Project Code: TBED10
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Date: January 2012

N22 Tralee Bypass/Tralee to Bealagrellagh, Co. Kerry. Archaeological Services Contract, Stage (iii) – Excavation.
Final Excavation Report for Knockawaddra West 2 in the townland of Knockawaddra West, Co. Kerry.

Ministerial Directions Number: A56
Excavation Registration Number: E4292
Townland Name: Knockawaddra West, Co. Kerry
Site Type: Isolated pit
National Grid Reference: 086801/1161287 and 086791/116096
Archaeological Consultant: Rubicon Heritage Services Ltd
Director: Tony Bartlett
Report Author: Stephen Hourihan

RUBICON HERITAGE

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EXECUTIVE SUMMARY

This report presents the final results of an archaeological excavation undertaken at Knockawaddra West 2, Co. Kerry, on behalf of Kerry County Council. The works were undertaken as part of Stage (iii) of the Archaeological Services Contract prior to the commencement of construction of the N22 Tralee Bypass/Tralee to Bealagrellagh, Co. Kerry, which extends from Lissatanvally townland to Flemby townland in Co. Kerry. The Minister of the Environment, Heritage and Local Government, following consultation with the National Museum of Ireland, issued Directions to Kerry County Council for archaeological works relating to the road development (Ministerial Directions No. A56). The registration number, E4292, was allocated by the National Monument Service for archaeological excavations at Knockawaddra West 2 under the direction of Tony Bartlett of Rubicon Heritage Services Ltd (formerly Headland Archaeology (Ireland) Ltd).

Following a route constraints study, and a route appraisal and selection report, an Environmental Impact Study was carried out on the preferred route, including a chapter on archaeology and cultural heritage (Atkins 2008). A number of archaeological and architectural heritage constraints were identified along the route of the road and a number of recommendations were set out for the treatment of the sites and potential sites identified. Included in these recommendations were geophysical survey, test-excavations of the entire route, survey of the townland boundaries, underwater surveys and survey of architectural/built heritage sites, which were completed as part of Stage (i) archaeological work on the scheme (Bartlett *et al.* 2010a; Harrison 2010; Kieran and Hayden 2010; Long 2010 a-e).

Archaeological test trenching along the entire route (including Wetland Test Excavation) was carried out by Rubicon Heritage Services Ltd on behalf of Kerry County Council between 9 August 2010 and 3 September 2010 under Excavation Registration Number E4149. Additional testing was undertaken in wetland areas between 22 September and 1 October 2010 under the same licence number. Due to the number and size of powerline exclusion zones test trenching was undertaken in exclusion zones between 29 September and 15 October 2010 The test excavations at Knockawaddra West 2 identified one possible pit and two possible postholes within Area A and a possible pit in Area B (Bartlett *et al.* 2010a).

Stage (ii) stripping, cleaning and mapping of all areas of archaeological potential identified during test trenching was carried out by Rubicon Heritage Services Ltd on behalf of Kerry County Council between 30 August and 13 October 2010 (Bartlett *et al.* 2010b). Stage (ii) works at Knockawaddra West 2 confirmed the presence of the Stage (i) possible pit and other possible features.

Full archaeological excavation was undertaken at the site between on 31 March 2011; a preliminary report on the results of the excavation was submitted in August 2011.

A total area of 396 m² was exposed at Knockawaddra West 2 in two separate areas (Areas A-B), revealing two phase of activity. The archaeological feature identified in Area B was a possible refuse pit, containing lithic material, a glass bead and metallurgical waste. The features in Area A were found to be non-archaeological in nature.

Features
A sub-oval waste pit which measured 3.14 m in length, 2.30 m in width and 1.65 m in depth was identified. The basal fill comprised dark brown sandy clay, which contained occasional charcoal and burnt bone inclusions; a piece of flint debitage and five pieces of ferrous slag were also recovered from this fill. Overlying this were five other fills from which came a glass bead and other metalworking debris.

Artefacts and samples

A total of one lithic was retrieved during the excavations, dating to the Middle Bronze Age.

A single early medieval glass bead was also recovered during the excavation.

A total of two samples of industrial waste and one soil samples were retained from the excavation.

The slag would seem to be related to iron metallurgy based on its dark colour although whether as a result of smelting or smithing remains unclear. The small quantity suggests accidental deposition perhaps with other non-metallurgical waste material (Appendix 12).

The chief palaeoenvironmental material recovered from the sample was small quantities of wood charcoal. The assemblage contains oak and non-oak fragments; for radiocarbon dating purposes one of the non-oak fragments was identified as alder (Appendix 7).

From the small burnt animal bone assemblage recovered, two bones were identified as medium mammal 1, most likely sheep/goat. The other bones recovered were unidentifiable but were most likely animal and not human (Appendix 8).

Dating

A Middle Bronze Age radiocarbon date of 1605-1415 cal. BC (SUERC-37292; 3215±35 BP) date has been attained from a fragment of alder charcoal taken from the basal fill of the pit (Appendix 9). However, the presence of iron slag and an early medieval glass bead point to a later phase of activity.

It is suggested that the pit was in fact a natural sinkhole that was first utilised during the Middle Bronze Age and following a later collapse was again filled with waste material in the early medieval period.

1 INTRODUCTION

This report presents the Final results of archaeological excavations carried out at Knockawaddra West 2 in advance of the proposed N22 Tralee Bypass/ Tralee to Bealagrellagh road scheme.

The proposed scheme has two main components, the N22 Tralee Bypass and the N22 Tralee to Bealagrellagh Road (Figure 1). The N22 Tralee Bypass extends from the N69 National Secondary Route approximately 4km north of Tralee town to the N70 National Secondary Route approximately 500 metres south of the town. It passes east of the town via the N21 National Primary Route and the proposed intersection with the N22 Tralee to Bealagrellagh Route (N22 Access Route). The N22 Tralee to Bealagrellagh road will provide a separate access route to Tralee from the N22 Killarney Road.

Kerry National Road Design Office (NRDO) initially prepared a Route Constraints Report for this scheme in January 2000 (Kerry NRDO 2000). Following the completion of this report, six route options were identified. An environmental assessment of the Route Options was undertaken by RPS-MCOS on behalf of Kerry NRDO and this formed part of the Route Selection Report in August 2002 (Kerry NRDO 2002).

The preferred route, determined in the Route Appraisal and Selection Report was a combination of two of the originally proposed route options. In 2007 Kerry NRDO developed a number of route options as alternatives to Section A of the Bypass, these linked to the improved section of the N69 at Leath Cross. In 2007, Atkins prepared An Environmental Constraints Report for the Proposed Scheme Extension to N69 to Leath on behalf of Kerry NRDO.

The Constraint Studies included archaeology and heritage and all identified issues and data in relation to this was used in the identification of route options in the Route Selection Report. Following route selection an Environmental Impact Statement (EIS) was carried out on the entire length of the proposed road (Atkins 2008). The scheme was approved by An Bord Pleanála (Ref. PL08 .HA0016) in September 2009.

The project is funded by the Department of Transport under the National Development Plan 2007-2013 and the Transport 21 programme. The total archaeological cost is administered by the National Roads Authority through Kerry County Council.

Rubicon Heritage Ltd. was formerly known as Headland Archaeology (Ireland) Ltd. The company underwent a rebranding in December 2011. Reports written by the company prior to this date are referenced to Headland Archaeology (Ireland) Ltd in the bibliography, though for consistency the company is referred to as Rubicon Heritage Ltd. throughout this report.

Archaeological test excavations (including wetland test excavation and targeted test excavation), a townland boundary survey, targeted geophysical survey, an underwater survey and an architectural/built heritage survey were undertaken along the entire route of the scheme Rubicon Heritage Services Ltd under Stage (i) of the Archaeological Services Contract (Bartlett *et al.* 2010a; Harrison 2010; Kieran and Hayden 2010; Long 2010 a-e). A total of 41 areas of archaeological potential were identified.

Stage (ii) works on the scheme involved the mechanical stripping of topsoil, hand cleaning of exposed surfaces and mapping of features identified at each site of archaeological potential. This was carried out by Rubicon Heritage Services Ltd between 30 August and 13 October 2010 (Bartlett *et al.* 2010b). Following Stage (ii) investigations a total of 38 archaeological sites discovered during the course of works by Rubicon Heritage Services Ltd were recommended for Stage (iii) excavations in advance of

construction works. An additional site in the townland of Camp was identified during works by the NRA project archaeologist during additional testing in wetland areas, bringing the total number of sites to 39.

Archaeological excavations were then undertaken by Rubicon Heritage Services Ltd at 35 of these sites between Monday the 24th January and Friday the 1st April 2011 under Stage (iii) of the Archaeological Services Contract.

Post-excavation assessment reports were completed by August 2011 and a program of specialist analysis and dating was then undertaken. This report presents the final excavation results including the result of all specialist analysis and radiocarbon dating.

2 SITE BACKGROUND AND LOCATION

2.1 Site location

Knockawaddra West 2 was situated in the townland of Knockawaddra West, parish of Ratass, barony of Trughanacmy and was located 1.5 km northeast of Tralee town at National Grid Reference: 086801/1161287 (Figure 1). The site itself was situated in an undulating field under medium pasture, sloping down to the south.

A summary of the soils and geology of the area was included in the Geology and Hydrogeology chapter of the EIS (Atkins 2008). There is little detailed regional information of the superficial geology of the area, but the Route Appraisal and Selection Report indicates that the majority of the site is directly underlain by Boulder Clay. However, the section of the preferred route which crosses the floodplain of the River Lee (i.e. west of Curraghleha) is described to be underlain by Alluvium.

The majority of rock formations encountered in and around Tralee are Lower Carboniferous (Dinantian) and Middle Carboniferous (Namurian) in age. The main formations underlying the greatest distances of the preferred route, from north to south, include the following: Numarian (undifferentiated) (NUM), comprised of black shales and sandstone; Cracoean Reef facies (CLcr) (eastern transgression of the Cloonagh Limestone (CL) Formation) comprised of unbedded pale grey limestone; Waulsortian Formation (WA), comprised of massive limestones; and Ballysteen Formation (BA), comprised of dark grey limestone and black mudstone.

2.2 General background

The archaeological context of the entire scheme has been outlined in the EIS (Lane 2008) and in previous reports (e.g. Bartlett *et al* 2010a and b).

The known archaeological sites in the vicinity of this site prior to the current road development were a total of three enclosures, two located in Knockawaddra West townland (RMP KE029-252 and KE029-292) and one situated in Knockawaddra Middle (RMP KE029-291).The nearest of these enclosures was located 40 m to the west, just outsides the roadtake and the identified pit is within the zone of archaeological potential for this (Figures 2 and 3).

The archaeology of the area prior to the current road scheme would indicate that there was extensive early medieval activity in the general vicinity of Knockawaddra West 2.

2.3 Recent excavations

The Archaeological Excavations Bulletin (www.excavations.ie) was checked for a record of any licensed archaeological investigations carried out in the townland of Knockawaddra West since 1970, however none were recorded.

Archaeological investigations undertaken as part of Stage (iii) of the Archaeological Services Contract in advance of the N22 Tralee Bypass identified two sites in the vicinity of Knockawaddra West 2. Knockawaddra Middle 2 was identified 200 m to the northeast and contained the remains of a Middle to Late Bronze Age settlement, but also a D-shaped early medieval structure was identified here (Hourihan 2012a); Knockawaddra West 1 contained the remains of Middle to Late Bronze Age burnt mound and was identified 110 m to the northeast (Hourihan 2012b).

These new discoveries indicate that there was activity in the area spanning from at least the Middle Bronze Age to the early medieval period.

3 OBJECTIVES AND METHODOLOGY

3.1 Objectives

The objective of the work was the preservation-by-record through appropriate rescue excavation of any significant archaeological features or deposits, which have been identified within the land take of the proposed development, in advance of the road construction programme, so as to mitigate the impact of the road development on this archaeological material.

3.2 Methodology

Full archaeological excavation was undertaken at Knockawaddra West 2 on 31 March 2011. The crew for the excavation consisted of 1 director, 1 supervisor and 2 site assistants.

Topsoil stripping of the site was conducted using a 360° tracked machine fitted with a 1.8 -2 m wide ditching (toothless) bucket under constant archaeological supervision. A total area of 396 m² was exposed. The resulting surface was cleaned and all potential features investigated by hand. Archaeological contexts were recorded by photograph and on pro forma record sheets. Plans and sections were drawn at scales of 1:10 and 1:20. Registers are provided in the appendices (Appendices 1-5). Ordnance Datum levels and feature locations were recorded using Penmap and a total station theodolite.

Environmental samples were taken from any deposits suitable for analysis or dating as per Rubicon Heritage Services Ltd environmental guidelines and following consultation with environmental archaeologist and archaeobotanist Dr. Scott Timpany.

Faunal remains samples were taken for analysis or dating as per Rubicon Heritage Services Ltd guidelines and following consultation with zooarchaeologist Claudia Tommasino Suárez.

Artefacts recovered during the excavation were assigned unique numbers and treated in accordance with National Museum of Ireland guidelines.

As part of Stage (iv) post-excavation services artefacts and environmental and metallurgical samples were analysed by the appropriate specialists and reports produced on the findings; these reports have been incorporated into this final report (see appendices).

4 THE RESULTS

A total area of 396 m² was exposed at Knockawaddra West 2 in two separate areas (Areas A-B), revealing two phases of activity. The archaeological feature identified in Area B was a possible refuse pit, containing lithic material, a glass bead and metallurgical waste. The features in Area A were found to be non-archaeological in nature.

The topsoil at the site (001) was a maximum of 0.25 m deep and comprised mid-brown clayey silt. Natural geological strata (002) consisted of light yellowish grey silty clay.

Area A was the northernmost area of this site. No features of archaeological significance were identified, with the Stage (i) and (ii) features found to be sink-holes and stone sockets.

4.1 Phase I

Area B was located approximately 21 m to the south of Area A; one archaeological feature was identified here.

Pit (015) was sub-oval, with sharp breaks of slope, steeply sloping, irregular sides and an irregular concave base (Plates 1and 2; Figure 5). It measured 3.14 m in length, 2.30 m in width and 1.65 m in depth and was situated approximately 3 m to the south of the northern baulk. It is thought that this pit was in fact originally a natural sinkhole (a phenomenon which is common place in this limestone area). It is not clear if the hole was modified or if the entire cut of the feature was natural. Cultural material within the fill of the sinkhole indicated it was used for the deposition of rubbish, though given that such sinkholes are prone to frequent collapse mixing of the stratigraphy is to be expected.

The basal fill within this feature comprised loosely compacted, dark brown sandy clay (020), which contained occasional charcoal and burnt animal bone inclusions and a piece of flint debitage which could date to anytime between the Neolithic and Bronze Age (E4292:020:001; Appendix 2). Five pieces of slag (Appendix 3) were also recovered from this fill but these must have been the result of a later phase of activity and are discussed further below.

Environmental analysis found that charcoal from this fill was both oak and non-oak fragments (Appendix 7). For radiocarbon dating purposes one of the non-oak fragments was identified as alder. This returned a Middle Bronze Age radiocarbon date range of 1605-1415 cal. BC (SUERC-37292; 3215±35 BP) (Appendices 7 and 9).

The secondary fill within the pit was mid-brown, loosely compacted sandy clay (019).

4.2 Phase II

As mentioned above five pieces of iron slag was recovered from the basal fill of pit (015). This could not be directly related to the earlier prehistoric Phase 1 activity as represented by the lithic artefact and the radiocarbon dated charcoal. It is thought that this material became mixed with the basal fill of the feature as a result of subterranean collapse within the sinkhole.

The tertiary fill of pit (015) was mid-brown silty clay (018), which had a loose compaction. A glass bead (E4292:018:001; Appendix 2) was recovered from this deposit. Analysis of the bead puts its date somewhere in the early medieval period (Appendix 10). This was situated beneath loosely compacted, mid-brown sandy clay with occasional charcoal fleck inclusions (017). The fifth fill

consisted of mid-greyish brown, loosely compacted silty sandy clay (016); it contained two pieces of slag within its soil matrix (Appendix 3). The upper fill within this feature was mid-greyish brown sandy clay (014), which was loosely compacted, containing occasional charcoal fleck inclusions.

4.3 The finds and samples

A total of two finds and three samples were retrieved during the investigations at Knockawaddra West 2.

Lithic assemblage
One lithic, a piece of flint debitage (E4292:020:001) was retrieved from the basal fill of the pit during the excavations. Due to the small size of the artefact analysis could only determine it was created using techniques typical of the Neolithic to Bronze Age periods (Appendix 11)

Miscellaneous small finds
A single glass bead (E4292:018:001) was recovered during the excavation of Knockawaddra West 2 (Figure 6; Plate 3). The bead is of annular shape composed of translucent amber coloured glass. The bead is decorated with six dots of opaque glass. The dots are of an off-white shade however it is likely they were originally white in colour. Whilst having no *exact* parallels this bead compares favourably in colour, form and general size with beads from other early medieval sites (Appendix 10).

Analysis of the samples
A total of two samples of metallurgical industrial waste and one soil samples were retained from the excavation.

The material from both metallurgical samples would seem to be related to iron metallurgy based on its dark colour although whether as a result of smelting or smithing remains unclear. The small quantity suggests accidental deposition perhaps with other non-metallurgical waste material (Appendix 12).

The soil sample was processed for environmental data and in consultation with a specialist one sample was selected for detailed specialist analysis. Charcoal remains were identified in the sample assessed in rare to common frequencies. The charcoal fragments size ranged from 0.2cm to 1cm maximum. Alder (*Alnus glutinosa*) and oak (*Quercus* sp.) charcoal were identified in the sample (Appendix 7).

Other remains
In addition to the above remains small fragments of burnt bone were also identified. Two of the bones were identified as medium mammal 1, most likely sheep/goat. The other bones recovered were unidentifiable but mostly likely were animal and not human (Appendix 8).

5 DISCUSSION

The results of the excavation at Knockawaddra West 2 point to two definite phases of activity at the site.

5.1 Phasing and Chronology

The only archaeological feature identified was an isolated pit (015) in Area B which was consistent with the remains of a refuse pit. The pit itself seemed to be a sink-hole which was utilised at least twice, in two separate phases. Due to ongoing collapse the strata had become confused over time.

The retrieval of the lithic artefact (E4292:020:001; Appendix 2) from the basal fill of this feature suggests that prehistoric activity took place in the locality of this site. This was later confirmed when a radiocarbon date from the same fill returned a Middle Bronze Age date 1605-1415 cal. BC (SUERC-37292; 3215±35 BP) (Appendix 9). Ferrous slag (Appendix 3) was also recovered from the basal fill which cannot be related to the Bronze Age material. Its presence in association with the Bronze Age material can be explained by ongoing slumping within the sink-hole over time.

A decorated glass bead (E4292:018:001; Appendix 2) was recovered from the tertiary fill of the pit. The form of decoration on the bead was typical of the early medieval period (Appendix 10). This again shows a later period of use of the pit. The ferrous slag could well be contemporary with this bead as iron-work was well established by the early-medieval period.

Due to the presence of the sink-hole phasing of the pit has been much distorted.

5.2 The site in context

The Middle Bronze Age evidence within the pit at Knockawaddra West 2 ties in well with the Middle Bronze Age settlement identified at Knockawaddra Middle 2, 200 m to the northeast (Hourihan 2012a). Two houses were identified at this site and so it is unsurprising that they may have utilised a natural sinkhole in the vicinity for the disposal of waste.

The excavation at Knockawaddra West 2 was located within the ZAP of KE029-292, an enclosure 40 m to the west. This enclosure is probably of early medieval date and so could possibly explain the second phase of activity in the pit identified in Area B. The ferrous slag within the pit was the result of metal-working in the vicinity (see below), and excavated early medieval enclosures often have evidence of metal-working within their confines (e.g. Dromthacker 2 (Troy 2012) approximately 1 km to the west).

A further two recorded enclosures are in the vicinity of the site, one located in Knockawaddra West townland (RMP KE029-252) and one situated in Knockawaddra Middle (RMP KE029-291) (Figures 2 and 3); these may also be early medieval in date and are also potential sources for the material within the pit.

An early medieval date was also returned for a D-shaped structure at Knockawaddra Middle 2 (*ibid*). This further attests to activity outside the enclosures in this area during the period. Evidence for unenclosed early medieval sites can often be elusive, and where it is found it is often on the periphery of enclosures as was found to be the case on the N7 Nenagh to Limerick road scheme where extensive early medieval remains were found (P. Long pers. comm.). This also seems to be the case at Knockawaddra West 2 where the isolated pit is likely to be directly related to nearby enclosures.

5.3 Activities represented

Despite only one feature being identified within the site the fact that it was a refuse pit gives us a glimpse of the day-to-day activities that were being carried out in the vicinity.

Domestic waste: The chief palaeoenvironmental material recovered from the pit was small quantities of wood charcoal. The assemblage contains oak and non-oak fragments, for radiocarbon dating purposes one of the non-oak fragments was identified as alder. Charcoal is likely to be a result of small scale burning episodes such as domestic hearths. While the radiocarbon dated charcoal sample dates to the Bronze Age this type of domestic residue could also be found on sites contemporary with the early medieval phase of use.

The faunal bone assemblage recovered most likely represents domestic waste where animals were slaughtered, consumed and disposed of on the same site. The presence of burnt bone may suggest the use of bones as fuel for fires, or the burning of disposed waste (Appendix 8).

The presence of charcoal and burnt bone along with a lithic artefact, glass bead and metallurgical waste, recovered during excavation supports the interpretation of the sink-hole being a refuse pit.

Glass production and personal adornment: As a form of body ornament glass beads have an ancient and universal history. The durability of glass has ensured its relatively good preservation with the result that glass beads are a common and numerous find on archaeological excavations in Ireland from at least the later Bronze Age (Warner and Meighan 1981, 52). In the early medieval period, monochrome, polychrome and artistically decorated glass beads are represented among excavated assemblages from a variety of site types, secular and ecclesiastical (Appendix 10).

Beads are readily portable artefacts, usually worn and carried by individuals, and as such they offer insights on the movement of people and the crafts they practised. Beads can be very informative about the ways by which people chose to affirm or state their cultural affinities or social status. Beads can be worn around the neck strung singly or as part of a necklace. They are also known to have been worn suspended from brooches on the shoulders or hung from the waist area (Rogers 2007, 194). Glass beads have also been worn in the hair and attached to swords and are found in graves of both sexes of all ages (Guido 1978, 5). Glass beads have also being used as decorative features on bronze pins of the early medieval period and many examples can be found in the National Museum of Ireland (Armstrong 1922, 75). Considering the many ways in which glass beads have being used we need to be cautious about treating finds of single glass beads as strays or lost components of composite necklaces (Appendix 10).

The bead recovered at Knockawaddra West 2 is of annular shape with the shade of glass used being reminiscent of the colour of amber and it may be that resembling amber beads was an underlying reason for producing beads of this shade. The bead is decorated with six dots of opaque glass. The dots are of an off-white shade however it is likely they were originally white in colour. The application of opaque white dots is a decorative motif seen on many different types of early medieval beads and can be used on its own or in combination with other motifs (Appendix 10).

A spiralling line of a dark shade is visible on the inside of the glass. This may be residue from the manufacturing process and indicate that the bead was made by winding on a metal rod. In the early medieval period winding would seem to be the most popular method used to make beads.

The bead, while demonstrating individual characteristics in keeping with all hand-crafted objects also shares traits and manufacturing techniques seen on beads of similar type and whilst having no *exact* parallels compares favourably in colour, form and general size with beads from other early medieval sites (Appendix 10).

Metalworking: The ferrous slag is likely to have originated in metal-working being carried out in the surrounding enclosures. The slag would seem to be related to iron metallurgy based on its dark colour although whether as a result of smelting or smithing remains unclear as it was not diagnostic. Also the source of the slag was not identified within the excavated site.

The main method of smelting iron was known as the bloomery process. Charcoal was placed in a furnace and preheated. Roasted ore and charcoal were then added to the top while bellows were used to pump air into the base of the furnace. The iron ore was then reduced to form iron metal while the impurities from the ore reacted to form slag. The temperature that was achieved during this process would rarely exceed 1250°C, too low to melt the plain iron generally produced; however, in the area around the blowing holes the temperature would be significantly higher. Here liquefied slag would separate from the solid iron particles and flow to the bottom of the furnace, the iron particles would then join to form a spongy lump known as the bloom which would later be removed.

The process of smithing could be done anywhere; it did not need a purpose built structure, but could use a domestic hearth already in the vicinity (McDonnell 1995). After the smelting process the resulting bloom needed further refining to remove trapped slag before it was suitable for forging. The basal stages of refining the bloom involved hammering it while it was hot to combine the metal and expel the slag. The resulting iron stock would then undergo secondary smithing to produce the required artefacts. Smithing took place in a hearth predominantly made from clay filled with charcoal; a blast of air was used to obtain a high temperature to forge the metal. Because they were exposed to high temperatures, the clay was sometimes partially vitrified. The archaeological remains of furnaces and hearths are often similar (Jones 2001).

5.4 Conclusions

The feature identified at Knockwaddra West 2 seemed to be a sink-hole utilised as a waste pit. The analysis of the recovered finds and samples, along with the C14 date show at least two phases of utilisation of the pit, the first during the Middle Bronze Age and the second during the early medieval period.

6 ARCHIVE QUANTITIES

The site archive is comprised of the following materials:

Item	**Quantity**
Context Sheets	20
Plans	0
Sections	1
Photographs	17
Registers	8
Notebooks	0

The archive material is contained within one box.

Storage of the archive in a suitable format and location is required in order to provide for any future archaeological research. It is proposed that in addition to the paper archive a digital copy is prepared. The archive is currently stored in the offices of Rubicon Heritage Services Ltd., Unit 1, Wallingstown Business Park, Little Island, Co. Cork. It is proposed that following completion of post-excavation the archive will be deposited with the National Monuments Service, Department of the Environment, Heritage and Local Government, or the National Museum of Ireland, or such other repository as may be directed by the Client's Representative and the Project Archaeologist.

7 DISSEMINATION

The preliminary results of the excavations on the scheme have been outlined in the NRA Seanda magazine (Long 2011).

The final results of this excavation will be included in a monograph publication dedicated to the results of the excavations on the N22 scheme. This publication is to be completed as part of the Stage (iii) and (iv) archaeological services contract.

Articles relating to the scheme are also planned for inclusion in journal publications.

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REFERENCES

Armstrong, E.C.R., 1921-22. Irish Bronze Pins of the Christian Period. *Archaeologia 72*, 71-86.

Atkins (compilers) 2008 *N22 Tralee By-Pass/Tralee to Bealagrellagh: environmental impact statement*. 4 volumes. Published report by Atkins for Kerry County Council.

Bartlett, T., Hession J. and Long, T. 2010a *Client Technical report on the results of Stage (i) archaeological works on the N22 Tralee Bypass/ Tralee to Bealagrellagh road scheme*. Unpublished Report by Headland Archaeology Ltd for Kerry County Council.

Bartlett, T., Hession J. and Long, T. 2010b *N22 Tralee Bypass/Tralee to Bealagrellagh, Co. Kerry. Archaeological Services Contract, Stage (i) and Stage (ii) – Standard Test Excavation and Pre-excavation Services (including Townland Boundary Survey and Architectural/Built Heritage Survey). Final Test Excavation Report, under Ministerial Directions Number A056 (E4149).*. Unpublished Report by Headland Archaeology Ltd for Kerry County Council.

Guido, M., 1978. *The glass beads of the prehistoric and Roman periods in Britain and Ireland.* [London]: Society of Antiquaries of London: Distributed by Thames and Hudson.

Harrison, S. 2010. *The results of Geophysical Survey along the route of the N22 Tralee Bypass/ Tralee to Bealagrellagh road scheme*. Unpublished Report by Headland Archaeology Ltd. For Kerry County Council.

Hourihan, S. 2012a *N22 Tralee Bypass/Tralee to Bealagrellagh, Co. Kerry. Archaeological Services Contract, Stage (iii) – Excavation. Final Report for Knockawaddra Middle 2 in the townland of Knockawaddra Middle, Co. Kerry.* Unpublished Report by Rubicon Heritage Services Ltd for Kerry County Council.

Hourihan, S. 2012b *N22 Tralee Bypass/Tralee to Bealagrellagh, Co. Kerry. Archaeological Services Contract, Stage (iii) – Excavation. Final Report for Knockawaddra West 1 in the townland of Knockawaddra West, Co. Kerry.* Unpublished Report by Rubicon Heritage Services Ltd for Kerry County Council.

Jones, D.M. (Ed) 2001. *Centre for Archaeological Guidelines, Archaeometallurgy.* http://www.english-heritage.org.uk/upload/pdf/cfa_archaeometallurgy2.pdf

Kerry NRDO. 2000 Tralee Ring Road and N22 Ratass to Bealagrellagh Constraint Report. Unpublished report by Kerry County Council.

Kerry NRDO. 2002. N22 Road Improvement Scheme Tralee Bypass/Tralee to Bealagrellagh; Route Appraisal & Selection Report. Unpublished report by Kerry County Council.

Kieran, E. and Hayden B. 2010. *Report on the results of Underwater Archaeological Survey on the N22 Tralee By-Pass/Tralee to Bealagrellagh road scheme.* Unpublished Report by Headland Archaeology Ltd. for Kerry County Council.

Long, P 2011 'Ancient imprints of life and death; preliminary results of excavations on the N22 Tralee bypass', *Seanda* (Issue 6), 29-31.

Long, P. 2010a *N22 Tralee Bypass/Tralee to Bealagrellagh, Co. Kerry. Archaeological Services Contract, Stage (i) and Stage (ii) – Standard Test Excavation and Pre-excavation Services. Final Test Excavation Report, under*

Ministerial Directions Number A56 (E4151). Report by Headland Archaeology Ltd for Kerry County Council.

Long, P. 2010b *N22 Tralee Bypass/Tralee to Bealagrellagh, Co. Kerry. Archaeological Services Contract, Stage (i) and Stage (ii) – Standard Test Excavation and Pre-excavation Services. Final Test Excavation Report, under Ministerial Directions Number A56 (E4152)*. Report by Headland Archaeology Ltd for Kerry County Council.

Long, P. 2010c *N22 Tralee Bypass/Tralee to Bealagrellagh, Co. Kerry. Archaeological Services Contract, Stage (i) and Stage (ii) – Standard Test Excavation and Pre-excavation Services. Final Test Excavation Report, under Ministerial Directions Number A56 (E4153)*. Report by Headland Archaeology Ltd for Kerry County Council.

Long, P. 2010d *N22 Tralee Bypass/Tralee to Bealagrellagh, Co. Kerry. Archaeological Services Contract, Stage (i) and Stage (ii) – Standard Test Excavation and Pre-excavation Services. Final Test Excavation Report, under Ministerial Directions Number A56 (E4154)*. Report by Headland Archaeology Ltd for Kerry County Council.

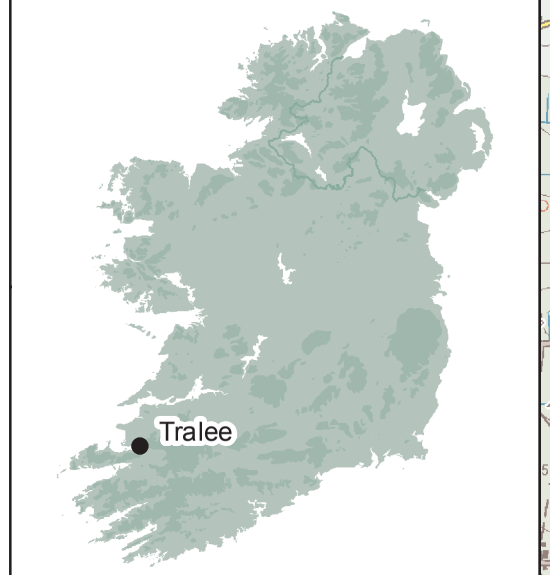
Long, P. 2010e *N22 Tralee Bypass/Tralee to Bealagrellagh, Co. Kerry. Archaeological Services Contract, Stage (i) and Stage (ii) – Standard Test Excavation and Pre-excavation Services. Final Test Excavation Report, under Ministerial Directions Number A56 (E4155)*. Report by Headland Archaeology Ltd for Kerry County Council.

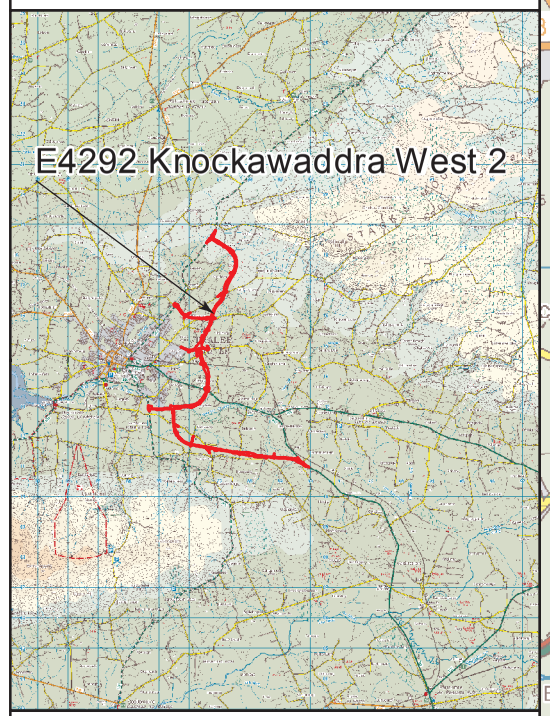
McDonnell, G. 1995. *The Historical Metallurgy Society: Archaeology Datasheet No 3*. http://hist-met.org/hmsdatasheet03.pdf

Rogers, P. W. & Council for British Archaeology, 2006. *Cloth and clothing in early Anglo-Saxon England: AD 450-700.* York: Council for British Archaeology.

Troy, C. 2012a *N22 Tralee Bypass/Tralee to Bealagrellagh, Co. Kerry. Archaeological Services Contract, Stage (iii) – Excavation. Final Report for Dromthacker 2 in the townland of Dromthacker, Co. Kerry.* Unpublished Report by Rubicon Heritage Services Ltd for Kerry County Council.

Warner, R., and Meighan, I.G., Dating Irish glass beads by chemical analysis. In O'Corrain, D., (ed) 1981. *Irish Antiquity, Essays and studies presented to Professor M.J. O'Kelly*. Dublin: Four courts press, 52-66.





KEY

CPO

Excavated Sites

E4290 Lismore 1
E4291 Lismore 2
E4297 Ballynabrennagh Lower 1
E4294 Knockawaddra Middle 1
E4293 Knockawaddra West 1
E4295 Knockawaddra Middle 2
E4299 Dromthacker 2
E4298 Dromthacker 1
E4292 Knockawaddra West 2
E4307 Ballinorig West 1
E4305 Ballinorig West 4
E4306 Ballinorig West 2
E4317 Ballinorig West 3
E4304 Ballinorig South 1
E4303 Ballinorig South 2
E4288 Ballingowan 1a
E4288 Ballingowan 1b
E4288 Ballingowan 1c
E4323 Manor East 1
E4322 Manor East 2
E4321 Manor East 3
E4311 Camp 1
E4318 Camp 5
E4308 Camp 2
E4313 Camp 4
E4309 Caherleheen 1
E4310 Caherleheen 2
E4320 Poulawaddra 1
E4319 Poulawaddra 3
E4289 Clashedmond 1
E4314 Dromavally 1a
E4314 Dromavally 1b
E4296 Ballindooganig 1
E4300 Gortbrack East 1
E4301 Gortbrack East 2
E4302 Gortbrack East 3
E4315 Dromavally 2
E4316 Ballindooganig 2

Department of Transport An Roinn Iompair

transport21 progress in motion

NDP NATIONAL DEVELOPMENT PLAN

NRA National Roads Authority An tÚdarás um Bóithre Náisiúnta

N

Project Name: N22 Tralee Bypass/ Tralee to Bealagrellagh

Scale: 1:33,000@A3

Project Code: TBED10

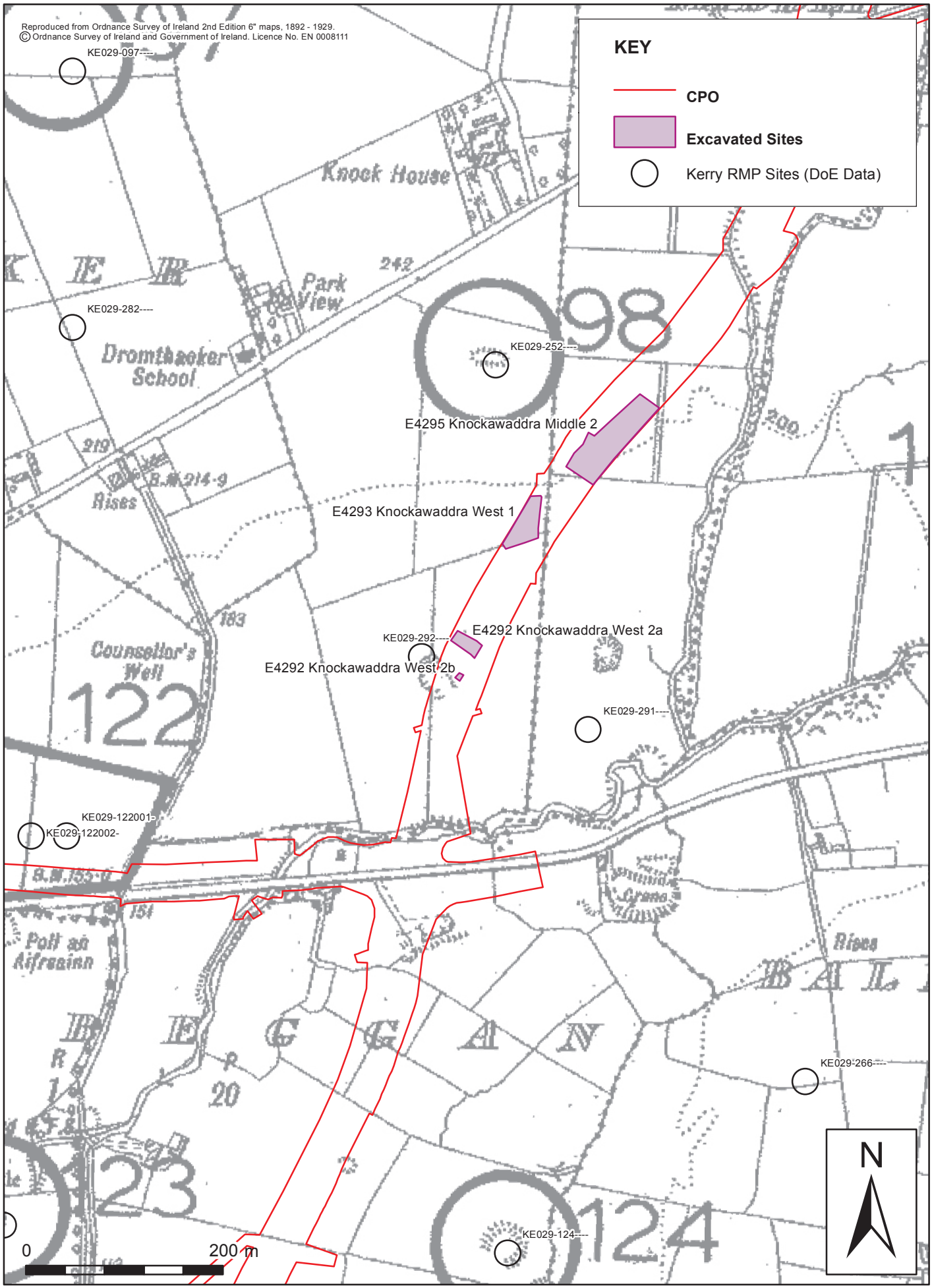
0 1,250 m

Kerry NRDO National Road Design Office Oifig Deartha um Bhoithre Naisiunta Chiarrai

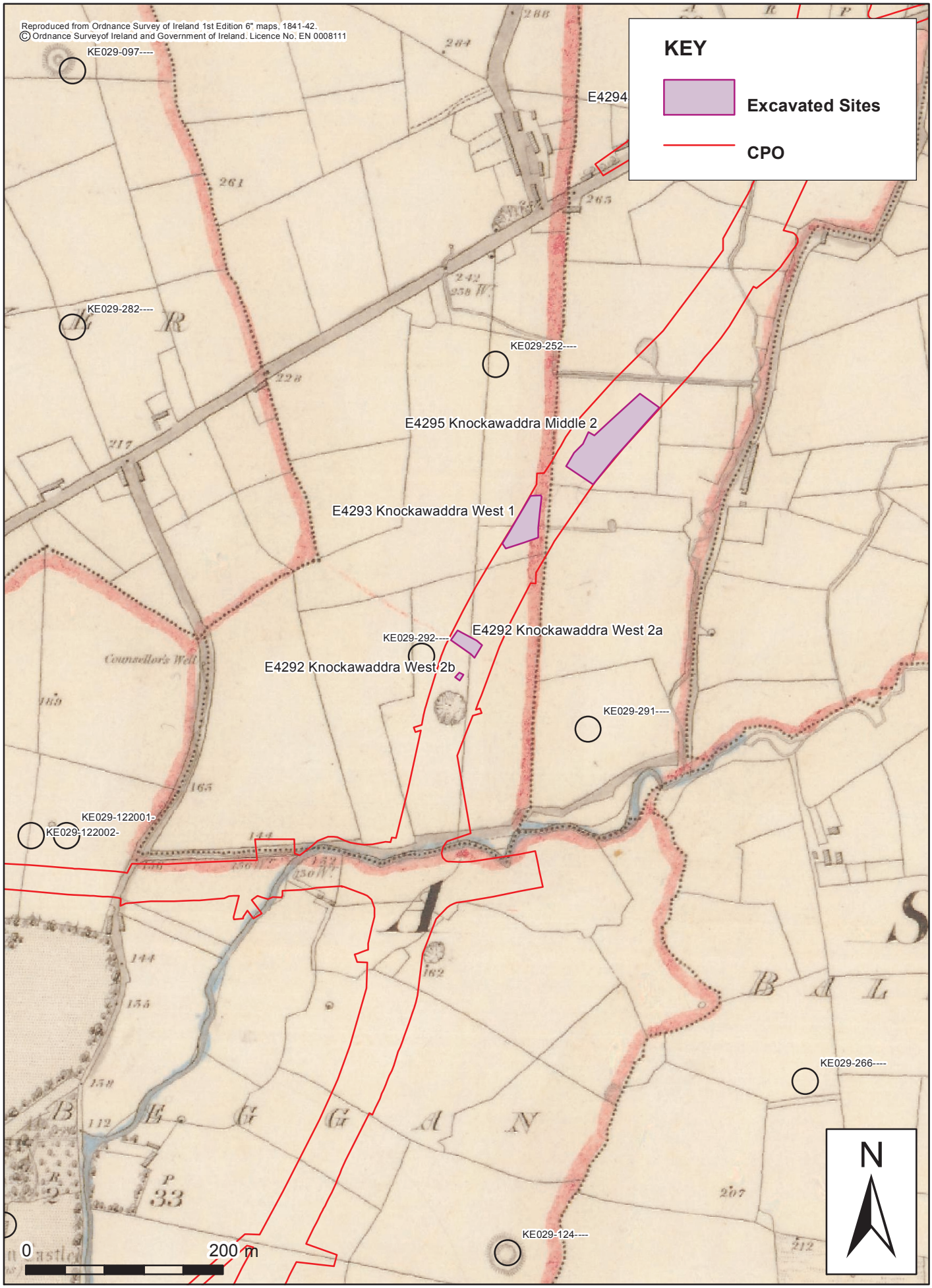
N22 Tralee Bypass/ Tralee to Bealagrellagh: Archaeological Works- Contract 1.
Figure 1 - Location of scheme

Drawn by: JMM April 2011	1st edit by: SN May 2011
2nd edit by: JMM Jan 2012	Signed off: PL Jan 2012

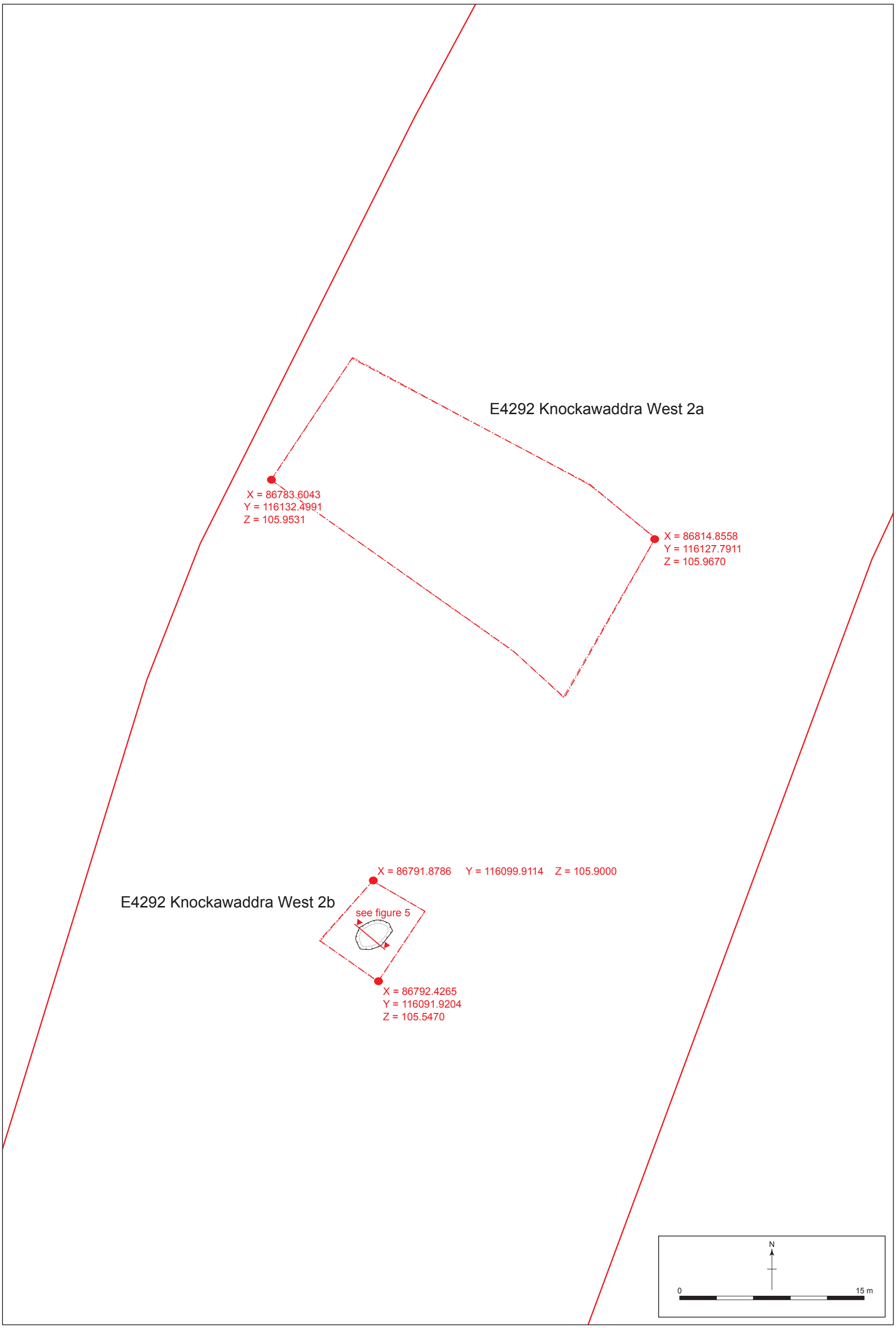
RUBICON HERITAGE



N22 Tralee Bypass/ Tralee to Bealagrellagh: Archaeological Works- Contract 1.
Knockawaddra West 2.
Figure 2 - Location of sites with RMP sites.



N22 Tralee Bypass/ Tralee to Bealagrellagh: Archaeological Works- Contract 1.
Knockawaddra West 2.
Figure 3 - Location of site on 1st Edition OS mapping.



N22 Tralee Bypass/Tralee to Bealagrellagh: Archaeological Works - Contract 2:
Knockawaddra West 2.
Figure 4 - Site layout.

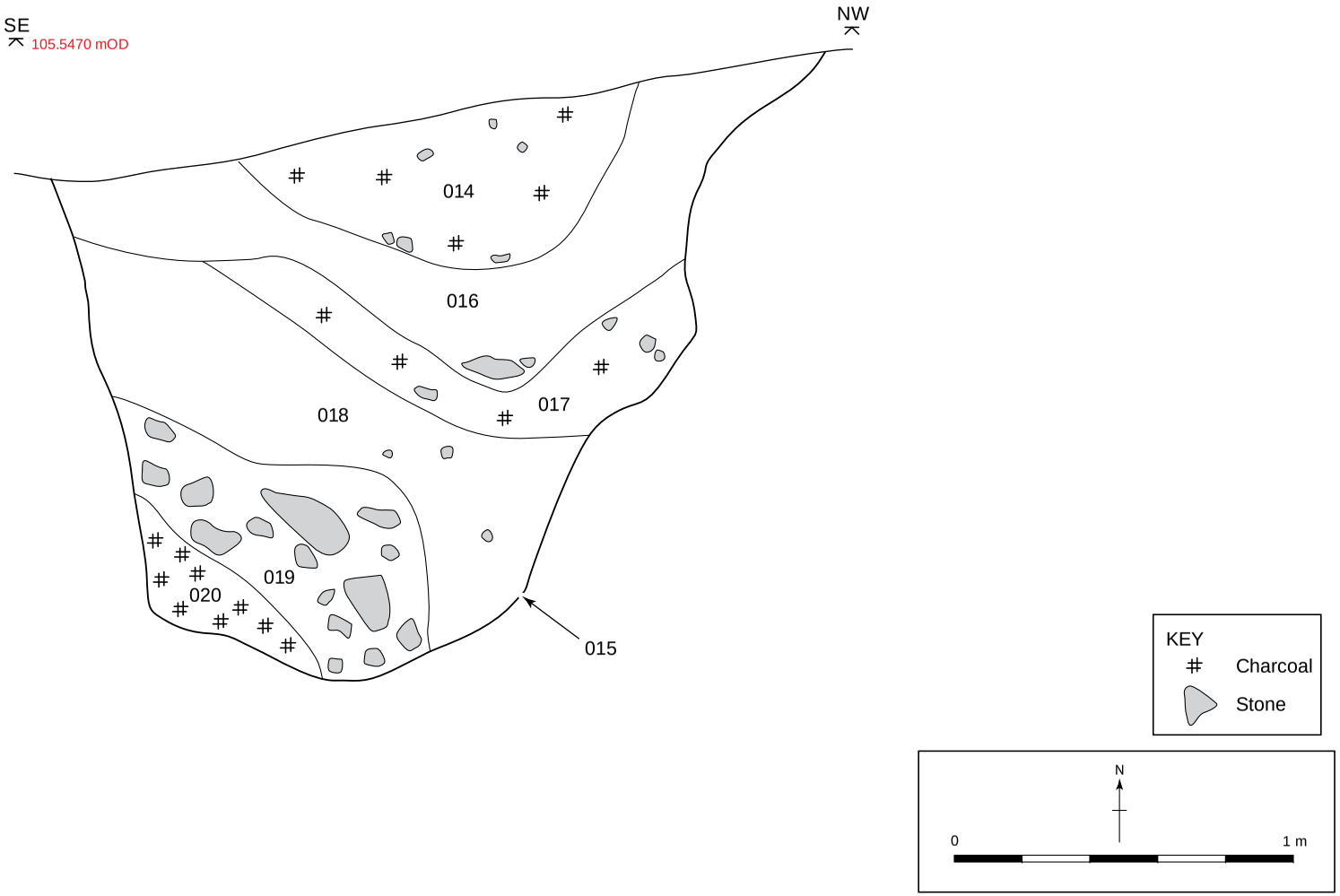
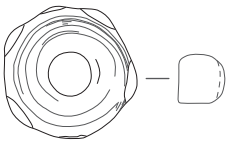


Figure 5 - Section drawings of features excavated in E4292, Knockawaddra West 2.



E4292:018:001
glass bead

Figure 6 - Illustration of glass bead E4292:018:001.

Plate 1 - Mid-excavation view of pit (015), facing southwest.

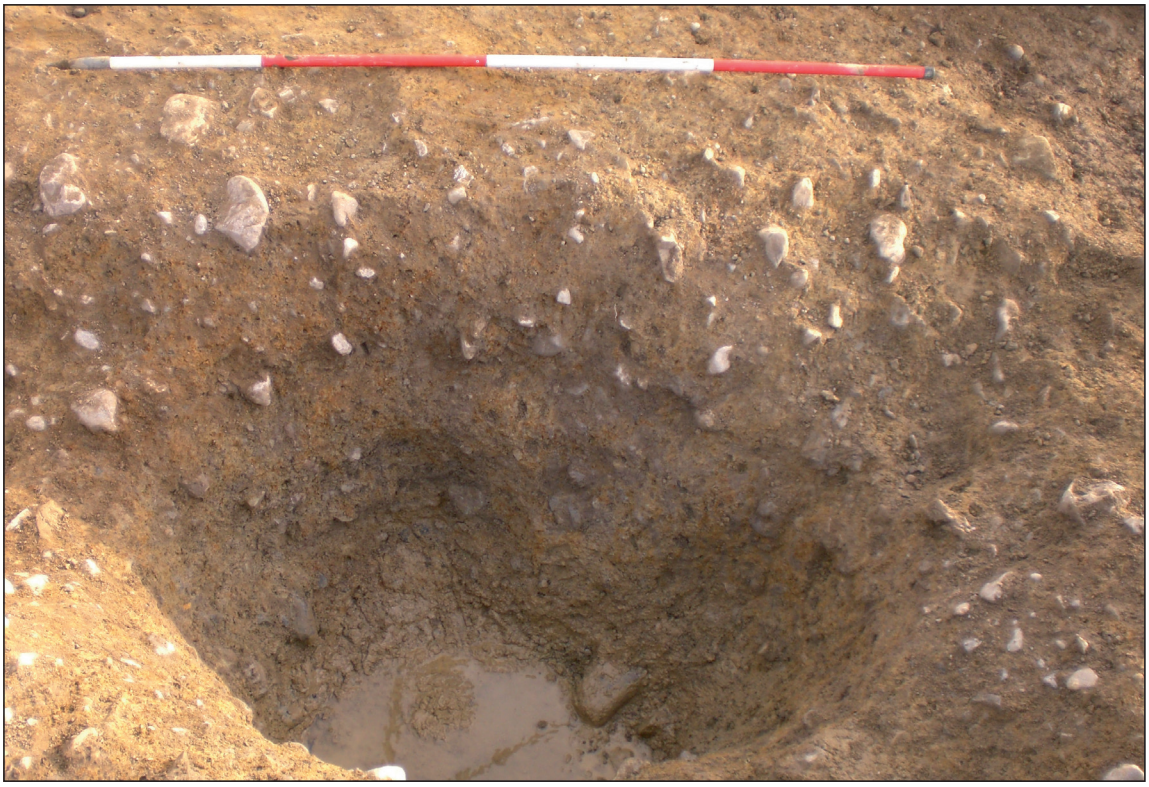


Plate 2 - Post-excavation view of pit (015), facing south.

Plate 3 - Glass bead E4292:018:001.

Appendix 1 – Context Register for Knockawaddra West 2

Context no.	Type	Fill of:	Filled by:	Length (m)	Width (m)	Depth (m)	Description	Interpretation
001	Deposit	-	-	-	-	0.25	Mid-brown clayey silt.	Topsoil
002	Deposit	-	-	-	-	-	Light yellowish grey silty clay.	Natural
003-013	Void	Void	Void	Void	Void	Void	Void	Void
014	Deposit	(015)	-	-	1.12	0.47	Loosely compacted, mid-greyish brown sandy clay with occasional charcoal fleck inclusions.	Upper fill of pit (015)
015	Cut	-	(014) (016)-(020)	3.14	2.30	1.65	Sub-oval feature with sharp breaks of slope, steeply sloping, irregular sides and an irregular concave base.	Cut of a pit
016	Deposit	(015)	-	-	0.93	0.60	Loosely compacted, mid-greyish brown silty sandy clay.	Fifth fill of pit (015)
017	Deposit	(015)	-	-	0.79	0.34	Loosely compacted, mid-brown sandy clay with occasional charcoal fleck inclusions.	Fourth fill of pit (015)
018	Deposit	(015)	-	-	1.06	0.63	Loosely compacted, mid-brown silty clay.	Tertiary fill of pit (015)
019	Deposit	(015)	-	-	0.80	0.61	Loosely compacted, mid-brown sandy clay.	Secondary fill of pit (015)
020	Deposit	(015)	-	-	0.35	0.33	Loosely compacted, dark brown sandy clay with occasional charcoal and burnt bone inclusions.	Basal fill of pit (015)

Appendix 2 – Finds Register for Knockawaddra West 2

Find no.	Material	Type	Identification	Description
E4292:018:001	Glass	Bead	Early Medieval	Glass bead with decoration
E4292:020:001	Flint	Debitage	Prehistoric	Flint debitage

Appendix 3 – Sample Registers for Knockawaddra West 2

Soil Samples

Sample No.	Context No.	Description
1	(020)	Loosely compacted, dark brown sandy clay with occasional charcoal and burnt bone inclusions

Slag Samples

Sample No.	Context No.	Description
1	(016)	Two pieces of slag from pit (015)
2	(020)	Five pieces of slag from pit (015)

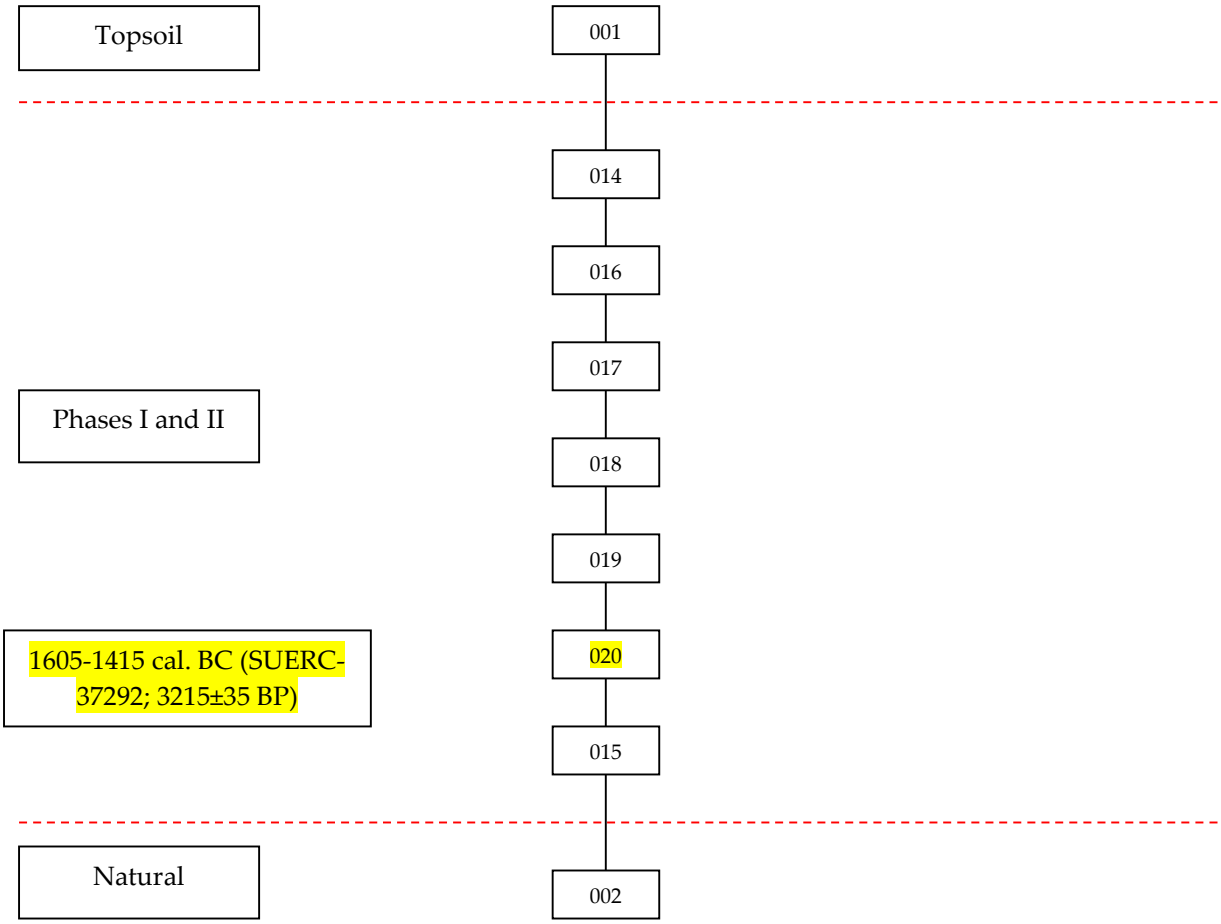
Appendix 4 – Drawing Register for Knockawaddra West 2

Drawing No.	Sheet No.	Scale	Type	Description
1	1	1:10	Section	NE-facing section of pit (015)

Appendix 5 – Photo Register for Knockawaddra West 2

Camera no.	Photo no.	Direction facing	Description
Cas 21	821	NW	Pre-excavation view of non-archaeological feature (011)
Cas 21	822	NW	Pre-excavation view of non-archaeological feature (007)
Cas 21	823	NE	Pre-excavation view of non-archaeological feature (005)
Cas 21	824	NE	Pre-excavation view of non-archaeological feature (013)
Cas 21	825	SE	Pre-excavation view of non-archaeological feature (013)
Cas 21	826	SW	Pre-excavation view of non-archaeological feature (013)
Cas 21	827	NW	Pre-excavation view of non-archaeological feature (013)
Cas 21	828	N	Pre-excavation view of pit (015)
Cas 21	829	NW	General view of burnt roots (007)
Cas 21	830	W	General view of sink hole (005)
Cas 21	831	N	General view of sink hole (005)
Cas 21	832	SE	General view of burnt roots (011)
Cas 21	833	NW	Mid-excavation view of non-archaeological feature (013)
Cas 21	834	SE	Mid-excavation view of non-archaeological feature (013)
Cas 21	835	NE	Mid-excavation view of non-archaeological feature (013)
Cas 21	836	SW	Mid-excavation view of pit (015)
Cas 21	837	SW	Mid-excavation view of pit (015)

Appendix 6 – Site Matrix for Knockawaddra West 2



Appendix 7 – The charred plant remains from Site E4292, Knockawaddra West 2, Tralee, Co. Kerry.
Authors: Abby Mynett and Laura Scott, Headland Archaeology Ltd

Absract
A sample was assessed from a site consisting of a possible refuse pit in the townland of Knockawaddra West, parish of Ratass, barony of Trughanacmy, located 1.5 km northeast of Tralee town. The assessment revealed the presence of wood charcoal dating to the middle Bronze Age.

Introduction
A single sample was taken from the excavation at Knockawaddra West 2, Tralee, Co. Kerry, a site consisting of a large pit. The sample was processed in order to retrieve any palaeoenvironmental material that could be used as radiocarbon dating material, together with providing data on whether the feature was used as a refuse pit.

Methodology
One sample of approximately 10L was taken on site from the basal fill (020) of pit (015). Samples were sub-sampled (to 0.5 litres) and then processed in laboratory conditions using a standard flotation method (cf. Kenward *et al.*, 1980). The floating debris (flot) was collected in a 250μm sieve and, once dry, scanned using a binocular microscope. Any material remaining in the flotation tank (retent) was wet-sieved through a 1mm mesh and air-dried. This was then sorted by eye and any material of archaeological significance removed. All plant macrofossil samples were analysed using a low power binocular microscope with x10 and x40 magnifications.

Results
The results of the radiocarbon dating are provided in Table 1. The assessment results of the samples are provided in Tables 2 (Composition of retents) and 3 (Composition of flots). All material was preserved through charring.

Radiocarbon dating
A Middle Bronze Age radiocarbon date of 1605-1415 cal. BC (SUERC-37292; 3215±35 BP) date has been attained from a fragment of alder charcoal taken from a sample (001) from the basal fill (020) of pit (015). Full radiocarbon information is present in Table 1.

Wood charcoal
Charcoal remains were identified in the sample assessed in rare to common frequencies. The charcoal fragments size ranged from 0.2cm to 1cm maximum. Alder (*Alnus glutinosa*) and oak (*Quercus* sp.) charcoal were identified in sample (001).

Other remains
In addition to the above remains small fragments of burnt bone were identified in Sample 001 context (020) recorded as being an occasional occurrence.

Discussion

Pit feature (015) 1605-1415 cal. BC
Only one archaeologically significant feature was identified during the excavation at Knockawaddra West 2, E4292, this being Pit (015). The pit was sub-oval in shape with steeply sloping irregular sides and a concave base. It had dimensions of 3.14m length, 2.30m width and 1.65m depth and contained

six fills in total. Radiocarbon dating of a fragment alder charcoal taken from the basal fill (020) returned a Middle Bronze Age radiocarbon date range of 1605-1415 cal. BC for the feature. The chief palaeoenvironmental material recovered from the pit was small quantities of wood charcoal. The assemblage contains oak and non-oak fragments, for radiocarbon dating purposes one of the non-oak fragments was identified as alder. The presence of burnt bone along with a lithic artefact, glass bead and metallurgical waste, recovered during excavation (Clark, 2011) supports the interpretation of this being a refuse pit.

Conclusions

- The only feature on site was a pit dating to the middle Bronze Age.
- Charcoal fragments from the feature were observed to be oak and alder.

References

Cappers, R.T.J., Bekker, R.M. and Jans J.E.A. 2006 'Digital seed atlas of the Netherlands', Barkhuis Publishing and Groningen University Library, Groningen.

Clark, L. 2011. N22 Tralee Bypass/Tralee to Bealagrellagh, Co. Kerry. Archaeological Services Contract, Stage (iii) – Excavation. Post-excavation Assessment Report for Knockawaddra West 2 in the townland of Knockawaddra West, Co. Kerry.

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

E-Number	Lab code	Sample ID	Material	σ13C	Radiocarbon age BP	Calibrated Age Ranges (1 ó)	Relative probability	Calibrated Age Ranges (2 σ)	Relative probability
E4292	SUERC-37292	Context 20, Sample 1	Charcoal *Alnus glutinosa*	-26.4‰	3215±35	1512-1444 cal BC	68.2%	1605-1576 cal BC 1536-1415 cal BC	4.3% 91.1%

Table 1- Radiocarbon results for Knockawaddra West 2

Context Number	Sample Number	Feature	Sample Vol (l)	Burnt bone	Charcoal quantity	Charcoal max size (cm)	Material available for AMS	Comments
020	1	Basal fill of pit (015)	0.5	++	+	0.2	Burnt Bone +	
Key: + = rare, ++ = occasional, +++ = common and ++++ = abundant **NB** charcoal over 1cm is suitable for identification and AMS dating								

Table 2: Knockawaddra West 2, E4292, Retent Sample Results

Context Number	Sample Number	Feature	Total flot Vol (ml)	Charcoal Quantity	Charcoal Max size (cm)	Material available for AMS	Comments
020	1	Basal fill of pit (015)	2			-	Archaeologically sterile
Key: + = rare, ++ = occasional, +++ = common and ++++ = abundant **NB** charcoal over 1cm is suitable for identification and AMS dating							

Table 3: Knockawaddra West 2, E4292, Flotation Sample Results

Appendix 8 - Faunal remains assessment from Knockawaddra West 2, Co. Kerry (E4292)
By: Claudia Tommasino Suárez

Methodology

Identification and quantification
During the assessment each specimen was identified according to species, skeletal element, age and sex where possible. The animal bone reference collection located in Rubicon Heritage Services Ltd, Unit 1 Wallingstown Business Park, Little Island, Co. Cork was utilised. The mammal specimens that could not be assigned to a species were recorded using the categories "large mammal" (lm), "medium mammal 1" (mm1), "medium mammal 2" (mm2) and "small mammal" (sm) (Harland *et al.* 2003). The specimens categorised as "large mammal" could belong to cattle, horse or big cervids such as red deer or reindeer. The "medium mammal 1" category refers to sheep, goat, pig or small cervids. The skeletal elements were divided into the four parts of the skeleton for the purposes of discussion: head (skull, mandible); axial carcass or trunk (vertebrae and ribs); meaty bones or upper limbs (scapulae, pelvis and its respective limb); and feet or lower limbs (metapodials, phalanges and carpals/tarsals).

The quantification of the assemblage was carried out using NISP (Number of Identifiable Specimens) calculated as the total of fragments attributed to a specific taxon (Grayson 1984; O'Connor 2004; Reitz and Wing 1999). All data is stored in digital and written form in the head office of Headland Archaeology (Ireland) Ltd, Unit 1, Wallingstown Business Park, Little Island, Co. Cork.

Taphonomy
The recognition of any taphonomic factors such as gnawing, burning, texture and completeness of the bones and the butchery marks present were dealt with according to Lyman (1994).

Results

The animal bones from Knockawaddra West 2 came from the basal fill (020) of pit (015).

The animal bone assemblage was found to be in a poor state of preservation with a high level of fragmentation. The bone was between 0-20% complete.

The assemblage was made up of 38 calcined bone fragments. Thirty-six of these fragments could not be assessed to species or skeletal element but are most likely animal rather than human. The remaining two bones were identified as medium mammal 1, most likely sheep/goat. The skeletal distribution of medium mammal 1 shows that both slaughter and meat-bearing waste was present. No other taphonomic modifications or butchery marks were observable on any fragments from this site.

The skeletal distribution identified suggests that the assemblage represents domestic waste where animals were slaughtered, consumed and disposed of on the same site. The presence of burnt bone may suggest the use of bones as fuel for fires, or the burning of disposed waste (Théry-Parisot 2002).
This animal bone distribution is commonly found in rural Irish sites from the Bronze Age through to the Post-Medieval period (McCormick and Murray 2007; Denham 2007). Beyond this no further interpretation can be drawn from Knockawaddra West 2 bone assemblage.

Context	*Sample*	*NISP*	*Species*	*Element*	*Taphonomy*

20	1	36	un	unid	cal
20	1	1	mm1	skull	cal
20	1	1	mm1	met	cal

Table 1 – Complete list of animal bones from Knockawaddra West 2. un = unidentified species, mm1 = medium mammal 1, unid = unidentified element, met = metaphysic, cal = calcined.

Bibliography

Denham, S. D. 2007 *Animal Exploitation in Medieval Ireland*. Unpublished PhD thesis, Queens University, Belfast.

Grayson, D. 1984. *Quantitative Zooarchaeology*. Academic Press Inc, Washington

Harland, J.F., J. H. Barrett, J. Carrott, K. Dobney, and D. Jaques 2003 'The York System: An integrated zooarchaeological database for research and teaching'. *Internet Archaeology* 13.

Lyman, R. 1994. *Vertebrate Taphonomy*. Cambridge: Cambridge Manuals in Archaeology.
McCormick, F. 2007 'The horse in Early Ireland', *Anthropozoologica*. **42** (1), 85-104.

McCormick, F. and Murray, E. 2007 *Knowth and the zooarchaeology of Early Christian Ireland.* Excavations at Knowth 3. Royal Irish Academy, Dublin.

O'Connor, T. 2004. *The archaeology of animal bones*. Sutton Publishing Limited, Great Britain.

Reitz, E. J. and E. S. Wing. 1999. *Zooarchaeology*. Cambridge manuals in archaeology. Cambridge University Press, Cambridge.

Silver, I. 1969 'The ageing of domestic animals' in Brothwell and Higgs (eds.) *Science in Archaeology* **2**, 331-58. Thames and Hudson.

Théry-Parisot, I. 2002 'Fuel Management (Bone and Wood) During the Lower Aurignacian in the Pataud Rock Shelter (Lower Palaeolithic, Les Eyzies de Tayac, Dordogne, France). Contribution of Experimentation'. *Journal of Archaeological Science* **29** (12), 1415-1421.

Appendix 9 – Radiocarbon dates and certificates

E-Number	Lab code	Sample ID	Material	σ13C	Radiocarbon age BP	Calibrated Age Ranges (1 ó)	Relative probability	Calibrated Age Ranges (2 σ)	Relative probability
E4292	SUERC-37292	Context 20, Sample 1	Charcoal *Alnus glutinosa*	-26.4‰	3215±35	1512-1444 cal BC	68.2%	1605-1576 cal BC 1536-1415 cal BC	4.3% 91.1%

Scottish Universities Environmental Research Centre

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RADIOCARBON DATING CERTIFICATE

05 December 2011

Laboratory Code	SUERC-37292 (GU25683)
Submitter	Trish Long Hourihan Headland Archaeology (Ireland) Ltd Unit 1, Wallingstown Business Park Little Island County Cork
Site Reference	Knockawaddra West 2 (E4292)
Context Reference	20
Sample Reference	1
Material	Charcoal : Alnus glutinosa (0.1g)
$\delta^{13}C$ relative to VPDB	-26.4 ‰
Radiocarbon Age BP	3215 ± 35

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

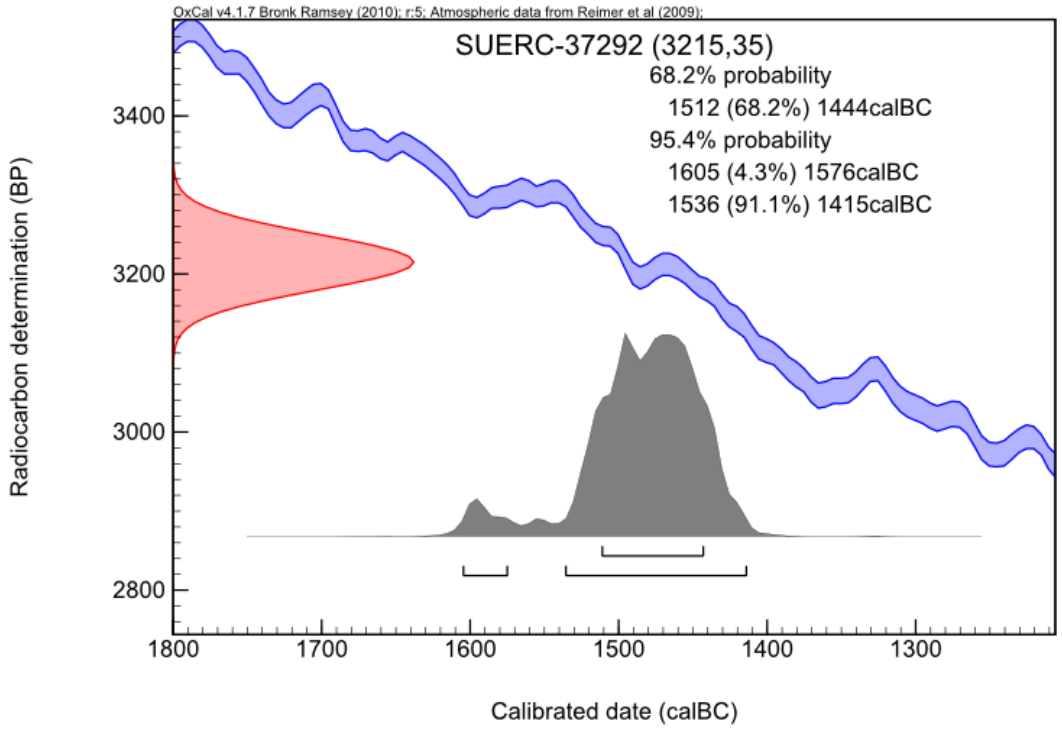
The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

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

Conventional age and calibration age ranges calculated by :- Date :-

Checked and signed off by :- Date :-

Calibration Plot



Appendix 10 - Report on the glass bead E4292:018:001
Author: Margerat Mannion

The assemblage comprises one glass bead. The dimensions of the bead are as follows: diameter 17.6mm, height 7.3mm and the perforation is 5mm. The bead was recovered from context (018) in Area B.

The bead is of annular shape with a centrally placed perforation and composed of translucent glass with a brownish caramel tint. The shade of glass used is reminiscent of the colour of amber and it may be that resembling amber beads was an underlying reason for producing beads of this shade.

The bead is decorated with six dots of opaque glass. The dots are of an off-white shade however it is likely they were originally white in colour. The dots are fairly regularly spaced and placed in such a way as to encircle the bead. Therefore once strung and worn the decorative feature on the bead would be visible regardless of how the bead rested on the string. The application of opaque white dots is a decorative motif seen on many different types of early medieval beads and can be used on its own or in combination with other motifs.

A spiralling line of a dark shade is visible on the inside of the glass. This may be residue from the manufacturing process and indicate that the bead was made by winding on a metal rod. In the early medieval period winding would seem to be the most popular method used to make beads.
The bead, while demonstrating individual characteristics in keeping with all hand-crafted objects also shares traits and manufacturing techniques seen on beads of similar type and whilst having no *exact* parallels compares favourably in colour, form and general size with beads from other early medieval sites.

Beads of comparable colour and form but without added decoration are known from Lagore, Co. Meath (Hencken 1950), and examples are also known from sites in Munster, with specimens recovered from the ringforts of Garranes (Ó Ríordáin, S., 1942) and Garryduff (O'Kelly, M.J., 1963), Co. Cork. Interestingly the spiralling dark line mentioned above, is also seen on the specimen from Garryduff.

Beads of comparable colour and form decorated with trailing bands of opaque white glass are known from the 1908 Knowles collection and there are many more examples among unprovenanced beads in the National Museum of Ireland. One of the unprovenanced beads (no. 63:1920) compares favourably to the Knockawaddra bead on colour, form and decoration.

Conclusion
As a form of body ornament glass beads have an ancient and universal history. The durability of glass has ensured its relatively good preservation with the result that glass beads are a common and numerous find on archaeological excavations in Ireland from at least the later Bronze Age (Warner and Meighan 1981, 52). In the early medieval period, monochrome, polychrome and artistically decorated glass beads are represented among excavated assemblages from a variety of site types, secular and ecclesiastical. Large assemblages have been found at Lagore and Deer Park Farm and a smaller but substantial number come from Garryduff and Garranes.

Beads are readily portable artefacts, usually worn and carried by individuals, and as such they offer insights on the movement of people and the crafts they practised. Beads can be very informative about the ways by which people chose to affirm or state their cultural affinities or social status. Beads can be worn around the neck strung singly or as part of a necklace. They are also known to have been worn suspended from brooches on the shoulders or hung from the waist area (Rogers 2007, 194).

Glass beads have also been worn in the hair and attached to swords and are found in graves of both sexes of all ages (Guido 1978, 5). Glass beads have also being used as decorative features on bronze pins of the early medieval period and many examples can be found in the National Museum of Ireland (Armstrong 1922, 75). Considering the many ways in which glass beads have being used we need to be cautious about treating finds of single glass beads as strays or lost components of composite necklaces. More recent studies are realising the importance of examining the performative role of artefacts of personal adornment such as beads in the social arena and how this study can enrich our appreciation of the social agency of material culture and the conventions governing the formation, exhibition and maintenance of individual and collective identities and the application of the results of this study to the facilitation of cross-societal and inter-regional comparative research (Hinton 2005, 1).

Bibliography

Armstrong, E.C.R., 1921-22. Irish Bronze Pins of the Christian Period. *Archaeologia 72*, 71-86.

Guido, M., 1978. *The glass beads of the prehistoric and Roman periods in Britain and Ireland.* [London]: Society of Antiquaries of London: Distributed by Thames and Hudson.

Hencken, H., 1950. Lagore Crannóg: an Irish royal residence of the 7th to 10th centuries. *Proceedings of the Royal Irish Academy 53 C*, 1-248.

Hinton, D., 2005. Gold & Gilt, Pots & Pins. New York: Oxford University Publishing.

O'Kelly, M.J., 1963. The excavations of two earthen ringforts at Garryduff, Co. Cork. *Proceedings of the Royal Irish Academy 63 C*, 17-125.

Ó Ríordáin, S., 1942. The excavation of a large earthen ringfort at Garranes, Co Cork. *Proceedings of the Royal Irish Academy 47 C*, 77-150.

Rogers, P. W. & Council for British Archaeology, 2006. *Cloth and clothing in early Anglo-Saxon England: AD 450-700.* York: Council for British Archaeology.

Warner, R., and Meighan, I.G., Dating Irish glass beads by chemical analysis. In O'Corrain, D., (ed) 1981. *Irish Antiquity, Essays and studies presented to Professor M.J. O'Kelly*. Dublin: Four courts press, 52-66

Appendix 11- Lithics Finds Report

Lithics Finds Report for E4292B Knockawaddra West 2b, Co. Kerry

Dr. Farina Sternke

MA, PhD

Contents

List of Tables

Introduction

One lithic find from the archaeological excavation at Knockawaddra West 2b, Co. Kerry was presented for analysis (Table 1). The find is associated with an isolated pit.

Find Number	Context	Material	Type	Condition	Cortex	Length (mm)	Width (mm)	Thickness (mm)	Complete
E4292b:020:001	020	Flint	Debitage						

Table 1 Composition of the lithic assemblage from Knockawaddra West 2b (E4292B)

Methodology

The lithic artefact was examined visually and catalogued using Microsoft Excel. Since the lithic is smaller than 20mm in length and width it was classed as debitage and not analysed further. The technological criteria recorded are based on the terminology and technology presented in Inizan et al. 1999. The general typological and morphological classifications are based on Woodman et al. 2006.

Quantification

The find is a worked piece of flint.

Provenance

The worked flint was recovered from the fill C20 of pit C15.

Technology:

The find is a small piece of debitage. It may have been produced during bipolar reduction of a beach flint pebble.

Dating:

The piece of debitage most likely dates to the Neolithic period or the Bronze Age based on it technology (Woodman et al. 2006).

Conservation

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

Summary

The lithic find from the archaeological excavation at Knockawaddra West 2b, Co. Kerry is residual piece of Neolithic or Bronze Age flint debitage.

This artefact makes a minor contribution to the evidence for prehistoric settlement in Co. Kerry.

Bibliography

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

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

Appendix 12 - Visual assessment of archaeometallurgical material

Visual assessment of archaeometallurgical material from E4292, Knockawaddra West 2, Co. Kerry

By: Barry Cosham

Client: Headland Archaeology Ltd.

Date: November 2011

Introduction

Headland Archaeology Ltd. undertook archaeological investigations in the townland of Knockawaddra West, Co. Kerry in advance of development works for the N22 Tralee Bypass scheme by Kerry county council. The preliminary evaluation of the findings of the excavation revealed the existence of an isolated pit (Clark, 2011). During the course of the post excavation work a small quantity of possible metallurgical material or 'slag' was recovered. The aim of this report is to determine the nature and quantity of these residues and recommend what, if any, further analyses should be undertaken.

Methods

The assemblage was comprised of two samples recovered during the excavation. The assemblage was washed by hand as necessary and allowed to air dry. A visual examination of the assemblage was undertaken, utilising stereo zoom light microscopy as required. The remains were quantified and a detailed description compiled. This allowed categorisation and identification with reference to Bachmann (1982) and Bayley *et al.* (2001) to be completed. The results, discussion and conclusion of the assessment are presented below.

Results

The examined assemblage (Appendix 12.1) had a total weight of 82 grams and was comprised of a very small quantity of undiagnostic slag and a heavily corroded iron object.

Discussion

The material from both samples originated in deposits within the single pit which comprised the entirety of the archaeology at Knockawaddra West 2. The slag would seem to be related to iron metallurgy based on its dark colour although whether as a result of smelting or smithing remains unclear. The small quantity suggests accidental deposition perhaps with other non-metallurgical waste material or even topsoil as the context from which it was retrieved was near the top of the depositional sequence.

Conclusion

Although there is a small quantity of metallurgical waste within the recovered assemblage from Knockawaddra West 2, there is nothing so suggest that the originating activity took place on the site or what form this activity took. Given the small quantity of slag it can be inferred that the metallurgical activity took place some distance away.

Recommendations

It is recommended that no further analyses be undertaken on the material from Knockawaddra West 2 as it is of such a small quantity and cannot be accurately provenanced.

Retention of material

It is advised that all archaeometallurgical material be retained in order to enable future study/analysis and because they fall within the remit of section 9 of the National Monuments (Amendment) Act, 1994. The material has no special storage considerations other than being kept dry.

References

Bachmann, H.-G. (1982). *The Identification of Slags From Archaeological Sites.* London: Institute of Archaeology Occasional Publication No. 6. University of London.

Bayley, J., Dungworth, D., & Paynter, S. (2001). *Archaeometallurgy.* London: English Heritage Guidelines 2001/01.

Clark, L. (2011). *N22 Tralee Bypass/Tralee to Bealagrellagh, Co. Kerry. Archaeological Services Contract, Stage (iii) – Excavation. Post-excavation Assessment Report for Knockawaddra West 2 in the townland of Knockawaddra West, Co. Kerry.* Headland Archaeology (Ireland) Ltd.: Unpublished Report.

Appendix 12.1 – Sample Catalogue

Sample No.	Context No.	Weight (g)	No. of Frags.	Avg. Dia. (mm)	Min-max Dia.	Colour/s	Density	Characteristic morphological features	Notes/other features	Interpretation
1	16	23	5	19	6 - 28	Black	High	None	Tiny undiagnostic slag fragments, one fragment broken into 5 pieces	Undiagnostic
2	20	59	2	33	17 - 47	Orange/ Brown/ Black	High	None	Iron with conglomerate/corrosion	Iron object?
	Total:	82								