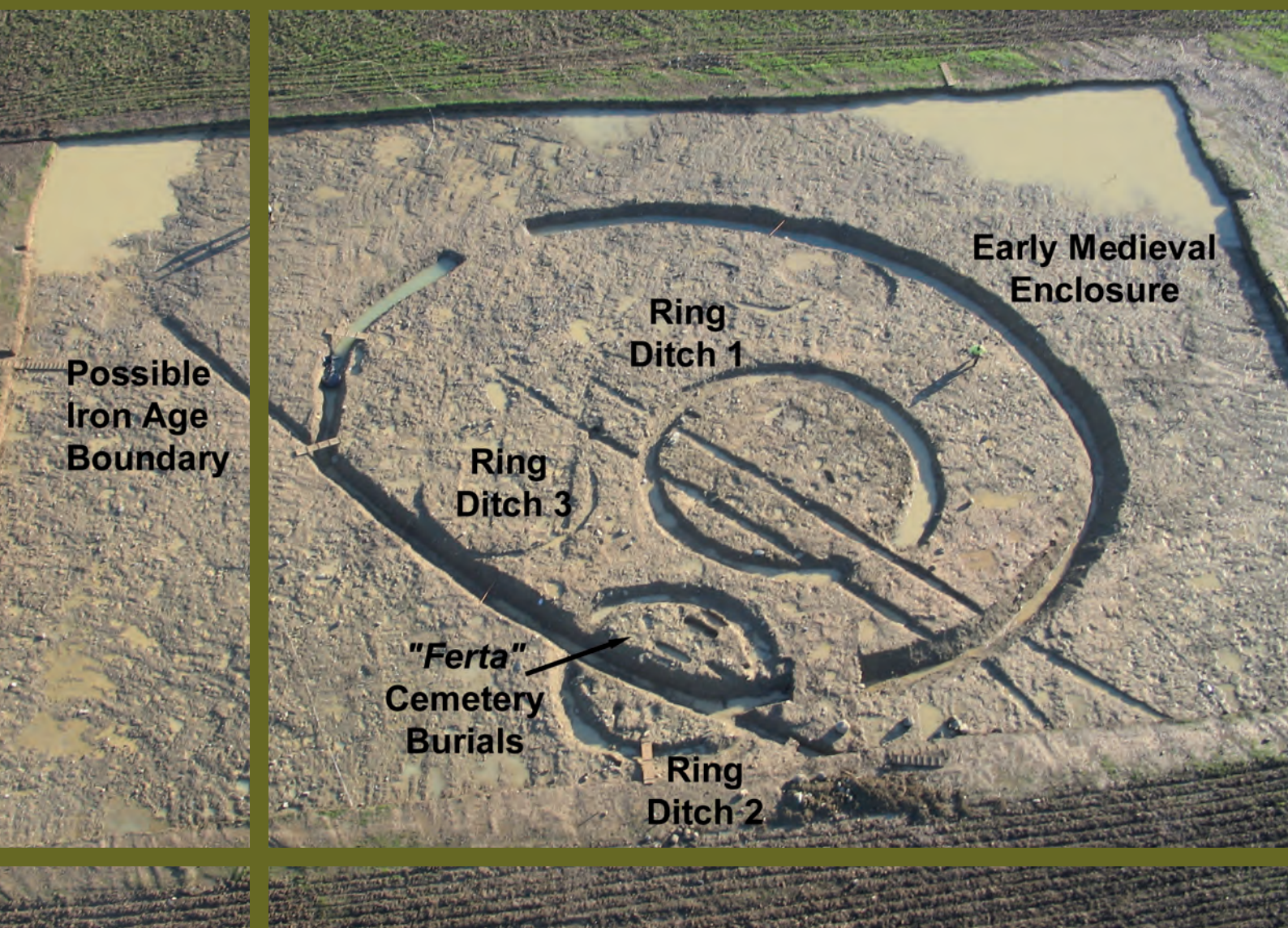
A subterranean passageway, possible chamber and drop-hole in the south-western interior of Ditch 1 most likely represents the remains of a second earth-cut souterrain (Souterrain B) as no evidence of drystone or wood construction was identified. A

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*The internal area of the Knockadrina 2 enclosure was partitioned into three zones which may have had different functions such as habitation, agriculture and industry.*

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The Iron Age ring-ditches and early medieval enclosure at Holdenstown 1, Co. Kilkenny, looking east.

*A sherd of African Red Slip Ware was recovered, dating from the sixth century and imported, probably from Tunisia.*

compacted floor surface was recorded in both the passage and the chamber. There was no evidence for a ramp between the drop-hole and the passageway; steps or a ladder had probably been used to provide access. The drop-hole was later used as a waste pit from which part of a copper vessel rim and a sherd of African Red Slip Ware were recovered. This pottery fragment was imported, probably from Tunisia, and dates from the sixth century AD. The souterrain also produced a copper-alloy brooch, which was recovered from the chamber.

A total of five inhumation burials were present in isolated positions across the site: one within Ditch 1, one within Ditch 3; one just beyond the northern edge of Ditch 1; one in the area enclosed by Ditch 2 (Burial 4) and the fifth located c. 70 m south of Ditch 4. The inhumations were of varying orientation and associated finds included a broken flint scraper, a metal knife, and a fragment of a lignite bracelet. Burial 4 produced a radiocarbon date of cal. AD 691–881 (see p. 41 for additional analysis of this burial).

Later medieval activity at Kilree 3 consisted of a stone-lined, keyhole-shaped kiln within the south-eastern fills of Ditch 1. This kiln had evidence for three phases of use. Several smaller kilns and three metal-working pits, which contained charcoal, slag and burnt clay, were also excavated. The post-medieval period was evidenced by several field drains and a large, stone-filled pit.



## Holdenstown 1

Holdenstown 1, excavated by Yvonne Whitty, was located on the eastern ridge of the Nore Valley, north-east of Bennettsbridge, Co. Kilkenny. The site was multiphased with three ring-ditches representing Middle Iron Age activity on site. A possible Iron Age linear boundary ditch truncated the two smaller ring-ditches in the north of the site. Subsequent burials adjacent to this appear to represent an early medieval *ferta* (ancestral burial ground), which may have some association with another early medieval cemetery at Holdenstown 2, 550 m to the north (see p. 40). The larger ring-ditch appeared to have been re-cut in the early medieval period and the fill of the re-cut produced a radiocarbon date of cal. AD 426–546. One of the *ferta* burials (Burial 6) produced a radiocarbon date of cal. AD 551–646.

The early medieval enclosing ditch (40 m in diameter) reused part of the Iron Age linear boundary and had a causewayed entrance in the east. There were no definitive internal structures or features that can be interpreted as contemporary with the early

medieval enclosure. The fill of the enclosing ditch produced a Middle Iron Age date (91 cal. BC–cal. AD 53) but as the stratigraphy clearly shows that the enclosure post-dates the *ferta* burials this date is interpreted as relating to material associated with the earlier ring-ditch activity, which subsequently became mixed with the ditch fills. The stratigraphic relationships would suggest that the enclosure dates from the seventh century AD at the earliest.

## Coneykeare 1

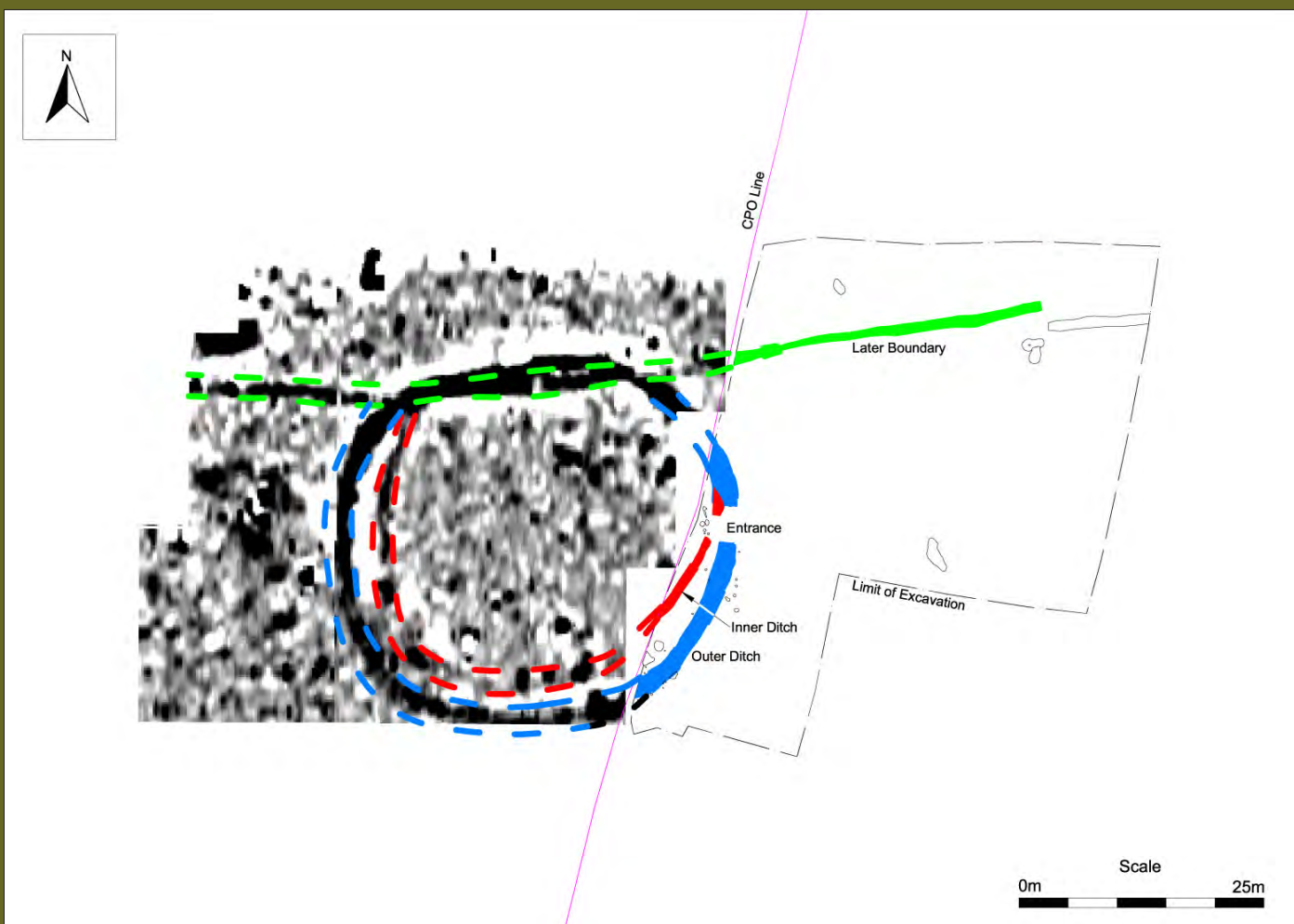
Coneykeare 1, excavated by Sinead Phelan, consisted of a double-ditched enclosure located on flat ground near Old Leighlin, Co. Carlow. Only 10–15% of the enclosing ditch was excavated, the majority of the enclosure is preserved beyond the road corridor. An outer ditch was identified with a causewayed entrance to the south-east. A smaller, internal ditch was also identified and is known to pre-date the construction of the outer ditch, which truncates it at its northern end. The internal ditch produced a radiocarbon date of cal. AD 429–568. A series of six post-holes was recorded at the southern end of the site; these represent a possible circular

hut structure that was truncated by the outer ditch. Further post-holes were located in the vicinity of the entrance and may indicate the presence of a gate. One of these produced a radiocarbon date of cal. AD 651–765.

A geophysical survey was carried out in November 2007 which established the extent of the outer and inner ditches. The combined results of the survey and the excavation indicate that the larger ditch replaced the smaller inner ditch without substantially increasing the area enclosed.

## Conclusion

The four early medieval enclosures uncovered as a result of the excavations along this section of the N9/N10 provide us with an insight into the domestic and funerary activities of the period. They confirm the presence of distinct early medieval communities across the landscape. These sites, particularly Knockadrina 2 and Kilree 3, possibly represent the location of farmsteads, each associated with a single family unit.



Geophysical survey and excavation results from the double-ditched enclosure at Coneykeare 1, Co. Carlow. (Image: Target Archaeological Geophysics and Irish Archaeological Consultancy Ltd)



# Playing with archaeology... no seriously!

Computer gaming technology has been used to create a visual reconstruction of the landscape setting of an Early Neolithic house.

*By Ken Hanley, NRA Archaeologist with the Southern Team*

The computer gaming industry, in terms of gross revenues (software only), is estimated to be worth €38 billion a year. This is serious money and for that you would be right to expect serious games; and serious

games they are. Whether you play them or not, you cannot but be impressed at the sheer realism of environments created in modern computer games. What is even more remarkable is that by simply using

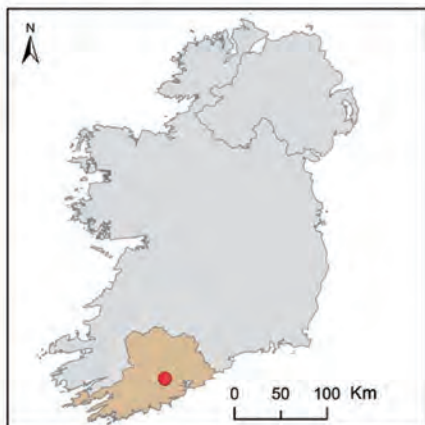
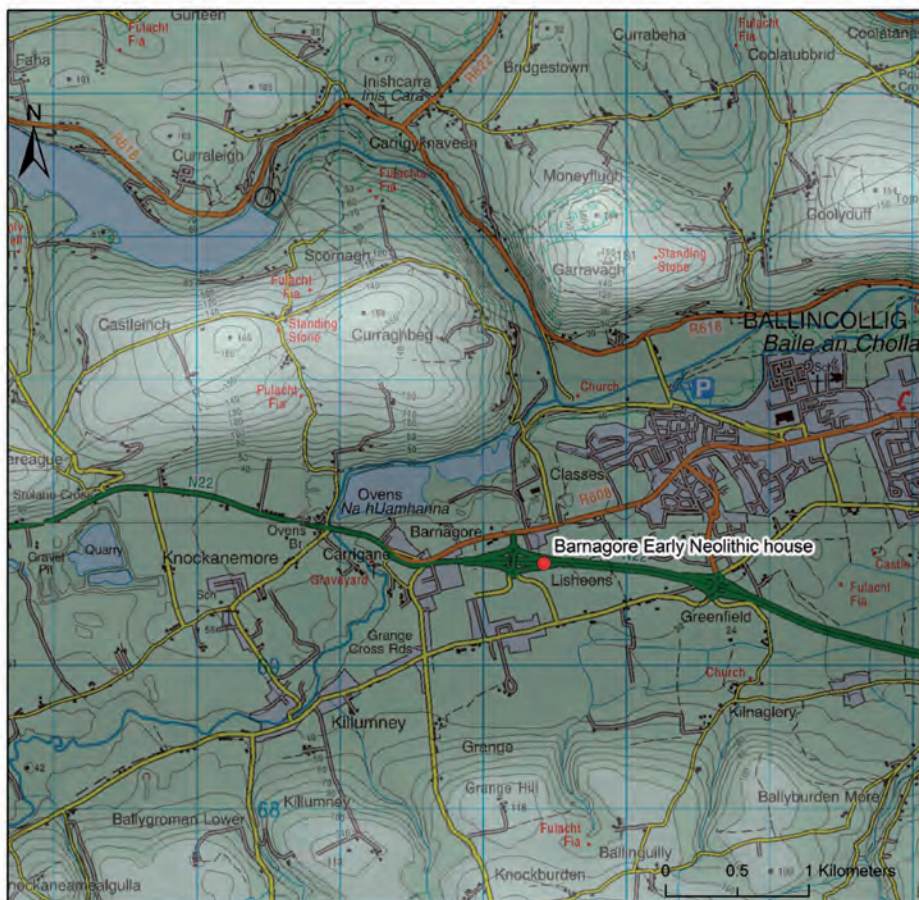
the level editors that many such games come with, games can be easily adapted by the 'player' for non-gaming uses such as creating and exploring historic landscapes. Creating realistic virtual environments from a blank canvas is a complex, expensive and time-consuming process, perhaps beyond the technical and financial means of most archaeologists. The ability, therefore, to tap into customisable and inexpensive computer game software, with all its state-of-the-art graphics, sophistication and ingenuity, offers archaeologists the means to apply novel uses in very aesthetic and (more importantly) realistic and thought provoking ways.

### Games software offering 'other use' visualisations

Archaeology is a relatively young discipline, emerging out of an age of antiquarianism in the 19th century, before maturing as a hybrid scientific discipline by the end of the 20th century. The 1990s saw a wave of virtual reality (VR) computer technology used to create virtual heritage exhibits, but, as some commentators have pointed out, such early attempts were often environmentally sterile, devoid of the dynamic natural features manifest in the real world and, arguably, this VR 'era' was a false dawn that did not live up to its much hyped potential. But what of the 21st century? The first decade of the new century has seen an explosion of geospatial technologies being applied to archaeology, aided by ever-increasing computer processing powers and bulging memory capacities. Paralleled to this was the advent of a new era of high-end computer game software engines. It seems remarkable that there have been in excess of 600 commercial game engines developed to date, according to some estimates. These include popular examples such as id Tech 3 engine (1999), the follow-on id Tech 4 engine (2003), Unreal Engine 2 (2003), CryENGINE (2004), Source Engine (2004) and Jupiter Extended (2005)—each new engine clearly increasing in sophistication, in terms of the physical real world-like dynamism they could model.

### Visualisation as ‘pretty image’

Game engine visualisations allow designers to create stunning landscape settings for archaeological sites within modelled real-world terrains. Modern game software provides sophisticated control over physical elements such as skies, weather, wind, sunlight, shadows, vegetation, buildings, rivers, oceans and terrains. From these models, highly realistic and aesthetic



Local topography of the Early Neolithic house site excavated at Barnagore, near Ballincollig, Co. Cork. (Images: Ken Hanley)



landscape visualisations can be output as image files. These can be captured from any conceivable angle, lighting conditions or scale. While being at the lower end of game software's functionality, these 'pretty pictures' are nonetheless a remarkable advancement in terms of archaeological illustration.

#### Visualisation as interactive experience

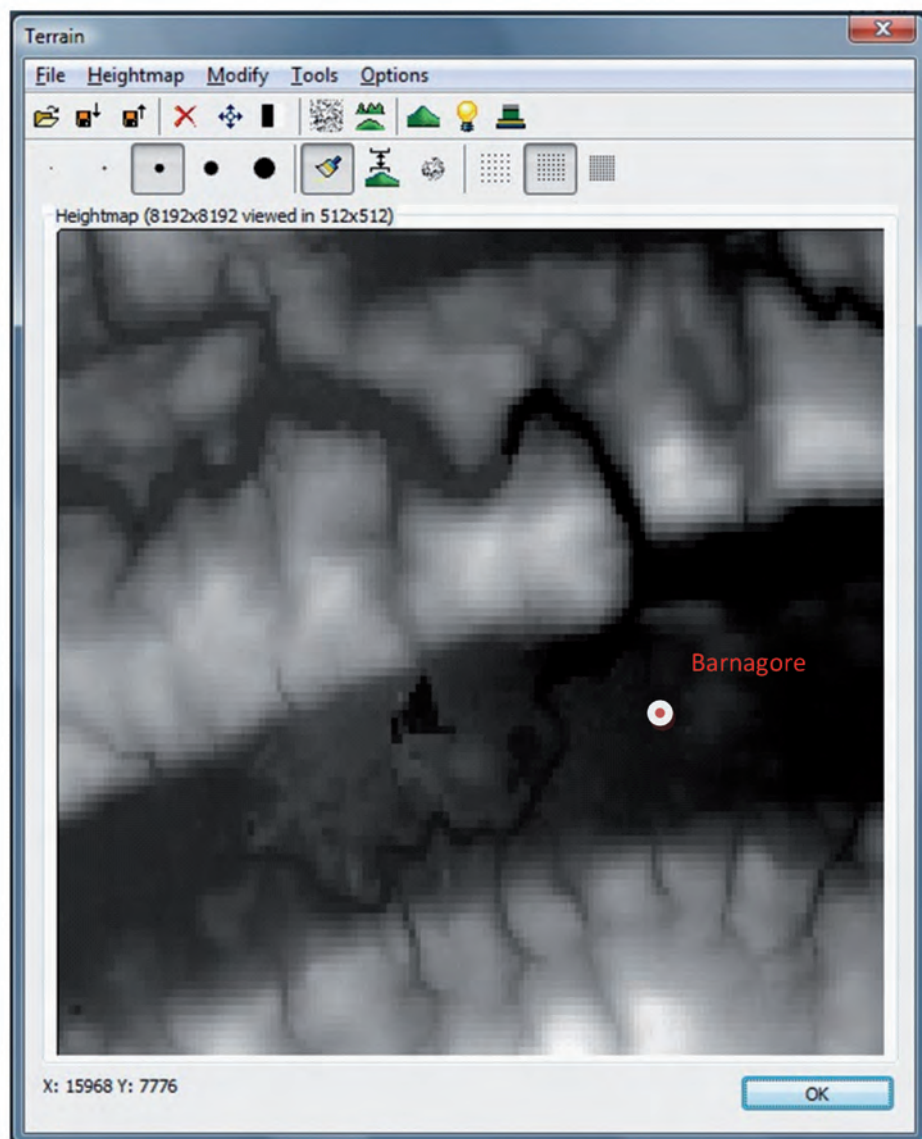
Game engine software can, however, do much more than this. By definition, game software can provide a highly realistic and intuitive interactive experience between the user and the virtual world created. The interactive experience can also be multi-sensorial, with visual, oral, aural and even haptic (i.e. artificial touch) interaction becoming mainstream. Such interaction can be either personal or shared and can be experienced locally or globally with the ubiquity of internet technology.

#### Visualisation as experimental laboratory

The maturing of game software in the first decade of the 21st century, however, has meant that this technology is now so sufficiently advanced that it has attracted the attention of many high-brow scientific communities, such that game software has (somewhat patronisingly) been re-branded as 'serious games'. It has been suggested that these games may be VR's 'second coming', in that they have already been used to impressive effect in interactive simulations with strong educational content. Researchers have classified various recent and diverse applications of game engine software in education, training and research for the scientific, medical and military communities.

#### Playing with the Neolithic

As part of a distance learning exercise for the University of Birmingham MA course in Landscape Archaeology, GIS and Virtual Environments, the author attempted to recreate, using computer game software, a landscape environment for a Neolithic house site excavated at Barnagore by Ed Danaher in 2002 on the N22 Ballincollig Bypass, near Ballincollig, Co. Cork. The excavation revealed the foundation remains of a subrectangular, timber-built house, though little else. Overall, the striking impression one gets from excavated examples of Early Neolithic (c. 4000–3500 BC) house sites in



Screen view from Sandbox 2 showing importation of real world height map depicting topography of the Barnagore area.

Ireland is that of an agrarian community occupying typically undefended, loosely grouped houses, cultivating variations of semi-structured plots, with plentiful availability of local woodland. The landscape of the Early Neolithic house at Barnagore is characterised by low plains (30 m above sea level) spanning a buried geological valley referred to as the Cork valley.

#### All the tools you need—for just €6!

The visualisation was carried out using *Crysis*, a first-person shooter video game developed by Crytek and published by

Electronic Arts for use on a Microsoft Windows platform. The game, which currently retails online for about €6, incorporates the powerful CryENGINE 2 game engine and comes complete with Sandbox 2, a level editor that allows players to customise levels and is specifically suited to the modelling of large terrains. Critically, the great advantage of Sandbox 2 is that it allows real-world height maps to be imported into the virtual model. CryENGINE 2 also includes a real-time editor, bump mapping, dynamic lights, a network system, an integrated physics system, shaders, shadow support and a dynamic music system, all of which provide remarkable tool options for modifying model scenes. (For those interested, CryENGINE 3 is now on the market and comes with a stand-alone software development kit.) Some supplementary structural modelling was also done using Google SketchUp (Version 8), which is free to download. While the emphasis was on creating a general landscape visualisation, the excavated Early Neolithic house was quickly modelled using Google SketchUp. (There are some tricky



Quickly generated model scene based on real-world topography.





Props such as burning wood and farm tools add to the agricultural ambiance of the site.

issues importing external structural models into *Crysis*, but third-party software such as that from PlayUp and other online support can assist.)

In order to accurately model the terrain in the vicinity of the Neolithic settlement, spot heights taken at 10 m intervals for the region were converted to a topographic image; with white areas representing higher ground and darker areas lower ground. From within CryENGINE 2, Sandbox 2 created a new level and the topographic image was imported as a height map. Given the 10 m spot height spacing of the original survey, the derived CryENGINE surface model has to be smoothed considerably.

### Modelling the environment

Within the level editor, several copies of the model representation of the Neolithic

house were made to give the effect of multiple houses in a loose grouping. Other structures such as an animal pen were added, for effect only. With the real-world terrain inserted into the model, the range of level-editing functionality within Sandbox 2 was then played with in order to arrive at an aesthetically pleasing model scene. The modelling terms of the Sandbox 2 menu and tool functions were deliberately used here to allow replication by those who may be interested in trying their hand at modelling.

### Surface texture

With the height map in place, a generic surface texture was applied in the Terrain Layers Editor, using plains\_grass\_green.dds. Subsequently, when tree and other vegetation was included, additional surface textures were added, such as forest\_ground\_soil.dds for areas under woodland and

mud\_ground.dds for indicating worn paths/track areas.

### Vegetation

Using the RollupBar a range of vegetation was applied, including hill and other trees of differing sizes, various grasses and bushes, and forest ground patches for wooded areas. In all cases the Sizevar was set to 2 or 3, the objects were set to give and receive shadows and AlphaBlend was also set to 'true'. The ElevationMin and ElevationMax were used as layer masks for wider distributions of trees as part of the broader landscape setting.

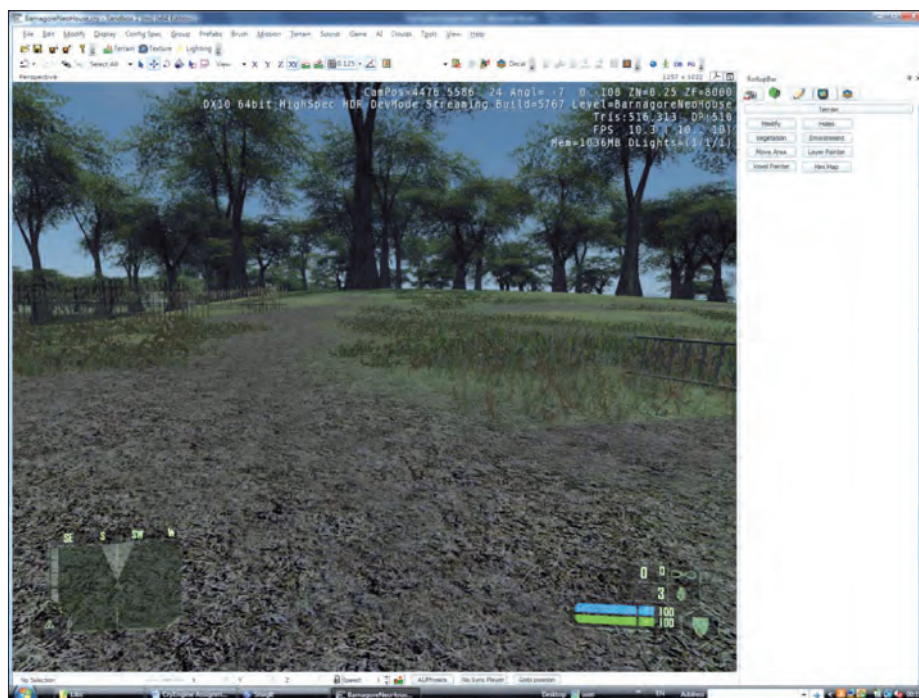
### Time of day and lighting

Time of day was set to midday and the sun setting path was set to north of the equator to match the region's latitude. The sunlight direction was set from roughly south to north.



Application of a 'mud and water' decal to entrance area of the animal pen providing a more realistic, trodden look.





Screen view of Sandbox 2 menu and tool options. View taken in 'game mode' to inspect the look of worn paths created for the scene.

### Boids

In order to create a natural feel to the environment it was important to create life and movement. The 'Boids' function provides a range of pre-animated creatures. A new layer called Boids was set up, then using New Objects/Entity/Boids in the RollupBar, the Birds boid was dragged onto the scene and the boid (called Birds1) was assigned. Equally, in order to give the scene an active farmstead feel a Chicken boid was inserted. Here again the settings were tweaked to suit the intended scene. (One small confession here, chickens, it seems, were not introduced into Ireland until the first few centuries AD!)

### Layer painting

In the Environmental RollUp menu, the Layer Painter was used to paint trackway/wear paths to and from the principal features, such as from the house to cultivation fields, between the cultivation fields themselves, and to and from the animal enclosure. Pathways were also painted leading away from the settlement.

### Props

In order to give the scene some semblance of a working farmstead, some wooden farm tools (ladder, spade and pitch fork) were added from the Library/Props/Misc/Farm tools folder. Equally, an external open fire was added depicting the burning of gathered wood.

### Decals

Under RollupBar Misc/Decal/MTL, decals (pre-modelled localised surface objects) were inserted to achieve certain high-end effects, such as the effect of heavily trodden ground or ploughed soils.

### AI (Artificial Intelligence) characters

It was felt necessary to populate the scene with people, in order to add life to the farm, but also to offer a sense of scale. To this end, some generic AI characters were added. Where required, AI characters can be assigned behavioural patterns to augment a scene.

Visualisation and understanding:  
a vector of convergence or divergence?

The ubiquity of 3D modelling and visualisation software means that it will prove increasingly difficult for archaeologists to linger in the traditional comfort zones of 'pit and post-hole' descriptions. Archaeological purists will have to accept that conjecture, even on a grand scale, is necessary to explore and test hypotheses. The increasing sophistication and ease of digital visualisations, however, does come with responsibility: Just as a good excavation report should separate evidence from interpretation, so too should good landscape visualisations. 'Hollywood' representations of sites and landscapes may well impress and stick in the mind, but these may well do little towards providing true understanding. Computer game software can, nonetheless, greatly assist archaeologists and other related specialists to both model and test hypotheses and, as importantly, it can also involve and educate the general public in ways that literature alone cannot.



Elevated view of conjectured Early Neolithic farmstead, overlooking the real-world topography of the Cork Valley.



# Archaeology



## in and out of the classroom

An NRA schools outreach programme in counties Donegal, Longford and Roscommon has received an enthusiastic response from the children involved.

By Deirdre McCarthy, NRA Assistant Archaeologist with the North-west Team

As part of the NRA's dissemination policy archaeologists with the North-west Team began an outreach programme with primary and secondary schools in their region and beyond. The purpose of the programme was to highlight the exciting new archaeological sites and finds excavated along road schemes in the school's locality and throughout the country. It focused on two areas: visiting schools to present illustrated lectures highlighting archaeological discoveries and arranging for local students to visit archaeological excavations along the route of proposed road schemes.

The author visited approximately 20 schools and described to the students the evidence for the early inhabitants of Ireland, including an explanation of how archaeologists have built up a picture of how these people lived through excavated remains. The students were enthusiastic in putting forward their own theories on site interpretation. The talks also highlighted the role of the archaeologist in road design, the types of sites most commonly found on road schemes and how the excavation of more than 2,000 sites along

national road schemes have helped us to recreate the past. The students were very interested in the techniques and protocols involved in excavating human remains and how scientific analyses can aid in determining the sex, age, diet and health of those buried.

During investigations along the N5 Ballaghaderreen Bypass (see pp. 12–15, this issue) and N5 Longford Bypass (see *Seanda*, Issue 5 [2010], pp. 50–1), students from local schools were invited to visit some of the archaeological sites during excavation and speak with the site excavators about the techniques and skills involved in excavation. All of the children displayed a huge interest in the techniques of excavating a site. A common feature of all the site visits was the children's natural curiosity in wanting to know about the origin of Irish people and their enthusiasm for speculating about the possible scenarios that resulted in the early settlers making their way to Ireland. The children also demonstrated great fearlessness in questioning the theories and scenarios archaeologists put forward to them.

Transition year pupils from St Mel's College, Longford, getting a tour during the excavation of a medieval graveyard on the N5 Longford Bypass. This site at Mullagh was excavated by Mandy Stephens of CRDS Ltd. (Photo: Deirdre McCarthy)



On Wednesday 15 September 2010, an archaeologist called Deirdre McCarthy came to visit Fifth Class at St Attracta's National School in Ballaghaderreen, Co. Roscommon. She is an archaeologist with the National Roads Authority. She brought pottery, hammerstones and a bone handle with her to show the class. She talked about the Stone Age and the Bronze Age people. She also showed us a slide show. Our teacher Mrs Deeney decided that we should do a project on 'A Social History of Ireland' from the megalithic era to the Celtic era.

On the 13 October our class went on an extraordinary field trip to an archaeological site along the route of the proposed N5 Ballaghaderreen Bypass. A group of archaeologists were excavating the site, which was close to an existing ringfort, outside the road corridor. Deirdre showed us the ringfort and gave us an early map showing its location. She spoke about the people that lived in ringforts and showed us pictures of the different ringforts found in Ireland. On the archaeological site we were shown other pits, probably dating from the Bronze Age, by James Kyle, another archaeologist. We all really enjoyed our field trip. It was worth getting muddy! Thank you, Deirdre, for making history so real for us.

*Fifth class, St Attracta's National School, Roscommon*

On the 14 October 2010, the Dom National School went to visit an archaeology dig just outside Ballaghaderreen. It was a



Pupils from Dom National School, Roscommon, during their visit to an excavation at Toobrackan 2 on the N5 Ballaghaderreen Bypass, accompanied by Excavation Director James Kyle, Irish Archaeological Consultancy Ltd, and NRA Assistant Archaeologist Deirdre McCarthy. (Photo: Gráinne Leamy)

magnificent experience. We met Deirdre McCarthy and James Kyle. There was a ringfort close to the site. Now I can say I stood on that road before it was built. I really liked the dig.

*Clare Sampey, Fourth Class, Dom National School, Roscommon*

I thought the archaeologist's dig was complicated but incredible. Visiting the dig was a brilliant experience. I loved the fact that we



Pupils from Second and Third Class, Drumoghill National School, Donegal, examining replica stone artefacts during the archaeologist's visit to their school. (Photo: Deirdre McCarthy)





Pupils from Dom National School, Roscommon, during their visit to an excavation on the N5 Ballaghaderreen Bypass. (Photo: Gráinne Leamy)

were standing near something that was there a long time ago. We got muddy but it was worth it.

*Erica Sampey, Fourth Class, Dom National School*

I enjoyed the archaeological dig today. My favourite part was seeing how people lived before.

*Emma O'Connor, Fourth Class, Dom National School*

I learnt that history is more complicated than we think.

*Arron Greene, Fifth Class, Dom National School*

When I am older and the road is built, I can say I stood on the place where people used to live.

*Nicole Finn, Fifth Class, Dom National School*

I liked the dig because it was on a very historical site. I never knew there was so much history around us. I learnt a lot from Deirdre and the others.

*Brian Flynn, Fifth Class, Dom National School*

The school went to a site where there was lots of interesting things to see. It was fantastic. It was a great opportunity and we saw some finds from the site.

*Niall Duffy, Fifth Class, Dom National School*

We went on an archaeology dig today and it was brilliant. We saw some amazing things and I had a great day.

*Shannon McDonagh, Fifth Class, Dom National School*

Today I learnt about ringforts—there are over 60,000 ringforts in Ireland and they are one of the most common sites. Everyone should go on an archaeological dig.

*Stephen O'Gara, Fifth Class, Dom National School*

The Dom National School went to an archaeology dig. We hopped on the bus, which followed Deirdre to the site. We were all very



Transition year pupils from St Mel's College, Longford, learning about a kiln excavated at Mullagh from Excavation Director Mandy Stephens. (Photo: Deirdre McCarthy)

excited. We were all wearing our wellingtons. It was muddy and cold. First we looked at a map. It showed all the archaeological sites in the area. We looked at a ringfort, close to the site being excavated. We looked at the archaeological site next, where a circular ditch might be associated with the ringfort. It might have been where the people living in the ringfort kept their animals, like cows, sheep and pigs. It would have had a high bank on it so the animals would not get out. Next we looked at some holes in the ground, where the archaeologists were excavating. There were pits used by people long ago. The pupils of Dom National School really enjoyed their day on the site.

*Josh McDermott, Fifth Class, Dom National School*



I learnt how people lived 1,000 years ago. It was very interesting.  
*Stephen Hayden, Sixth Class, Dom National School*

The bus pulled up and all the children climbed on, we were going to visit an archaeology dig. We were given a map of the area and a fact file by Deirdre. James showed us a part of the site that may have been used to hold livestock and another area where waste from metal-working may have been dumped. We lined up for a photo, then got on the bus and went for a cross-country run. It was an interesting day.

*Peter Curry, Sixth Class, Dom National School*

An archaeologist called Deirdre from the National Road Authority came to the school. She described what early humans looked like and their houses, food and weapons. The early humans ate nuts, acorns, mushrooms, berries and deer. The early humans lived in little huts. *Fulachtaí fia* is when they heat rocks and put them in a big hole full of water and they use it for cooking and taking baths. *Fulachtaí fia* are the most common sites found on road schemes.

*Thomas Reynolds, Second Class, Woodlands National School, Donegal*

Deirdre the archaeologist came to visit the school and told us about the sites they excavate on road schemes. We learnt that the first people in Ireland made huts but the huts only lasted for a short time. Archaeologists have found where the houses were. The houses had holes in them so the smoke could get out. Archaeologists found *fulachtaí fia* between bog and dry land. We also learnt about ringforts and souterrains.

*David Sparks, Second Class, Woodlands National School*

Sometimes when roads are being built, old things from the past are found under the ground. Archaeologists can find out what they are and how old they are. These discoveries can be skeletons, pottery, metal and other things which tell us how people lived long ago. They are exactly the same as us. They built wooden rectangle troughs near bogs called *fulachtaí fia*. It was used to cook and to bath in. They warmed it up by making a fire and putting rocks on the fire and then putting the hot rocks in the water and the hot rocks warmed the water up.

*Rachael Sullivan, Second Class, Woodlands National School*



Pupils from Second Class, Woodlands National School, Donegal, during a slideshow presented by Deirdre McCarthy during her visit to the school. (Photo: Tony Blake)

Around 65,000 years ago people in Africa decided to leave their country and travel to a better place. You see the people didn't have cars so they had to walk. But they finally came to Ireland. The people were very clever so they gathered food, and meat, hunting tools and wood for building houses and for fires.

An interesting story of Vikings in Ireland begins. A really long time ago, Vikings invaded Ireland. They sailed on a ship from country to country. They stole gold all over Europe but they stole the most in the land of the monks. The monks got tired of getting robbed so they built a massive tower and put their gold there and the door was halfway up the tower.

*Pierre Meyer, Second Class, Woodlands National School*

An archaeologist came to our class, her name was Deirdre; she taught us a lot. In the Neolithic and Bronze Age homes were made out of wood. They are safe enough to live in. Before they make the roads they dig the ground up to make sure that nothing is there. We can learn a lot about people lives from carrying out research on the excavated skeletons.

*Keeley Harris, Second Class, Woodlands National School*



Second Class, Woodlands National School, Donegal, with Deirdre McCarthy during her visit to the school. (Photo: Tony Blake)



# GLOSSARY

## Archaeological feature

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Any component of an archaeological site, such as a post-hole, pit, wall, ditch, or any deposit that may have accumulated on site.

## Anglo-Norman

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The Anglo-Normans were the descendents of the Normans who ruled England following the conquest by William of Normandy in AD 1066. In AD 1169 Ireland was invaded by the Anglo-Normans.

## Artefact

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Any movable object that has been used, modified or manufactured by humans.

## Bronze Age

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The era (c. 2400–600 BC) succeeding the Neolithic period, which saw the introduction of bronze for tools and weapons.

## Chert

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A grey, black or blue siliceous rock that occurs as bands in limestone deposits and was often used during prehistory for tool production in the Irish midlands.

## Carinated bowl

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A type of Early Neolithic pottery vessel with a hemispherical bowl, a distinct shoulder or carination, an upright, gently concave neck and an everted rim.

## Crannog

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A lake settlement, mainly dating from the early medieval period, built on an artificial, or artificially enlarged, island.

## Cremation

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The practice of burning the bodies of the dead. In prehistory the ashes were commonly placed in a pottery vessel and buried in a pit.

## DNA

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DNA (deoxyribonucleic acid) is a double-stranded nucleic acid in which the two strands twist together to form a helix. It carries the genetic information in the nucleus of all cells and forms the basis of inheritance in all organisms, except viruses.

## Fill

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A term used to describe the individual layer(s) of material contained within archaeological features, such as post-holes, pits or ditches.

## Flint

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A hard, brittle siliceous rock with conchoidal fracturing properties that is highly suitable for the manufacture of edged tools.

## Fulacht fia (plural *fulachtaí fia*)

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A site, generally dating from the Bronze Age, consisting of a horseshoe-shaped mound of burnt stones, a hearth(s) and a trough(s). These sites were used to heat water for a variety of possible purposes. Also known as ancient cooking places.

## Geographical Information System

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A system merging cartography, statistical analysis and database technology in order to integrate, store, manipulate, analyse, manage and display geographically referenced data.

## Global Positioning System

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A Global Positioning System (GPS) provides a longitude and latitude for a position on the ground by reference to satellites. It thus allows for the accurate and rapid survey and mapping of surface archaeological features.

## Geophysical survey

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A scientific method of exploring below the ground surface by measuring differences, or 'anomalies', in the magnetic, electrical and other properties of the earth capable of being detected by survey instruments.

## Inhumation

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The practice of laying the bodies of the dead in a grave.

## *In situ*

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Archaeological artefacts are said to be *in situ* when they are found in the location where they were last deposited (i.e. undisturbed and unexcavated).

## Iron Age

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The final period of prehistory, beginning around 600 BC. In this period iron superseded bronze for the manufacture of tools and weapons.

## La Tène

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A famous Iron Age site at Lake Neuchâtel, Switzerland, where metal artefacts bearing distinctive curvilinear decoration were discovered. La Tène has given its name to La Tène art and to the second period of the European Iron Age.

## Lignite

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A soft, brownish-black coal in which the alteration of vegetable matter has proceeded further than in peat, but not as far as in bituminous coal. Polished lignite, or jet, was often used to make bracelets during the early medieval period.

## Medieval

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The period succeeding the Iron Age, which in Ireland is dated from the advent of Christianity in the fifth century AD up to the 16th century.



## Neolithic

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The Neolithic period or New Stone Age (c. 4000–2400 BC) preceded the introduction of metal-working and is characterised by the beginnings of farming.

## Post-medieval

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The period after the medieval period, often taken to be the era after the dissolution of the monasteries in the mid 16th century.

## Radiocarbon dating

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A scientific method of dating by measuring the decay of the radioactive isotope Carbon 14, which is present in all organic material. As the amount of Carbon 14 in the atmosphere has fluctuated throughout time radiocarbon dates have to be calibrated against tree-ring sequences that provide absolute calendar dates.

## Ring-barrow

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A barrow is an earthen burial mound, generally dating from the Bronze Age and Iron Age. Ring-barrows are the most common form and consist of a low, circular mound of earth, 15–20 m in diameter, surrounded by a ditch with an external bank.

## Ring-ditch

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A small, circular enclosure, defined by a ring-shaped ditch, which is often associated with prehistoric burials. Many have been discovered to be ploughed-out ring-barrows.

## Ringfort

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An early medieval defended farmstead consisting of a circular enclosure defined by an earthen bank and an external ditch. High-status ringforts can have two or three banks.

## Sites and Monuments Record

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A list of archaeological sites with accompanying maps recorded on a county-by-county basis by the State.

## Slag

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A glassy, non-metal residue and waste material left behind after the smelting of a metal.

## Souterrain

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An early medieval underground structure consisting of one or more passages and chambers, with a concealed entrance at ground level. They functioned as temporary refuges and storage areas.

## Viking

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Scandinavian word (*Vikingur*) for seafaring raiders from Norway, Sweden and Denmark who ravaged the coasts of Europe from the seventh century AD onwards.

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# NRA Scheme Monographs

## *In the Lowlands of South Galway*

**By Finn Delaney and John Tierney**

**Published June 2011**

The latest volume in this important series describes over 20 archaeological sites excavated on the route of the N18 Oranmore to Gort road scheme, which traverses a landscape in which human communities have come and gone for 10,000 years. The excavations are individually described in this book but the authors also try to understand the evidence from each period in its broad landscape setting and thus offer the reader a bird's-eye view of life on the lowland plain of South Galway, from prehistory to modern times.

## *Cois tSiúire—nine thousand years of human activity in the Lower Suir Valley*

**Edited by James Eogan and Elizabeth Shee Twohig**

**To be published December 2011**

This forthcoming book and accompanying CD present the results from over 60 significant archaeological excavations on the route of the recently constructed N25 Waterford City Bypass. The excavations revealed that humans have lived in this part of the Lower Suir Valley for at least 9,000 years, from the time of the earliest hunter-gatherers, through the first farmers, the introduction of bronze and iron, to the early medieval settlements and beyond. *Cois tSiúire* (alongside the Suir) includes important accounts of an early seventh-century AD vertical watermill at Killoteran, the earliest such mill yet identified in Ireland, and the ninth century AD Viking enclosed settlement and grave at Woodstown.

**NRA Scheme Monographs are available through bookshops, or directly from Wordwell Book Sales, Media House, South County Business Park, Leopardstown, Dublin 18 (tel: +353 1 2947860; e-mail: [helen@wordwellbooks.com](mailto:helen@wordwellbooks.com)).**

