N18 Ennis Bypass
and N85 Western Relief Road

Site AR104, Killow, Co. Clare

Final Archaeological Excavation Report

for Clare County Council

Licence No: 04E0191

by Kate Taylor

Job J04/01

(NGR 136822 175115)

1st August 2006

N18 Ennis Bypass and N85 Western Relief Road, Site AR104, Killow, Co. Clare

Final Archaeological Excavation Report

for Clare County Council

Licence No: 04E0191

by Kate Taylor
TVAS Ireland Ltd

Job J04/01

1st August 2006

Summary

Site name: N18 Ennis Bypass and N85 Western Relief Road, Site AR104, Killow, Co. Clare

Townland: Killow

Parish: Doora

Barony: Bunratty Upper

County: Clare

SMR/RMP Number: N/A

Planning Ref. No: N/A

Client: Clare County Council, New Road, Ennis, Co. Clare

Landowner: Clare County Council, New Road, Ennis, Co. Clare

Grid reference: 136822 175115 (OSI Discovery Series 1:50,000, Sheet 58. OS 6" Clare Sheet 34)

Naturally occurring geology: Gravel island adjacent to clay with sandstone inclusions

TVAS Ireland Job No: J04/01

Licence No: 04E0191

Licence Holder: Kate Taylor

Report author: Kate Taylor

Site activity: Excavation

Site area: 6593m^2

Sample percentage: 100%

Date of fieldwork: 16/02/04-10/03/04

Date of report: 01/08/06

Summary of results: The excavation area encompassed part of a gravel island (a drumlin) and the edge of a bog. The drumlin was partially enclosed by two ditches, one of which was dated to the medieval period. A number of pits, some apparently cremation burials, were recorded within and outside the enclosed area. This funerary activity was taking place in the late Bronze Age/early Iron Age. A burnt stone spread, dated to the 9th to early 10th centuries BC was also discovered at the edge of the bog and a wooden bowl, dated to 777 BC to 407 BC, was recovered within a peat layer adjacent to the burnt spread.

Monuments identified: Prehistoric burnt stone spread and funerary pits, medieval ditches.

Location and reference of archive: The primary records (written, drawn and photographic) are currently held at TVAS Ireland Ltd, Ahish, Ballinruan, Crusheen, Co. Clare.

Report edited/checked by: Graham. Hull ✓01.08.2006

N18 Ennis Bypass and N85 Western Relief Road, Site AR104, Killow, Co. Clare
Final Archaeological Excavation Report

by Kate Taylor

Report J04/01q

Introduction

This report documents the final results of an archaeological excavation of prehistoric cremation burials and a burnt stone spread and medieval ditches (Site AR104) on the route of the N18 Ennis Bypass and N85 Western Relief Road at Killow, Co. Clare (136822 175115) (Fig. 1). The excavation forms part of the Ennis Bypass Archaeological Contract 6.

A preliminary archaeological report for this site was produced in May 2004 (Taylor 2004).

The National Monuments Act 1930 (as amended) provides the legislative framework within which archaeological excavation can take place and the following government publications set out many of the procedures relating to planning/development and archaeology:

Framework and Principles for the Protection of the Archaeological Heritage (DAHGI 1999a)

Policy and Guidelines on Archaeological Excavation (DAHGI 1999b)

Code of Practice between the National Roads Authority and the Minister for Arts, Heritage, Gaeltacht and the Islands (NRA/MAHGI 2001)

Project background

As part of the National Roads Authority scheme for upgrading the N18 Limerick to Galway Road, Clare County Council, in consultation with NRA Project Archaeologist Sébastien Joubert, requested a series of archaeological investigations along the route of the proposed Ennis Bypass and a Western Relief Road. The proposed scheme has an overall length of 21km and involves the construction of a 13.8km eastern bypass of Ennis from Latoon, north of Newmarket-on-Fergus, to Cragard, north of Barefield. The Western Relief Road is 7.1km long and is to link Killow and Claureen (Fig. 1).

A number of sites of archaeological interest were known to lie on the route of the new roads and the mitigation strategy agreed by the Project Archaeologist and the national licensing authorities for these sites was preservation by record, i.e. full archaeological excavation. Further sites, without surface expression, were located as the result of intensive test trenching along the course of the road (03E1291 Hull 2003 and 03E1293 Roger 2004). As preservation *in situ* was not a reasonable option, the resolution strategy for these new sites was also preservation by record.

The archaeological excavation and post excavation work were funded by Clare County Council through the National Roads Authority and part-financed by the European Union under the National Development Plan 2000-2006.

Location, topography and geology

The site was located in the townland of Killow, in the parish of Doora, barony of Bunratty Upper and was centred on NGR 136822 175115 (Figs 1 and 2). The site lay 3.8km south-east of Ennis town centre (the O'Connell Monument), 2km north-east of Clarecastle and 100m south of the Doora to Clarecastle road.

The landscape to the north and east of the site is characterised by deep bog with occasional drumlins apparent as gravel islands within the bog. To the south and west the land is higher and drier. Site AR104 straddled these two landscapes, occupying parts of two gravel islands, an area of bog and the edge of the drier ground (Plates 1 and 2).

The topsoil varied from a thin gravelly loam on the islands to a thick peat in the boggy parts of the site. The underlying natural deposits also varied, being a pale gravel with limestone boulders at the north and a pale clay with sandstone pieces at the south. At the time of the excavation the land was under rough pasture with the western fence line marked by large conifers, the roots of which caused substantial ground disturbance.

The topography of the site showed abrupt changes in level. The top of the gravel hillock was at a height of approximately 5.8m above Ordnance Datum (OD) whilst the hollow at the south-eastern side was just 1.8m OD.

Archaeological and historical background

As part of the environmental assessment process for the road scheme, Clare County Council commissioned desk-based and walkover surveys that formed part of an Environmental Statement (Babtie Pettit 2000) and an archaeological study for the Environmental Impact Statement (Doyle 1999). A total of 36 sites of known or potential cultural heritage significance were identified along the entire route of the proposed Ennis Bypass and Western Relief Road.

Earthwork and geophysical survey were undertaken on potential archaeological sites and invasive testing and excavation took place in 2002 and 2003 on some of the above ground sites affected by the proposed road (Aegis 2002, IAC 2003, Geoquest 2002, Earthsound 2003).

A systematic programme of testing along the new road route, involving the mechanical excavation of a central linear trench with offsets, took place in Summer/Autumn 2003. Twenty-two previously unknown sites, including cremation cemeteries, burnt stone spreads, enclosures and brick clamps were found (03E1291 Hull 2003 and 03E1293 Roger 2004). Monuments dating from the Bronze Age to the modern period were found.

Earlier phases of archaeological intervention on newly constructed stretches of the N18 (Dromoland to Carrigoran), to the immediate south of this road project, have demonstrated that the locality has a rich range of prehistoric and later monuments (99E0350 Hull and Tarbett-Buckley 2001).

Recent archaeological work on the BGE Gas Pipeline to the West in the neighbourhood of the new road route has tended to support the picture of continuous human activity in Co. Clare from the Neolithic and even becoming intensive from the Bronze Age. A number of burnt stone spreads and burnt mounds were excavated near the route of the new road in the summer of 2002 (MGL 2002).

Due to their location close to the ruins of Killow medieval church (CL034:102) the fields in which Site AR104 lies were identified at an early stage in the project as having archaeological potential. The potential site was named P4 and was subject to geophysical survey in 2002, revealing an anomaly thought to potentially represent a building in the southern field.

Despite the presence of Killow church 100m to the south, the only other new archaeological site discovered in the vicinity was site AR103, 450m to the south. Site AR103 consisted of a small burnt spread dated to the 9th to 10th centuries BC and a large modern water hole (Taylor 2006).

Earlier test excavations

The fields in which site AR104 lies were identified as potential site P4 and, following geophysical survey a number of test trenches were excavated (03E0836 Connolly, Aegis 2002). No archaeological deposits were discovered in this phase of testing.

Archaeological deposits were, however, found at this location during the centre-line and offset testing (03E1291 Hull 2003). These were: a burnt spread in the boggy south of the field, a cremation pit, linear features, a pit and two possible pits on the drier hillside. Chert and flint artefacts were found in the topsoil at the north of the field.

A deposit of burnt limestone pieces was observed beneath up to 1.25m of peat. The limits of the spread were defined by the strategic placement of extra test trenches and the spread was seen to measure 14m (east to west to edge of CPO) by 19m (north to south). The spread was lenticular in form and was between 0.15m thick at the edges and up to 0.5m thick at the centre.

To the north west of the burnt spread, on the lower slopes of the hillock, a cremation pit and a rather amorphous feature were recorded. Two possible pits were also examined at the north-west of the site, one of which proved upon excavation to be a root hole.

Four lithic items were found in the topsoil in a relatively discrete area at the north-east of the field. These pieces were a possibly worked flint, two possibly worked chert scrapers and a prehistoric chert blade.

Excavation aims and methodology

A licence to excavate was granted to Kate Taylor by the National Monuments Section of the Department of the Environment, Heritage and Local Government, in consultation with the National Museum of Ireland, on behalf of the Minister for the Environment, Heritage and Local Government. The licence number is 04E0191.

The aims of the excavation were to:

1) Preserve by record all archaeological deposits and features within the excavation area
2) Produce a high quality report of the findings

The fieldwork took place between the 16th February and the 10th March 2004. The excavation was directed by Kate Taylor and supervised by Richard Oram, assisted by Tim Dean, Lewis Goodman, Lee Roy Krackowicz, Siobhan McNamara, Frank Mulcahy, Michael Parks and Alan Smart.

The main excavation encompassed two areas separated by a deep drainage ditch and a hedge line. Together, these excavation areas had maximum dimensions of 130m by 85m and covered 6320m^2. Topsoil and overburden were removed by 15 tonne and 24 tonne, 360º tracked machines fitted with toothless grading buckets and operated under direct and continuous archaeological supervision. The spoil was visually scanned for artefacts.

Due to the danger of using heavy plant on the soft peat of the bog at the northern end of the site it was not possible to fully excavate the entire area that had originally been intended for investigation. It is unlikely that substantial archaeological deposits were located in this area, however, as the gravel sloped steeply into the bog and the water table lay close to the surface of the peat.

Following the discovery of a piece of struck chert on the surface of a backfilled test trench in the field to the south of the excavation trench, three extra test trenches were mechanically excavated to ascertain whether any further features were located nearby (extra area 273m^2 - Fig. 3). No additional

archaeological features or deposits were located and no further excavation took place in the southern field.

The majority of the site was cleaned using hand tools to fully define the limits of the potential archaeological features and deposits. Slots were dug to investigate all possible features and deposits and those that proved to be of archaeological interest were fully excavated.

The burnt spread and deep water-logged hollow beneath were, following recording, excavated mechanically under close archaeological control. The remainder of the archaeological deposits were excavated by hand.

A full written, drawn and photographic record was made according to the TVAS Ireland Field Recording Manual (First Edition 2003). The site was planned using a combination of digital and hand drawing methods. Digital plans were made using a Global Positioning System (GPS) unit, tied into the N18 surveying base station to provide millimetre accuracy.

Excavation results (Figs 3-8 and Plates 1-8)

The excavation revealed evidence of several phases of activity ranging in date from the prehistoric period to fairly recent times. As many of the features are undated it is not possible to describe the site by phase, instead the features are described by type. All features and contexts are listed in Appendix 1.

The archaeological features and deposits comprised two burnt stone spreads, twenty pits, a possible posthole, two ditches and one gully. Two peat layers were also recorded.

Peat and burnt stone spreads

The earliest peat layer, deposit 158, filled a deep hollow at the south-eastern edge of the main gravel island. This deposit was excavated mechanically as, despite the dry weather, the hollow was constantly flooded. A large amount of water-logged wood was observed in the peat and this was thought to be a fallen tree. A wooden stake was also recovered from the deposit.

The larger burnt stone spread, deposit 51, partially overlay peat layer 158 at the edge of the hollow. The deposit was recorded in two patches with a total area of 200m^2, was up to 0.40m thick and continued beyond the excavated area (Figs 4 and 5, Plate 3). The deposit had a concave, bowl-shaped profile, following the hollow beneath. Deposit 51 was a firm dark brown to black sandy silt with frequent inclusions of charcoal and burnt stone, mostly limestone but occasionally sandstone. No trough was associated with the stone spread.

Burnt stone spread 60 was located nearby. The deposit, which overlay the natural clay and a small pit, 2, had a total area of 8m^2 and was up to 0.10m thick. The material was a charcoal rich sandy silt with few burnt stone inclusions and may in fact have been a spread of material associated with pit 2.

Overlying both burnt stone spreads was a further peat layer, deposit 50. This deposit filled the hollow above the burnt stone, essentially forming the topsoil in this boggy area. In the deepest part of the hollow the peat was 1.25m thick; however it became thinner as the land rose to the north, south and west. Between the two patches of burnt stone spread 51, part of a wooden bowl was recovered from within the peat. As is frequently the case with peat deposits, it was not possible to directly relate the position of the artefact to nearby archaeological deposits.

Pits

Twenty pits were excavated on the site and it is not clear to what extent these features were related functionally or chronologically. The majority of the twenty pits were concentrated outside the

enclosure ditches to the south-east. The pits were generally stratigraphically discrete, although pit 2 lay beneath burnt stone spread 60 and pit 34 appeared to have been partially truncated by the outer enclosure ditch (11). A few of the pits at the south-east lay beneath peat layer 50. Pit 36 truncated gully 41 and may be a modern tree root hole.

The pits ranged in width from 0.5m to 2.0mm and were shallow and ranged in depth from 0.02m to 0.40m deep (Figs 4, 6 and 7). The pits are described individually in Table 1.

Over half the pits contained bone and some may represent cremation burials. In a few cases there was evidence of *in situ* burning and it is possible that some of the pits had a domestic function.

Table 1: Pit descriptions

Pit No.	Dimensions (m) (length x width x depth)	Plan Profile	Fill No. and description (in stratigraphic order)	Comments
1	1.40 (diameter) x 0.30	Circular Concave	52: Firm, mid brown peaty silt, occasional stones	Fig. 6
2	1.00 (diameter) x 0.05	Circular Concave	53: Loose, dark brown sandy silt, occasional charcoal	
3	0.50 x 0.40 x 0.10	Oval Steep sides to flat base	54: Soft, mid brown peat	Articulated bone in fill. Probably modern
4	0.30 (diameter) x 0.08	Circular Concave	55: Soft, dark grey – black sandy silt, frequent charcoal	
5	2.00 x 1.00 x 0.05	Irregular Irregular	56: Loose, dark orange – black sandy silt, frequent charcoal and burnt stones	
6	0.55 (diameter) x 0.06	Circular Concave	57: Firm, mid grey brown sandy silt, occasional stones and charcoal	?Cremation burial pit Fig. 7
7	1.00 (diameter) x 0.10	Circular Concave	58: Loose, black silt, frequent charcoal 64: Firm, yellow silty clay, occasional stones 65: Firm mid brown silt, occasional charcoal and stones	?Cremation burial pit Fig. 7, Plate 7
8	0.70 (diameter) x 0.15	Circular Concave	61: Loose, dark grey – black sandy silt, frequent charcoal 62: Loose, mid orange – black sandy silt, frequent charcoal 63: Loose, mid yellow, brown silty clay	?Cremation burial pit Fig. 7
9	0.80 x 0.45 x 0.06	Oval Irregular	59: Loose, dark brown – black sandy clay, occasional burnt stones and charcoal	?Cremation burial
10	0.60 x 0.40 x 0.02	Oval Concave	66: Firm, dark brown – black silty clay, occasional burnt stones and charcoal	

Pit No.	Dimensions (m) (length x width x depth)	Plan Profile	Fill No. and description (in stratigraphic order)	Comments
12	1.80 x 0.50 x 0.10	Oval Irregular	67: Loose, dark grey – black silt, frequent charcoal, occasional stones 68: Firm, mid brown silt, frequent charcoal and stones 69: Loose dark grey – black sandy silt, frequent charcoal, occasional stones 70: Loose, dark brown sandy silt, frequent charcoal and stones	?Cremation burial
14	0.90 x 0.60 x 0.04	Oval Concave	74: Firm, mid grey brown silty clay, occasional charcoal and stones 75: Firm pale yellow brown silty clay, occasional stones	?Cremation burial with possible capping layer Fig. 7
16	0.50 x 0.40 x 0.02	Oval Concave	78: Firm, dark grey brown silty clay, occasional charcoal and stones	
25	1.00 (diameter) x 0.25	Circular Steeply concave	Topsoil 73 in top 87: Firm, grey black sandy silt, occasional charcoal and stones	Relationship with pit 27 unclear. *In situ* burning
27	1.30 (diameter) x 0.40	Circular Steeply concave	Topsoil 73 in top 92: Firm, dark grey – black silt, frequent charcoal (laminated?), rare burnt stones	Relationship with pit 25 unclear. *In situ* burning Plate 8
32	0.70 x 0.60 x 0.08	Oval Concave	97: Firm, dark grey – black sandy silt, occasional charcoal and burnt stones	
33	1.70 x 0.30 x 0.20	Oval Concave	98: Firm, mid yellow brown sandy silt, occasional stones 99: Firm, dark grey brown sandy silt, occasional charcoal and stones	Possibly part of ditch 18 Partially excavated during testing 03E1291
34	1.80 (diameter) x 0.12	Circular Concave	150: Firm dark grey – black sandy silt, frequent charcoal, occasional burnt stones and burnt clay 152: Firm, reddish brown silty clay, occasional charcoal and stones	?Cremation burial *In situ* burning Beneath enclosure ditch Fig. 7
35	1.20 x 0.80 x 0.30	Irregular Concave	151: Loose, mid grey brown sandy silt, occasional stones	Modern (rubber in fill)
36	1.30 (diameter) x 0.24	Circular Concave	154: Firm, mid yellow brown sandy silt, occasional stones 153: Firm, mid grey –black sandy silt, frequent charcoal, occasional stones	*In situ* burning ?Root hole

Ditches

Two parallel curvilinear ditches, 11 and 18, partially enclosed the large gravel island on its eastern side. The ditches were 0.4-3.5m apart, with a typical gap between them of 2m. Both ditches were extremely shallow and poorly defined in the loose gravel (Figs 4, 7 and 8, Plates 5 and 6). At the northern ends the ditches petered out, whilst at the southern ends they appeared to have been

truncated. The outer ditch, 11, was visible for a length of 66m, was 1.0-2.3m wide and 0.15-0.35m deep. The inner ditch, 18, was discontinuous but the total length covered was 71m. Ditch 18 was 1.5-2.3m wide and 0.05-0.14m deep. A break of 5.5m near the southern end of ditch 18 was partially blocked by a shallow pit, 33. It is possible that this formed a complex entrance feature, or alternatively that the pit was originally simply an irregular part of the ditch itself. Both ditches had shallow concave profiles and the upper portions were largely infilled with material indistinguishable from the topsoil. Beneath the topsoil, fills were commonly mid grey brown sandy silts with gravel inclusions.

A possible posthole, 17, was observed in the base of ditch 11 close to the southern end. This feature was 0.50m in diameter and 0.14m deep with steep sides and a flat base. No related features were recorded and it is possible that this feature was simply the product of the removal of a large stone during the original excavation of the ditch.

Gully

A linear gully, 41, was recorded at the western edge of the site (Fig. 4). The gully was 40m long and was 0.40-0.50m wide and 0.04-0.07m deep with a shallow concave profile (Fig. 8). Although no dateable material was recovered, the feature appeared to represent an agricultural drain or furrow and was not thought to be very old.

Finds

Forty-seven artefacts were recovered both during excavation and from the sieved soil samples (Appendix 2). These items include wooden artefacts, human and animal bone assemblages, lithics, and pieces of metal.

The finds recovered from the location of site AR104 during testing (03E1291) were also examined in the context of the excavated site. These are lithic pieces from the topsoil and small bone assemblages from partially excavated pits.

The finds have been cleaned, numbered, labelled, properly packed and will be deposited with the National Museum of Ireland in accordance with *Advice Notes for Excavators* (NMI 1997).

Wooden bowl by Graham Hull

A piece of a wooden bowl (04E0191:1, Fig. 9 and Plates 4 and 9-11) was found in peat layer 50, not far from the burnt stone spread 51 (Fig. 4). The bowl was sent to ArchCon Labs for species identification and conservation. The vessel has a maximum external diameter of diameter of 225mm and a maximum internal diameter of 205mm. The surviving portion of the bowl is 100mm high and the wood is 10mm thick and has been identified by Lorna O'Donnell (ArchCon Labs) as *Fraxinus excelsior* (Common Ash or European Ash). This type of tree seldom becomes older than 250 years.

Conservation

The bowl was conserved by Cathy Daly/Erica Devine of Archcon Labs. There are no obvious turning lines, indicative of lathe manufacture, but there are two carved ridges that may represent the beginning of a rim detail or perhaps the upper part of the bowl.

The bowl on recovery was extremely soft and degraded and in five larger, and two small, pieces. The density of the wood was calculated by weighing two fragments in air and in water. This gave values for density as 0.149g/cc and 0.12g/cc.

The bowl was cleaned with a soft brush and water and traced on a Molinex overlay (exterior). The bowl fragments were placed into 2 litres of 10% v/v solution of PEG 400 in tap water. A solution of 35% PEG 3350 was added in increments. The bowl fragments were then frozen and freeze-dried until dry to touch. The bowl was reassembled with Mowilith DM427 adhesive and packed in an Addis box with acid-free tissue paper.

Radiocarbon determination

A radiocarbon determination was made from a sample of wood from the bowl. A piece of wood, weighing 250mg, was taken from the edge of the bowl and dated by the Radiocarbon Dating Laboratory, Queen's University Belfast (see below). The fragment of wood returned a date of 2461±32 (2 sigma Cal BC 777 to 407). Ash trees live for no longer than 250 years and it can therefore be stated with confidence that the bowl dates to the Iron Age.

Parallels for the wooden bowl

Of the few dozen prehistoric wooden bowls that have been discovered in Ireland or Scotland, most are from non-archaeological peat digging in the north of Ireland. Earwood (1989/90) has demonstrated clear typological affinities between wooden bowls and cauldrons and these same vessel types made in bronze. Radiocarbon dating has shown that many wooden bowls were manufactured in the late prehistoric period. The bowl from AR104 is similar in form to some of the other vessels from this period but incomplete survival means that there is no evidence of the handles that characterise those bowls. The lack of tool marks, on what are likely to be lathe-turned bowls, is typical and probably reflects high quality finishing by sanding or polishing the vessels. The AR104 bowl is made from ash and this wood is seemingly unusual as the other examples are mostly alder.

Given the lack of pottery in the Iron Age, wooden vessels must have played a significant role in daily life, and Earwood (*ibid.*) observes that, given the fineness of manufacture of many of the wooden vessels, this indicates that they were not merely 'poor man's substitutes' for metal vessels but were highly prized alternatives.

Wooden stake by Lorna O'Donnell

A worked piece of wood (04E0191:47, Fig. 10) was identified within a peaty deposit (158) immediately beneath the burnt stone spread 51. The stake was found in a vertical attitude within deposit 158. The stake has been conserved by ArchCon Labs in a solution of PEG and then frozen and freeze-dried.

Methodology

The piece of wood was sampled using a razor blade and examined under a light transmitting microscope at magnifications of 100x, 200x and 400x. The wood was identified using keys (Schweingruber 1990, Hather 2000 and Wheeler *et al* 1989) and reference material. Analysis followed methods employed by O'Sullivan (1996), O'Neill (2005) and Coles and Orme (1985). Facet measurements were taken with callipers and a protractor was used for cutting angles.

Results

The timber is a chisel ended hazel stake that ranged in diameter from 70mm to 80mm and was 260mm long. The wood was knotty with no surviving bark.

The stake was cut at a 25º angle and had slightly concave facets with clean junctions. The most complete facet was 4.2mm long and 3mm wide.

Discussion

The stake was well preserved in anaerobic bog conditions. An ash bowl was also recovered on the site, although it was not directly related to the stake and an ash stake was recovered from nearby during test trenching. The presence of both ash and hazel indicates that the site was located in a relatively dryland area. Ash is a vigorous grower, requiring a nutrient rich soil and plenty of light to flourish. It will tolerate waterlogged soils, but prefers dry (Preston *et al* 2002, 538). Hazel is often found with ash, or as an understorey in oak woods (Hickie 2002). Given the location of the site, it is likely that the wood was gathered on the dryer upslope part of the site or indeed away from the excavated area, as hazel would not grow in bogland conditions.

The clean facet junctions indicate that the stake was worked with a metal axe. The facets are slightly concave. The shallow cutting angle suggests the use of a sharp metal tool (O'Sullivan 1996, 264). The jam curves indicate that the stake had been chopped with a convex edged axe.

The wood was suitable for ring width analysis, as it was already broken across the diameter. The analysis showed the piece to be 23 years old. The pattern of growth is quite distinctive, as it is quite fast for the first three years, with a subsequent decrease in growth. This pattern of growth may be a result of coppicing. If a tree is coppiced, the first two or three rings tend to be wide, followed by a fall in growth rates (O'Sullivan 1998). The hazel stake may have been part of a coppice management cycle, or may have been cropped as part of adventitious coppice. While, until recently, the art of woodland management was seen to be a skill introduced to Ireland by the Anglo-Normans, there is no reason not to consider that prehistoric craftsmen did not employ some form of management. In Derryville bog, hazel was managed at least by the Iron Age, but also probably earlier (Stuijts 2005, 157). Mc Keown has identified evidence of possible management of ash from the Bronze Age mines in Mount Gabriel (1994) and in the Somerset Levels coppicing practices were already established by the Neolithic period (Morgan 1983). A greater amount of wood would need to be examined to establish whether any management techniques were being employed in the Ennis area when the site was in use.

Lithics by Dr Steve Ford

A collection comprising 19 lithic items was recovered from three excavation contexts (including topsoil), all hand collected. Just one context produced more than ten items. The material includes items made from quartz, chert and other rock.

Two items of chert were recovered, both flakes one of which was fine grained, partly cortical and patinated a whitish colour. The other piece was a grey/black colour.

Sixteen items of quartz were recovered. Of these, 15 were small fragments but one was a larger piece. It is unclear how much of this material was flaked as it does not, by and large, exhibit conchoidal fractures. Yet the material can produce sharp edges (cf Knight 1991) and its presence here in areas where the natural material does not outcrop but may be found locally in drift deposits (Briggs 1988) suggests it was brought to the site and used. Most of the minute fragments here are too small for use *per se* but they might represent retouch chips.

One flake, weighing 12g appeared to be of a fine grained metamorphic or igneous rock but is otherwise unidentified.

In addition, five items were recovered during the test trenching. All the pieces are catalogued in Table 2.

Table 2: Catalogue of lithics

Find number	Cut	Deposit	Sample	Description	Weight (g)	Dimensions (mm)
04E0191:8	-	73 – SE end	-	Broken flake, grey/black chert	5	
04E0191:9	-	73 – test trench	-	Hard rock, fine grained. possibly flaked. dorsal surface fresher than ventral	12	
04E0191:10	-	73 – over 11 and 18	-	10 fragments quartz , plus one larger piece	17	23x30
04E0191:43	30	95	-	3 fragments quartz	28	
04E0191:44	31	96	-	Broken chert/coarse flint flake cortical?, patinated whitish	<1	
04E0191:45	31	96	-	2 fragments quartz	8	
03E1291:2		topsoil	-	?Chert broken ?flake. No bulb of percussion	1	18
03E1291:3		topsoil	-	Possible ?chert flake. No obvious bulb of percussion	11	31
03E1291:4		topsoil	-	?Chert flake (intact)	2	35
03E1291:6		topsoil	-	White flint spall - debitage	<1	20
03E1291:17		Near 556	-	Rough quartz crystal. Unlikely to be worked	4	22mm

Human and animal bone by Sîan Anthony

Methodology

Bone from 31 contexts was examined from Site AR104 (Table 3). A variety of deposit types were excavated including probable domestic pits and ditches, burnt stone deposits, cremation burials and redeposited pyre debris or potentially cenotaph-type memorial deposits (McKinley 2000). Some of the bone was recovered during excavation; other material came from soil samples. The contexts thought to represent potential cremation burials were subject to whole-earth recovery and then wet-sieved to a 2mm fraction, all small pieces of bone were scanned rapidly as in many cases deposits only produced fragments under 1 or 2mm in size. The bones were not separated into size, so percentage fragmentation could not be calculated however the majority of fragments were under 2mm leaving a lack of recognisable pieces throughout the assemblage.

In addition, small fragments of bone were recovered from three deposits during the testing (Hull 2003). These assemblages are catalogued in Table 4. These pieces were a cow tooth was identified from deposit 559 (AR104 pit 33, deposit 98) but only small mammalian fragments from 560 (AR104 pit 33, deposit 99). Small fragments were also identified from 557 (AR104 pit 32, deposit 97), which included pieces of a fragmentary ovicaprid mandible. All were in poor condition.

Human osteological analysis followed recommendations from McKinley (1994, 2000) and Brickley and McKinley (2004). Mammalian bones were identified using standard texts (Hillson 1992 and Getty 1975), all were rapidly scanned and bones damaged on excavation were rejoined and counted as one bone. Small amounts of cremated material were only identified as mammalian only, this does not preclude the possibility that some may be human but could not be readily identified as such. Where they are recognised as animal this is noted.

The majority of the cremated bones were relatively well preserved, although some deposits retained a slightly worn and chalky appearance, trabecular bone was poorly represented with general limb bones and skull pieces often noted. However this is more likely from the easily identifiable nature of these pieces rather than any recognisable pattern in deposition. It has been demonstrated that trabecular bone and easily recognised articular surfaces are lost in adverse soil conditions (Neilson-Marsh et al 2000).

The small amount of cremated material may be a result of truncation, sites where it is estimated that the original ground levels were truncated contained extremely shallow pits and postholes; much of the original deposit may simply not be recovered. However in some cases the weight of bone is unlikely to represent a true cremation burial deposit, often they are likely to represent redeposited pyre debris.

Results

Nineteen cut features and three additional deposits produced a total of 451 fragments of bone weighing just over 2kg. Fragmentation was high in most deposits, particularly burnt contexts.

A range of expected domesticated animals are represented including ovicaprids, cattle, occasional horse and pig. One piece of wild deer antler was also recovered from topsoil 73 overlying one of the enclosure ditches.

Preservation varies between good and poor with cortical exfoliation and frequent fragmentation, presumably upon removal from their contexts. The deer antler had been cut to produce a small square measuring 59 by 30mm only, this was the only butchery mark observed, however animal gnawing was noted on a cattle radius.

Many pieces were burnt, mostly completely oxidised and possible cremated human bones were identified in assemblages from pits 12, 15 and 27. Other contexts could have contained human bones but were unidentified due to high fragmentation, thus are only categorised as mammalian.

Table 3: Catalogue of bone

Find Number	Cut	Deposit	Group Number	Sample Number	Species	Pres.	Burnt?	Colour	Total	Weight (g)	Maximum fragment size (mm)	Comments
04E0191:2	-	51		20	Mammal	G			5	<1	12	Fragments
04E0191:3	-	51-surface/ spoil			Cow	G			1	56		MC, distal unfused
04E0191:4	-	60		10	Mixed animal	E	40	Differ	59	36 (=16 + 20 crem)	18	Csz and mammal burnt fragments
04E0191:5	-	73	cleaning over 11		Mixed animal	P			4	127		Ssz. Deer, cow tooth, antler, limb bones, all weathered
04E0191:6	-	73	cleaning over 18		Mixed animal	P			5	332		very weathered cow, csz and s/g limb bones
04E0191:7	-	73 - over 21	cleaning over 18		Cow	P			2	118		Gnawed radius shaft
04E0191:11	1	52			Mixed animal	P			2	16		csz limb bones, s/g mandible, very weathered
04E0191:12	1	52		1	Mammal	G	1	Black	1	<1	13	Fragment
04E0191:13	2	53		2	Mixed animal	G	5	White/ dark grey	8	8		Csz and mammal fragments
04E0191:14	3	54			Cow	E			1	677		1 skeleton, juvenile
04E0191:15	5	56		4	Csz	P			15	243		Maxilla, tooth and limb bone fragments
04E0191:16	6	57		3	Mammal	E	10	White/ dark grey	10	1		Fragments
04E0191:17	7	58		5	Mammal	G	80	Differ	80	51 (=17 + 34 crem)		Varied burning
04E0191:18	7	64		26	Mammal	G	13	White/ dark grey	13	1		Possibly human
04E0191:19	8	61		7	Mammal	E	12	White, 1 charred	12	<1		Fragments
04E0191:20	8	62		8	Mammal	G	10	Differ	10	<1		Varied burning
04E0191:21	8	63		9	Mammal	E	5	White	5	<1		Fragments

Find Number	Cut	Deposit	Group Number	Sample Number	Species	Pres.	Burnt?	Colour	Total	Weight (g)	Maximum fragment size (mm)	Comments
04E0191:22	9	59			Mixed	E			7	84		Horse tibia and csz limb bones
04E0191:23	9	59		6	Mammal	E	8	White	8	<1		Fragments
04E0191:24	12	67		12	Mixed animal	G	35	White	40	10 (=6 + 4 crem)	15	mostly mammal fragments,, csz phalange, mammal tooth frgment and limb bones
04E0191:25	12	68		23	Mammal	G	5	White	5	<1	16	Fragments
04E0191:26	12	69		24	Mixed animal	G	2	White	3	82	46	Proximal horse MC - 46mm, rest mammal fragments
04E0191:27	12	70		25	Human	G	14	White/ dark grey	14	1	7	Fragments
04E0191:28	13	71	11	13	Mammal	G	4	White	4	<1	<2	Varied burning, fragments
04E0191:30	13	72	11	14	Mixed animal	P			11	39		csz and ssz fragments
04E0191:31	14	74			Mixed animal	G	4	White	5	6		ssz limb bone unburnt and weathered, rest fragments
04E0191:32	14	74		15	Mammal	G	15	Differ	15	<1	8	Varied burning, fragments
04E0191:33	14	75		16	Mammal	G	11	White	11	<1		Possibly human
04E0191:34	15	76	11		Csz	P			7	34		Limb bones
04E0191:35	15	76	11	17	Mammal	G	4	White	4	<1		Fragments
04E0191:36	15	77	11		Human	G			1	2	23	Limb bone
04E0191:37	19	80	11		Csz	E			10	24		Horncore, skull and limb bone fragments
04E0191:38	21	82	18		Horse	P			1	36	40	Mp distal end, dbdth -40mm
04E0191:39	22	91	11		Mixed animal	E	15	White	15	8		Ssz and mammal fragments
04E0191:40	26	88	18		Mammal	P			6	4		Fragments
04E0191:41	27	92		18	Human	G	41	Differ	41	15	37	Most grey-white, but some are just charred, fragments
04E0191:42	29	93	18		Mixed animal	P			6	77		Very weathered, pig, horse, csz vert
04E0191:46	34	150			Mammal	E	4	White	4	<1		Fragments

Table 4: Bone from test excavations

Find Number	Cut	Deposit	Equivalent Context Numbers AR104		Species	Pres.	Burnt?	Colour	Total	Weight (g)	Maximum fragment size (mm)	Comments
03E1291:15	501	559	33	98	Cow	G			1	20		Tooth
03E1291:16	501	560	33	99	Mammal	G			15	3	<2	Fragments
03E1291:19	-	557	32	97	S/g	P			1	10		Mandible in pieces

Samples

Twenty-six bulk soil samples were taken from a number of well-stratified and sealed contexts (Appendix 3). Twenty-four of these samples have been floated and wet sieved through a 300micron mesh and then through a 2mm mesh in order to recover charred plant material, cremated bone and small artefacts. The heat-affected stone was retained from the two samples of burnt stone deposits.

In addition, a small sample of wooden fragments was collected from the peat immediately beneath the location of the bowl. These have not been analysed as their relevance to the bowl could not be demonstrated.

Two peat column samples were taken. On reflection, and considering previous palaeoenvironmental work in the area, these samples will probably not greatly enhance our understanding of the past landscape and it is therefore no further work has been undertaken.

Identification of stone samples by Dr Martin Feely

Methodology

TVAS delivered two plastic bags containing six and seven stone samples taken from two deposits from site AR104, both burnt spreads. The thirteen stone samples were identified using a Nikon incident light binocular microscope. Each stone sample in each sample bag has been given a letter and the description of each stone is matched below to that letter.

Results

Table 5: Rock types

Cut	Deposit	Sample	Identification
-	51	20	6 stones: a) Micaceous sandstone b) Medium grained sandstone c) Fossiliferous carboniferous limestone d) Fossiliferous carboniferous limestone e) Fossiliferous carboniferous limestone f) Fossiliferous carboniferous limestone
-	60	10	7 stones: a) Medium grained sandstone b) Medium grained sandstone c) Igneous rock (maybe volcanic in origin) with fine grained porphyritic texture (visible crystals set in a finer grained groundmass) displaying quartz/feldspar crystals d) Fine grained sandstone e) Igneous rock displaying porphyritic texture. Feldspar crystals are set in a fine grained matrix f) Igneous rock displaying porphyritic texture. Feldspar crystals are set in a fine grained matrix g) Igneous rock displaying porphyritic texture. Feldspar crystals are set in a fine grained matrix

Fragmentation of stones

I see nothing exceptional about the stone samples and the average size of each stone is quite small <100mm to pebble size. They represent material I would expect to encounter in glacial debris. I cannot say that they are smaller fragments of larger heated stones dropped into cold water.

Discussion

In general the stone samples from the Ennis Bypass are either sandstone or limestone. The sandstones are of three main types: a common sandstone, a micaceous variety which has visible "shiny" flakes mica and finally a pebbly variety like a fine conglomerate. The limestone samples all have visible fossiliferous material similar to that found in the Lower Carboniferous limestones of Ireland.

Additional "stone" varieties include fragments of the mineral calcite, quartz and fine grained igneous rocks. The sandstone samples most likely represent Devonian sandstones while there is little doubt that the limestone is Lower Carboniferous in age. This is not surprising as both geological periods are represented by rock exposures in the west and southwest of the country. Glacial debris commonly contains disaggregated blocks of both rock types. The fragments of calcite and quartz probably formed part of geological structures termed veins, which transect existing rocks. The igneous varieties may represent samples of Carboniferous volcanic rocks but this is speculative.

Charred plant macrofossils and other remains by Val Fryer

Introduction

Samples for the extraction of the plant macrofossil assemblages were taken from contexts across the excavated area, and 24 were submitted for assessment (Table 6). Of these samples, one (sample 18) was selected for quantification and the results of this analysis is also incorporated into the table.

Methods

The samples were floated and wet sieved by TVAS Ireland Ltd, and the flots were collected in a 300 micron mesh sieve. The dried flots were scanned under a binocular microscope at magnifications up to x 16, and the plant macrofossils and other remains noted are listed below on Table 6. Nomenclature within the table follows Stace (1997). Counts of cereal grains include only whole grains or embryo ends, and material was identified by comparison with modern reference specimens. All plant remains were charred. The density of material within each assemblage is expressed in the tables as follows: x = 1 – 10 specimens, xx = 10 – 100 specimens and xxx = 100+ specimens.

Results

Plant macrofossils

With the exception of sample 18, charcoal fragments formed the principal component of all the assemblages, although pieces of charred root/stem, tuber and buds were also reasonably common. Hazel (*Corylus avellana*) nutshell fragments were present at a low to moderate density in eleven assemblages.

Sample 18 (from pit 27) was somewhat unusual as it contained a moderate to high density of cereals and weeds seeds. Oat (*Avena* sp.), barley (*Hordeum* sp.) and wheat (*Triticum* sp.) grains were recorded, with barley being particularly abundant (108 grains per litre of soil sampled). Due to the severe puffing and distortion of the grains during combustion, few could be closely identified, although a small number of asymmetrical lateral grains of six-row barley (*H. vulgare*) were noted. Chaff was extremely rare, but four poorly preserved bread wheat (*T. aestivum/compactum*) type rachis

nodes, identified by their characteristic crescentic glume inserts, were recovered. A very limited range of weed seeds were recorded, with all being of common segetal species (namely brome (*Bromus* sp.), black bindweed (*Fallopia convolvulus*) and persicaria (*Persicaria maculosa/lapathifolia*)). It is perhaps of note that the seeds were all of a similar size to the cereals; these would not have been easily separated from the grains and, along with the oats and wheat, were probably tolerated as contaminants of the main barley crop.

Barley and wheat grains were also noted within the fills of pit 12 (samples 12 and 23), although at a far lower density than those recorded from the above feature.

Other remains

Small fragments of burnt bone were recorded from a total of nine pit fills, and rare pieces were also noted within burnt stone spread 60 (sample 10). Burnt soil concretions and/or fragments of heavily burnt peat were abundant in the assemblage from sample 5. The fragments of black 'cokey' and tarry material are probable residues of the combustion of organic remains at very high temperatures.

Discussion

Those assemblages derived from possible cremation deposits appear to indicate that wood and/or charcoal was the principal fuel used for cremating the deceased, although peat may have been utilised for the cremation within pit 7. The presence of buds, tubers and pieces of root/stem possibly suggests that the pyres were kindled with hedge brush or uprooted dried plant material, although some of these remains may be derived from material burnt *in situ* under the pyres. Although the nutshells may be present as offerings to the deceased, it is equally possible that they were part of the hedge brush kindling.

Although cereal grains are abundant in sample 18 (pit 27), accurate interpretation of the assemblage is made difficult by the condition of the macrofossils. It is apparent that the material was burnt at a very high temperature, possibly on repeated occasions, and this burning may have drastically altered the original composition of the assemblage by destroying a range of less robust seeds and chaff elements. Despite this, it may be possible to speculate that the assemblage has a domestic origin, possibly being derived from material accidentally spilled during culinary preparation. Barley was the only cereal commonly utilised as a whole grain, often being used as a supplement to soups and stews. It is also well suited to cultivation on the local soils, as it is reasonably salt tolerant. Although the assemblage contains little which could indicate a potential date for the deposit, it is perhaps of note that it's composition is closely paralleled by a seventh to tenth century sample from a site at Manusmore (Site AR102), also excavated as part of the Ennis Bypass scheme (see Fryer 2006).

Conclusions

In summary, most assemblages appear to be derived from fuel waste/pyre debris, with wood/charcoal being the principal fuel utilised.

Although the interpretation of a single sample is difficult, it would appear most likely that the assemblage from pit 27 is derived from a domestic origin, possibly from material spilled during culinary preparation.

Table 6: Catalogue of charred plant macrofossils and other remains

Sample No.		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Cut No.		**1**	**2**	**6**	**5**	**7**	**9**	**8**	**8**	**8**		**10**	**12**
Deposit No.		**52**	**53**	**57**	**56**	**58**	**59**	**61**	**62**	**63**	**60**	**66**	**67**
Cereals	**Common name**												
Hordeum sp. (grains)	Barley												xcf
Triticum sp. (grains)	Wheat												xcf
Tree/shrub macrofossils													
Corylus avellana L.	Hazel		x	x		x	x	x	x		xx		
Other plant macrofossils													
Charcoal <2mm		x	xx	xxx	xx	xx	xx	xxx	xxx	xx	xxx	xx	xxx
Charcoal >2mm		x	x	xxx	x	x	xx	xxx	x	xx	xx	xx	xx
Charred root/stem			x	x		x		xx	x	x	x		x
Indet.buds									x				
Indet.tuber frags.				xcf			x						
Indet.seeds						x			x				
Other remains													
Black porous 'cokey' material			x	x		x					x		
Bone			xb	xb	x xb	xx xxb		xxb	xb		x xb		x xb
Burnt stone				x		x		x					x
Burnt soil concretions/peat						xxx							
Vitrified material													x
Sample volume (litres)		**2**	**2**	**4**	**1**	**6**	**1**	**0.5**	**0.5**	**0.5**	**10**	**1**	**1**
Volume of flot (litres)		**<0.1**	**<0.1**	**0.4**	**<0.1**	**0.4**	**<0.1**	**0.1**	**0.1**	**<0.1**	**0.1**	**<0.1**	**0.2**
% flot sorted		**100%**	**100%**	**50%**	**100%**	**50%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**50%**

Table 6: Catalogue of charred plant macrofossils and other remains (continued)

Sample No.		**13**	**14**	**15**	**16**	**17**	**18**	**20**	**21**	**23**	**24**	**25**	**26**
Cut No.		**13**	**13**	**14**	**14**	**15**	**27**		**34**	**12**	**12**	**12**	**5**
Deposit No.		**71**	**72**	**74**	**75**	**76**	**92**	**51**	**150**	**68**	**69**	**70**	**64**
Cereals	**Common name**												
Avena sp. (grains)	Oat						336						
Hordeum sp. (grains)	Barley						1088			x			
(sprouted grains)							4						
H. vulgare L. (grains)	Six-row barley						36cf						
Triticum sp. (grains)	Wheat						44						
T. aestivum/compactum type (rachis nodes)	Bread wheat type						4						
Cereal indet (grains)							400					x	
Tree/shrub macrofossils													
Corylus avellana L.	Hazel	xcf					12fg	x	x				
Herbs													
Bromus sp.	Brome						8						
Fallopia convolvulus (L.) A.Love	Black bindweed						84						
Persicaria maculosa/lapathifolia	Persicaria						48						
Other plant macrofossils													
Charcoal <2mm		x	x	xx	x	xxx	xx	xxx	xxx	xxx	xxx	xx	x
Charcoal >2mm		x	x	xx	x	xxx	xxx	xx	xxx	xx	xx	xx	xx
Charred root/stem			x	x		x			x				
Indet.buds								x					
Other remains													
Black porous 'cokey' material							x					x	
Black tarry material		x							x	x			
Bone					x xb							x	
Burnt stone			x			x		x				x	
Mineralised soil concretions				x									
Sample volume (litres)		**12**	**15**	**0.5**	**1**	**1**	**10**	**10**	**10**	**1**	**1**	**1**	**4**
Volume of flot (litres)		**<0.1**	**<0.1**	**<0.1**	**<0.1**	**0.1**	**0.5**	**0.3**	**1.5**	**<0.1**	**<0.1**	**<0.1**	**<0.1**
% flot sorted		**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**50%**	**<10%**	**100%**	**100%**	**100%**	**100%**

Charcoal by Simon Gannon

Introduction

Twenty-four samples of charcoal fragments were retrieved from 24 contexts from the site, consisting of enclosure ditches, a burnt stone spread and pits. Identification of taxa of the retrieved charcoal may assist in the reconstruction of the local, contemporary woodland-environment and the use of the woodland resources by the people responsible for the archaeological features.

Methodology

In sorting fragments suitable for identification a guide size of at least 2mm in radial cross-section was used. In this sort some samples were found to contain an unusually large number of fragments and sub-samples were taken, as detailed in Analysis Results.

Initially the grain direction of the fragments was identified before fracturing across their transverse plains. Identifications were made under microscopic examination, in most cases. Further fractures were made to reveal radial and/or tangential plains in cases where identification was more difficult. Magnification of between x10 (hand lens) to x400 was used. Structural elements of the fragments were examined to allow for identification of roundwood, heartwood, and sapwood features.

Reference material comprised a reference collection of charred samples of taxa and reference publications, *Microscopic Wood Anatomy* (Schweingruber 1990) and *The Identification of the Northern European Woods* (Hather 2000).

Analysis Results

The results are summarized in Table 7. Classification follows that of *Flora Europae* (Tutin *et al* 1964-80). Certain related taxa cannot be securely differentiated on the basis of their anatomical characteristics and are assigned to their respective family groups as with the genera *Salix* and *Populus*, and the genera *Craetaegus, Malus* and *Sorbus.* Provisional identifications have been given in cases where the condition of the charcoal was degraded.

The various identifications of wood taxa were consistent with taxa from the following groups:

<u>Broadleaf taxa</u>
Betulaceae. *Alnus* sp., alder, *Betula* sp., birch.
Corylaceae. *Corylus* sp., hazel.
Fagaceae. *Quercus* sp., oak.
Oleaeceae. *Fraxinus* sp., ash.
Rosaceae.
Subfamily Pomoideae. *Craetagus* sp., hawthorn; *Malus* sp., apple; *Sorbus* spp., *Sorbus aucuparia*, rowan; *S. aria*, whitebeam; *S. hibernica*, Irish whitebeam, and other *Sorbus* species.
Prunus sp., *Prunus avium*, wild cherry; *P. spinosa*, blackthorn; *P. padus*, bird cherry.
Salicaceae. *Salix* sp., willow; *Populus* sp. poplar.
Ulmaceae. *Ulmus* sp., elm.

<u>Coniferous taxa</u>
Cupressaceae. *Taxus* sp. yew.

Discussion

Anatomical characteristics from charcoal fragments do not allow for identification of individual species in every case. Several species belong to groups of species, species of genera, of sub-families

and of families that cannot be separated anatomically (Schweingruber 1990, Hather 2000). It is possible that a narrow range of species and, occasionally, one or two species can be indicated with a degree of confidence due to established factors, principally their native status and history of introduction by people (Huntley and Birks 1983, Peterken 1996 and Scannell and Synott 1987). The following section places the given charcoal based taxa identifications in the context of defined tree species allowing for implications related to their environmental characteristics and possible use by ancient peoples to be drawn. Reference works consulted include Goldstein *et al* 1984, Huntley and Birks 1983, Kelly 1998, Mitchell 1978, O'Sullivan 1996, Rackham 1976-90, Raftery 1996, Scannell and Synott 1987 and Tutin 1964-80.

Taxa descriptions

Alder

The sole native species is *Alnus glutinosa*, Common Alder, Irish fearnóg (family – Betulaceae).
Environment indications. Tolerant of nearly all soil types including relatively infertile soils, such as ironpan and peaty soils. Particularly tolerant of water logged conditions and is often a streamside tree. Has the ability to 'pioneer' into previously disturbed land. Native distribution throughout Ireland.
Uses in antiquity. A hardwood suitable for a variety of artefacts and smaller structural timber. Tends to harden when in contact with water and therefore suitable for making piles etc. It burns quickly when used for firewood but has been found suitable for charcoal production.

Birch

There are two native species silver birch, *Betula pendula*, beith gheal and downy birch, *B. pubescens*, beith chlúmhach. (Family - Betulaceae).
Environmental indications Tolerating a wide range of habitats, preferring dry sandy soils, *B. pubescens* tolerant of wetter conditions. A light demanding species, not surviving under the mature canopy of woodlands. Pioneering well, invading cleared land and creating conditions suitable for other trees. *B. pubescens* is native to all of Ireland, *B. pendula* to west and central Ireland.
Uses in antiquity. Wood is not strong but flexible and tough although decays/ breaks down and burns out easily. Bark is waterproof and durable. Coppices quite well.

Hazel

There is a single native species, *Corylus avellana*, hazel, coll (family - Corylaceae).
Environmental indications. Botanically a shrub, but does not flower and fruit without sunlight, so is really a canopy tree preferring woodland edges and clearings though it bears moderate shade and is also found as understorey, typically in oak woodlands. Fairly tolerant of poor soils but does not grow on acid soils and preferring chalky, fertile, deep soil. Growing throughout Ireland.
Uses in antiquity. A tough and flexible wood, useful for small implements and small structural elements. Also grows easily in coppice-like form producing rods suitable for wattle and basketry type structures. Makes useful firewood.

Ash

There is a single native species, *Fraxinus excelsior*, ash, fuinseog (family - Oleaceae).
Environmental indications. Requiring deep, fertile, moist but well drained, soils. Grows well in mixed stands when not shaded. Widespread throughout Ireland.
Uses in antiquity. A strong but elastic wood suitable for many purposes including structural timber (not where in prolonged contact with water or soil). Coppices readily. Burns well even when green, partly due to low water content.

Hawthorn/ *Sorbus*

The represented species is probably one or more of the following native members of the sub-family Pomoideae that includes several *Sorbus* species. (Family - Rosaceae).

Crab Apple, *Malus sylvestris*, cran fia-úll; hawthorn, *Crataegus monogyna*, sceach geal.
Environmental indications. Both species. Very rugged and adaptable to almost any climate and most soil types, requiring moist soil and can grow in semi-shade or no shade. Natural distribution throughout Ireland.
Uses in antiquity. Both species produce a very hard close grained wood, suitable for small implements such as mallets and splitting wedges. Both species make excellent fuel; *C. monogyna* can also make livestock barriers and is noted for being the hottest firewood.

Sorbus. One or more of the native group of at least six species that includes, the most widespread rowan, *Sorbus aucuparia*, caorthann, as well as whitebeam, *Sorbus aria*, fionncholl coiteann; and Irish whitebeam, *Sorbus hibernica*, fionncholl ghaelach.
Environmental indications. General. Very tolerant of soil quality generally, though requiring moist soil. Tolerating light shade, though fruiting better in a sunny position. Effective pioneer, Rowan natural to all of Ireland. Other *Sorbus* species native to Ireland have a much more restricted range within Ireland and elsewhere, with Irish whitebeam found only in Ireland.
Uses in antiquity. Heavy, close grained hard wood suitable for carving and useful for making bows, tool handles, mallet heads and, if sizable, beams etcetera. Coppices well.

Blackthorn/ cherry

Here there are three native species, wild cherry, *Prunus avium*, crann silin; blackthorn, *Prunus spinosa*, draighean and bird cherry, *Prunus padus*, donnroisc. (Family - Rosaceae).
Environmental indications. Tolerant of most soils, preferring well-drained, acid, neutral and alkaline soils. Can grow in semi-shade, e.g. light woodland, or no shade, requiring moist soil. *P. spinosa* is common as a shrub in woods, can grow in semi-shade, scrub, often forming thickets, sometimes small trees. *P. spinosa* is a pioneer species, invading cultivated fields. Natural distribution throughout Ireland. *P. padus* native over more northern parts of Ireland.
Uses in antiquity. *P. avium* and *P. padus* produce a very hard wood and, when attaining good size, highly rated for timber. *P. spinosa* has very hard wood but often twisted, of no structural use but useful for small components and used as livestock barriers.

Oak

There are two native species, pedunculate oak, *Quercus robur*, dair ghallda and sessile oak, *Quercus petraea*, dair ghaelach. (Family - Fagaceae).
Environmental indications. Broadly soil tolerant. *Q. robur* preferring alkaline or neutral soils rich in minerals, particularly damp clay soils and usually found in mixed woodland. *Q. petraea* preferring acid and lighter well drained soils, often in pure stands. Both species are naturally distributed throughout Ireland.
Uses in antiquity. Both species produce a hard wood resistant to abrasion and water degradation, particularly useful for structural timber and implements, poles and fencing. Woodland trees can be coppiced to produce stakes, straight poles etcetera. The density of oak wood makes for an optimum long lasting fire fuel (Rossen and Olsen 1985).

Willow /poplar

The Salicaceae family provides various possible individual species, native to Ireland, including ten or more from the genera of willows and one from the genera of poplars.

Willow

There are ten or more willow species native to Ireland, though some having restricted range. Examples of the more widespread species being eared willow (*Salix aurita*), crann sníofa; goat willow (*Salix caprea*), sailchearnach; and grey willow (*Salix cinerea*), saileach liath.
Environmental indications. Extremely hardy and tolerant of a wide range of soils and habitats, often growing in, though not restricted to, wet places. Not tolerant of drought. *S. cinerea* and *S. purpurea* are not particularly shade tolerant, *S. caprea* is reputably more tolerant of shade. These are 'pioneer' species and can move into areas where the soil has been disturbed such as cleared woodland.
Uses in antiquity. Very tough and flexible wood useful for woven structures. Brittle branchwood not suitable as timber breaks violently when burnt. The stems are very flexible. Coppiceable, it can produce stout poles.

Poplar
Aspen, *Populus tremula*, crann creathach.
Environmental indications. Tolerant of poor soils growing on scrub, frequent on damp sites on hillsides, in rocky valley bottoms. A woodland tree where not under canopy. Moderately tolerant of drought as mature tree, not at all as a seedling. A short-lived pioneer tree. Native to Ireland.
Uses in antiquity. Wood is very soft with limited usefulness, of low flammability but making good charcoal.

Yew

The native species is yew, *Taxus baccata*, iúr (family - Taxaceae).
Environmental indications. Growing on limestone and chalk in woods and scrub, often occurring in dense shade of oak woods. Also can form pure stands in sheltered sites. Natural distribution throughout Ireland.
Uses in antiquity. A heavy, hard, durable, and elastic wood, resistant to water. Useful for structures, bows, tool handles etc. Makes good firewood.

Elm

The sole native species is *Ulmus glabra*, wych elm, leamhán sléibhe (family-Ulmaceae).
Environmental indications. Generally requiring non-calcareous top soil, can grow in heavy clay soil, needing moist but not waterlogged ground. Distribution throughout Ireland. Moderately shade tolerant.
Uses in antiquity. A hard, elastic, wood which is durable under water. Useful as structural timber, implements etcetera. Responds well to coppicing. The inner bark fibre can be used for ropes, mats etc.

The total range of taxa from AR104, Killow, comprises birch (*Betula*), hazel (*Corylus*), ash (*Fraxinus*), hawthorn/apple/*Sorbus*-group (Pomoideae), cherry/blackthorn (*Prunus*), oak (*Quercus*), willow/poplar (Salicaceae), yew (*Taxus*), elm (*Ulmus*) and possibly alder (*Alnus*). The represented taxa belong to the groups of species represented in the native Irish flora and, conversely, non-native tree species such as lime (*Tilia*) and beech (*Fagus*) are not represented.

Generally, there are various, largely unquantifiable, factors that effect the representation of species in charcoal samples including bias in contemporary collection, inclusive of social and economic factors, and various factors of taphonomy and conservation (Théry-Parisot 2002). On account of these considerations the identified taxa are not considered to be proportionately representative of the availability of wood resources in the environment in a definitive sense and are possibly reflective of particular choice of fire making fuel from those resources.

A local environment with a relatively wide range of trees and shrubs is indicated from the charcoal of this site. There is a strong overall level of consistency in taxa representation between the samples. Hawthorn/apple/*Sorbus*-group (Pomoideae) and cherry/blackthorn (*Prunus*) are consistently represented in higher numbers than oak (*Quercus*) or ash (*Fraxinus*) which are overall prevalent taxa from the Ennis Bypass sites. Hazel (*Corylus*) is well represented in one context (pit 34, deposit 150, sample 21) and otherwise less well in the samples than hawthorn/apple/*Sorbus*-group (Pomoideae) and

cherry/blackthorn (*Prunus*). Oak (*Quercus*) has a consistently low presence, appearing in a relatively high number in just one context (pit 27, deposit 92, sample 18). Willow/poplar (Salicaceae) is also consistently represented above the average of the Ennis Bypass sites. The overall picture of wood use varies from that of most of the other Ennis Bypass sites excepting Site AR103, Killow, with which there is a distinct correspondence in surviving charcoal taxa (Gannon 2006). With oak (*Quercus*) and ash (*Fraxinus*) present in the environment of AR104, as evidenced by the site charcoal, there is a possibility that fire fuel choice may have included a factor other than the obtaining of maximum fire energy from these sources. It may also be worth noting that the three dominant taxa, hawthorn/apple/*Sorbus*-group (Pomoideae), cherry/blackthorn (*Prunus*) and hazel (*Corylus*) are mainly producers of *wood* rather than *timber*, as with oak (*Quercus*) and ash (*Fraxinus*), which suggests that structural by-production is a less likely fire fuel source. It may also be considered that prior human activity could have significantly reduced the availability of structural timber trees, especially oak (*Quercus*), as at the Bronze Age settlement at Clonfinlough, Co. Offaly (Maloney *et al* 1993). It is also possible that characteristics of the woodland environment, such as particular abundance of the most common charcoal taxa of this site, encouraged the indicated bias in collection. From the samples containing hazel (*Corylus*) there are several with nut shell fragments, which may indicate circumstances involving food processing near the various deposits.

Conclusion

The identified taxa produce a picture of wood use that varies from most of the other Ennis Bypass sites but that corresponds closely to the other Killow site, AR103. Oak and ash are represented in relatively low numbers while there is a preponderance of hawthorn/apple/*Sorbus*-group (Pomoideae) and cherry/blackthorn (*Prunus*) through the samples, albeit with a greater overall total of hazel (*Corylus*). Willow/poplar (Salicaceae) also appears consistently. The charcoal of the site has probably derived from fire fuel debris, and a particularly ready access to, and possible preference for hawthorn/apple/*Sorbus*-group (Pomoideae), cherry/blackthorn (*Prunus*) and hazel (*Corylus*) is indicated.

Table 7: Number of identified charcoal fragments per sample

Sample	Cut	Deposit	Context type	*Alnus*	*Betula*	*Corylus*	*Corylus/ Alnus*	*Fraxinus*	Pomoideae	*Prunus*	*Quercus*	Salicaceae	*Taxus*	*Ulmus*
1	1	52	Pit	-	-	-	-	-	-	-	-	-	-	-
2	2	53	Pit	-	-	4 (1r 3sh)	-	7	4	-	3	-	-	-
3	6	57	Pit	-	2	44 (3sh)	-	8	29 (3r)	9	6	2	-	1
4	5	56	Pit	-	-	4	-	-	11	14	-	-	-	-
5	7	58	Pit	-	-	18 (1sh)	-	6	39 (3r)	6	1	1	-	-
6	9	59	Pit	-	-	6 (6sh)	-	-	9	4	3	-	-	-
7	8	61	Pit	-	-	13	-	2	35	37	-	-	-	-
8	8	62	Pit	-	-	5 (1r)	-	1	7	8	-	-		-
9	8	63	Pit	-	-	-	6	-	30	12	-	-	-	-
10	-	60	Burnt spread	-	-	17 (15sh)	-	49	17	2	9	1	-	-
11	10	66	Pit	-	-	-	9	-	2	-	-	2	-	-
12	12	67	Pit	-	-	18	-	6	26	39	-	6	1	-
13	13	71	Ditch	-	-	-	1	4	-	-	-	-	-	-
14	13	72	Ditch	-	-	-	-	-	-	-	1	-	-	-
15	14	74	Pit	-	-	-	1	1	1	-	2	-	-	-
16	14	75	Pit	-	-	-	-	-	-	-	-	-	-	-
17	15	76	Ditch	-	-	-	-	-	-	-	9	-	-	-
18	27	92	Pit	-	-	5 (2sh)	-	-	2	8	84	1	2	2
20	-	51	Burnt spread	-	-	41	-	12	-	-	-	-	-	-
21	34	150	Pit	-	-	102	-	-	-	-	-	-	-	-
23	12	68	Pit	-	-	19	-	-	8	4	-	-	-	-
24	12	69	Pit	-	-	4	-	-	8	14	-	-	-	-
25	12	70	Pit	-	-	5	-	1	7	2	-	2	-	-
26	5	64	Pit	-	-	-	-	-	4	-	?1	?1	-	-

(r: roundwood; sh: nut shell)

Radiocarbon dates

Six radiocarbon determinations were made by Beta Analytic Inc, Miami, Florida (Table 8).

Table 8: Radiocarbon determinations

Sample material	Cut	Deposit	Sample	Lab code	Radiometric age	Calendrical calibrations
Wood Fraxinus	-	Wooden bowl 04E0191:1	-	UB-6287	2461±32 BP	2 sigma (95%) Cal BC 777 to 407 1 sigma (68%) Cal BC 764 to 513
Charred Hazelnut	7	58	5	Beta-211589	2390±40 BP	2 sigma (95%) Cal BC 750 to 700 and Cal BC 540 to 390 1 sigma (68%) Cal BC 430 to 400
Charcoal Corylus	-	51	20	Beta-211591	2940±40 BP	2 sigma (95%) Cal BC 1280 to 1010 1 sigma (68%) Cal BC 1210 to 1060
Charcoal Corylus	34	150	21	Beta-211592	2220±40 BP	2 sigma (95%) Cal BC 390 to 180 1 sigma (68%) Cal BC 370 to 200
Cattle sized limb bone	15	76	-	Beta-211590	640±40 BP	2 sigma (95%) Cal AD 1280 to 1410 1 sigma (68%) Cal AD 1290 to 1320 and Cal AD 1340 to 1390
Cattle sized limb bone	19	80	-	Beta-213002	400±40 BP	2 sigma (95%) Cal AD 1430 to 1530 and Cal AD 1560 to 1630 1 sigma (68%) Cal AD 1440 to 1500

The radiocarbon determinations indicate that human activity was taking place on the site from the Late Bronze Age through to the Early Iron Age and then again in the medieval period. Specifically, it can be seen that there are three phase of activity. A burnt stone spread dating to between 1280 BC and 1010 BC, pits and the wooden bowl dating to between 777 BC and 180 BC and a pair of curvilinear ditches dating to between AD 1280 and AD 1630.

Note about Sample 04E0191 15 by Ron Hatfield, Beta Labs

It should be noted that Sample 04E0191 15 (Beta-211590) yielded a C13/12 ratio of -23.7 o/oo despite looking quite good through the treatments. Depleted (more negative) C13/12 ratios than -22.0 o/oo can be indicative of the presence of exogenous carbon compounds that could not be removed by the pretreatments and purification processes. Generally these exogenous carbon compounds if present will cause a bias in the results usually in the more recent direction - by how much is dependant upon the actual age of the bone and the age and amount of contaminant present.

In some circumstances depleted C13/12 ratios can also be caused by highly degraded proteins (this did not appear to be evident) or due to partial heating or burning (also not apparent). Other reasons could be due to illness, starvation or diets very rich in animal fats.

Typically Beta Labs do not recommend dating samples such as this unless there are other lines of evidence to evaluate the accuracy of the result with or if a "minimum age" result is acceptable. The sample would be "at least as old as" the age reported...but perhaps in truth somewhat older.

Discussion

The excavation of site AR104 at Killow, Co. Clare has produced evidence of a gravel hillock that was partially enclosed by a pair of ditches in the later medieval period. At the base of this hillock, on the margins of boggy ground, a burnt stone spread dating to the later Bronze Age was examined and a wooden bowl dating to the late Bronze Age/early Iron Age transition was found nearby. Also from this transition period were possible human cremation burials perhaps associated with deposits of cereals and possibly horse deposits.

The topography of the local landscape is most likely to have influenced and attracted human activity. The gravel hillock could be thought of as an 'island' in a very boggy environment. This insularity would favour defence and might promote thoughts of sacredness as well as being, more prosaically, a dry spot in a wet locale.

Unfortunately, the site was poorly preserved, in that the loose nature of the gravel into which many of the features were cut, lends itself to disturbance by agriculture and tree roots. There is then, the probability that redeposition and residuality have distorted the artefactual assemblages and potentially dates of some of the features.

Prehistoric

The earliest dated activity found on the site was a spread of burnt limestone and sandstone that was used in the period between the 13th and 11th centuries BC. It is not clear what specific activity the spread represents; however it is likely that the stone was used to heat water in a similar manner to *fulachta fiadh*, with the lack of a trough perhaps indicating that the water was held in a portable container. The burnt stone material extended slightly beyond the excavated area and further archaeological deposits may be present outside the CPO.

A burnt stone spread dated to the 9th to early 10th centuries BC was excavated 450m to the south (AR103, Taylor 2006) and there is the possibility that that the two burnt stone spreads were either contemporary or may have been used consecutively. Other burnt stone activity is recorded in the immediate vicinity – a *fulacht fiadh* is noted on the Sites and Monument Record map (CL034-19901) 350m to the south-east.

Fulachta fiadh, in general, seem to have a floruit in the middle/late Bronze Age (Grogan 2005 and Brindley *et al.* 1990). While the burnt stone spread at AR104 cannot be described as a classic *fulacht fiadh* (i.e. there is no significant crescentic mound or large trough), it has been argued that *fulachta fiadh* seem to occur in the proximity of habitation enclosures (Cooney and Grogan 1994) and that these monuments may have formed part of a social 'round', in which individual family groups hosted reciprocal ceremonial activities for the local community (Grogan 2005).

The wooden bowl, found in close proximity to the burnt stone spread, has been dated to the period 777 BC to 407 BC and while this is at least 230 years later, given the long period of use of burnt stone spreads evidenced on other sites, there is the possibility that the bowl and spread are related. Perhaps the bowl was used to contain hot water or for food consumption.

Five deposits of cremated human (or possibly human) bone were identified, four of which were in small pits. The single dated sample (of possible human bone) indicates burial in the periods 750 BC to 700 BC or 540 BC to 390 BC. These dates are significant, in that they add to the very small corpus of late Bronze Age/early Iron Age funerary activity known in Ireland between the years 800 BC and 400 BC (Tiernan McGarry UCD forthcoming and *pers. comm.*). The Ennis Bypass road project also produced cremation burials from this underrepresented period at Site AR102, 2km to the south-east at Manusmore (Hull 2006). The low bone weights, despite the evident truncation and disturbance seen on the site, suggest cenotaph (or memorial) burial, where only a representative part of the pyre deposits was collected.

Of potentially significance, is the fact that horse bones were found associated with one human burial and present in three other nearby contexts. Horses are generally held to have been introduced into Ireland, in small numbers, from the Iron Age, and it is just possible that these equine deposits were votive. The easy disturbance of the gravel into which the archaeological features were cut, urges caution, however, of over-interpretation of the significance of the horse remains.

Also, seemingly associated with two of the human burials, were significant quantities of charred cereals (oat, barley and wheat) and these may have been burnt deliberately and deposited with the remains of the dead, perhaps as offering for the afterlife.

Medieval

The hillock was enclosed on its eastern side by two parallel ditches. These ditches were shallow and do not appear to have been defensive, although with a fence or hedge they may have served to contain stock. The ditches may have originally formed a complete circuit around the hill but as few internal features were discovered, the purpose of the enclosure is not clear.

Two deposits from within one of the ditches were radiocarbon dated and both samples indicate that the ditch was in use in the period between the later 13th and earlier 17th centuries AD. The proximity of Killow church, 220m to the south-east, may be significant. The church and graveyard, as extant today, are relatively modern (O'Donovan and Curry 1839) but it is probably located on the site of an earlier church associated with Clare Abbey and mentioned in the abbey's charter dating to AD 1195 (Power 2004, 21). The Irish name *Cill-Lugha* (Lugha's church) indicates that the church was dedicated to Saint Lugha.

The church and the gravel hillock, that was examined as site AR104, are on dry land surrounded by very boggy ground and it would be surprising if there was not some association – the two sites are intervisible and both are located on relatively high ground – although the nature of that association can not now be appreciated.

Archaeological potential off the road CPO

The excavation within the road CPO has demonstrated that significant archaeological deposits have survived at Site AR104. On the drier ground to the east of the CPO it is possible that features associated with the enclosed hillock could be present. On the boggy west outside the CPO it is possible that further burnt spreads exist. Similarly, in this area, other gravel islands have archaeological potential.

Publication plan

A summary of the findings of the excavation has been submitted to *Excavations 2004*.

Copies of this final excavation report will be deposited with the Clare County Museum and the Local Studies Library, Ennis, Co. Clare

A summary article, describing the findings of this road project has been published in the local journal *The Other Clare* (Hull and Taylor 2005).

An illustrated information brochure describing the findings of this road project has been published by Clare County Council.

The stated aim of the National Roads Authority with regard to archaeological publication is clear, (O'Sullivan 2003) and it is anticipated that the results of this excavation will be disseminated as a component of a monograph dedicated to the archaeology of the Ennis Bypass. Publication is expected to take place in 2006/7 at the latest.

The radiocarbon dated *fulachta fiadh* and burnt stone spreads excavated as part of this road project and a number of other dated burnt stone sites, excavated by the author and others on the BGE Gas Pipeline to the West (Grogan forthcoming), on the west bank of the upper Fergus estuary would make an informative article in a national journal and would provide valuable comparative data to supplement the Discovery Programme research programme. It is proposed to discuss this thematic and regional publication with the Project Archaeologist Sébastien Joubert and with Eoin Grogan.

_____

Kate Taylor MIAI MIFA
TVAS Ireland Ltd
1st August 2006

References

Aegis, 2002, F Coyne and T Collins, Archaeological test trenching investigations report, unpublished report

Babtie Pettit Ltd, 2000, N18 Road Improvements Dromoland to Crusheen (including the Ennis Bypass), Environmental Impact Statement

Brickley, M, and McKinley, J (eds), 2004, *Guidelines to the Standards for Recording Human Remains*, IFA Paper no.7, Reading

Brindley, A L, Lanting, J N and Mook, W G, 1990, Radiocarbon dates from Irish fulachta fiadh and other burnt mounds, *The Journal of Irish Archaeology* **5**, 25-33

Briggs, C, S, 1988, Stone resources and implements in prehistoric Ireland: a review, *Ulster Journal of Archaeology*, **51**, 5-20

Cooney, G and Grogan, E, 1994, *Irish prehistory: a social perspective*, Wordwell, Bray

Coles, J M, and Orme, B J, 1985, Prehistoric woodworking from the Somerset Levels: 3. Roundwood, *Somerset Levels Papers* **11**, 25-50

DAHGI, 1999a, *Framework and Principles for the Protection of the Archaeological Heritage*, Department of Arts, Heritage, Gaeltacht and the Islands, Govt. of Ireland, Stationary Office, Dublin

DAHGI, 1999b, *Policy and Guidelines on Archaeological Excavation*, Department of Arts, Heritage, Gaeltacht and the Islands, Govt. of Ireland, Stationary Office, Dublin

Doyle, S, 1999, Archaeological study for EIS of proposed N18 Road Development, Dromoland to Crusheen (Ennis Bypass), Co. Clare, Archaeological Development Services report

Earthsound, 2003, J Bonsall, Archaeological geophysical survey of AR22, unpublished report

Earwood, C, 1989/90, Radiocarbon dating of late prehistoric wooden vessels, *Journal of Irish Archaeology*, **V**, 37-44

Fryer, V, 2006, 'Charred plant macrofossils and other material' in N18 Ennis Bypass and N85 Western relief Road, Site AR102, 04E0189, Manusmore, Co. Clare, unpublished Final Archaeological report, TVAS Ireland report 04/01o

Gannon, S, 2006, 'Charcoal' in K Taylor, Site AR103, 04E0190, Killow, Co. Clare, N18 Ennis Bypass and N85 Western Relief Road, unpublished Final Archaeological report, TVAS Ireland report 04/01p

Geoquest 2002, M J Noel, Geophysical survey of areas on the route of the proposed N18, unpublished report

Getty, R, 1975, *Sisson and Grossman's The Anatomy of the Domestic Animals*, 5th Edition, London

Goldstein, M, Simonetti, G, Watschinger, M, 1984, *Complete Guide to Trees and their identification*. MacDonald Illustrated

Grogan, E, 2005, *The North Munster Project, Vol 1, The later prehistoric landscape of south-east Clare*, Discovery Programme Monographs, 6, Wordwell, Bray

Grogan, E, (ed) forthcoming, The Archaeology of the Gas Pipeline to the West

Hather, J G, 2000, *The identification of northern European woods*, Archetype, London

Hickie, D, 2002, N*ative trees and forests of Ireland*, Gill and MacMillan, Dublin

Hillson, S, 1992, *Mammal Bones and Teeth*, London

Hull, G, 2006, 04E0189, N18 Ennis Bypass, Site AR102, Manusmore, Co. Clare, Final Archaeological Report, TVAS Ireland report J04/01o

Hull, G, 2003, 03E1291, N18 Ennis Bypass Archaeological Test Excavations, Contract 4, Central Linear Trench with Offsets (Southern and Western Sections), Final Archaeological Assessment Report, TVAS Ireland report J03/12b

Hull, G and Tarbett-Buckley, C, 2001, Archaeological Monitoring and Excavation, N18/N19 Road Improvement Scheme, Ballycasey-Dromoland Contract 1, Licence 99E0350, unpublished report, Valerie J Keeley Ltd

Hull, G and Taylor, K, 2005, 'Archaeology on the route of the Ennis Bypass', *The Other Clare*, Vol **29**, 35-41, Shannon Archaeological and Historical Society

Huntley, B and Birks, H J B, 1983, *An atlas of past and present pollen maps for Europe: 0-13000 years ago*, Cambridge University Press

IAC, 2003, E Connolly and D Nelis, Report on archaeological testing on the N18 Ennis Bypass, unpublished preliminary report

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

Knight, J, 1991, Vein quartz, *Lithics*, **12**, 37-56

Maloney, A, Jennings, D, Keane, M and McDermot, C, 1993, *Excavations at Clonfinlough County Offaly*, Transactions of the Irish Archaeological Wetland Unit, vol. 2, Crannóg, Dublin

McGarry, T, forthcoming, Irish Late Prehistoric Burial Practices: continuity, developments and influences, *Trowel* **XI**, UCD, Dublin

Mc Keown, S, 1994, 'The analysis of wood remains from Mine 3, Mount Gabriel' in W O'Brien (ed) *Mount Gabriel, Bronze Age mining in Ireland*, Galway University Press, Galway, 135-162

McKinley, J I, 1994, 'The Anglo-Saxon cemetery at Spong Hill, North Elmham, part VIII: the cremations', *E Anglian Archaeol* **69**

McKinley, J I, 2000, 'The Analysis of Cremated Bone', in M Cox, and S Mays (eds) *Human Osteology*, 403–21, London

MGL, 2002, Gas Pipeline to the West, Section 3, Archaeological Excavations, unpublished final reports, Margaret Gowen & Co, Ltd, Glenageary, Co. Dublin

Mitchell, A, 1978, *Collins Field Guide: Trees of Britain & Northern Europe, 2nd Ed*.

Morgan, R, 1983, Tree-ring studies in the Somerset Levels: The examination of modern hazel growth in Bradfield woods, Suffolk, and its implications for the Prehistoric data, *Somerset Levels Papers* **9**, 44-49

Neilson-Marsh, C, Gernaey, A, Turner-Walker, G, Hedges, R, Pike, A and Collins, M, 2000, 'The chemical degradation of bone', in M Cox, and S Mays (eds) *Human Osteology,* 403–21, London

NMI, 1997, Advice Notes for Excavators, unpublished guidelines, National Museum of Ireland, Dublin

NRA/MAHGI, 2001, *Code of Practice between the National Roads Authority and the Minister for Arts, Heritage, Gaeltacht and the Islands*

O'Donovan, J and Curry, E, 1839, Ordnance Survey Letters, Clare County Library

O'Neill, J, 2005, 'Worked wood' In M Gowen, J O Neill and M Philips (eds), *The Lisheen Mine Archaeological Project 1996-8*, Wordwell, Bray 329-340

O'Sullivan, A, 1996, Neolithic, Bronze Age and Iron Age, in B Raftery (ed), *Trackway excavations in the Mountdillon Bogs, Co. Longford 1985 – 1991,* Crannóg Publication, Dublin, 291 – 243

O'Sullivan, A, 1998, 'Woodmanship and the supply of underwood and timber to Anglo-Norman Dublin' in C Manning (ed), *Dublin and beyond the Pale, Studies in honour of Patrick Healy,* Wordwell, Bray, 59-70

O'Sullivan, J (ed), 2003, *Archaeology and the National Roads Authority*, NRA, Dublin

Peterken, G F, 1996, *Natural Woodland, Ecology and Conservation in Northern Temperate Regions*, Cambridge

Power, J, 2004, *A History of Clare Castle and its Environs,* Joseph Power, Ennis

Preston, C D, Pearman, D A and Dines, T D, 2002, *New Atlas of the British Flora*, Oxford University Press, New York

Rackham, O, 1976-1990, *Trees and Woodland in the British Landscape. The Complete History of Britain's Trees, Woods and Hedgerows,* J M Dent

Raftery, B (ed), 1996, *Trackway Excavations in the Mountdillon Bogs, Co. Longford 1985-1991. Irish Archaeological Wetland Unit Transactions* Vol. 3, Crannog, University College Dublin

Roger, T, 2004, 03E1293, N18 Ennis Bypass Archaeological Test Excavations, Contract 3, Central Linear Trench with Offsets (Northern Section), Moore Group Ltd, Draft Preliminary Archaeological Assessment Report

Rossen, J, and Olson, J, 1985, The controlled carbonisation and archaeological analysis of SE U.S. wood charcoals, *Journal of Field Archaeology* **12**, 445-456.

Scannell, M J P and Synott, D M, 1987, *Census Catalogue of the Flora of Ireland.* Stationary Office, Dublin

Schweingruber, F H, 1990, *Microscopic Wood Anatomy*, Swiss Federal Institute for Forest, Snow and Landscape Research, Birmensdorf

Stace, C, 1997, *New Flora of the British Isles,* Second edition, Cambridge University Press

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

Taylor, K, 2006, Site AR103, 04E0190, Killow, Co. Clare, N18 Ennis Bypass, unpublished Final Archaeological report, TVAS Ireland report 04/01p

Taylor, K, 2004, Site AR104, 04E0191, Killow, Co. Clare, N18 Ennis Bypass, unpublished Preliminary Archaeological report, TVAS Ireland report 04/01e

Théry-Parisot, I, 2002, 'Gathering of firewood during the Palaeolithic' in S Thiébault (ed), *Charcoal Analysis, Methodological Approaches, Palaeoecological Results and Wood Uses*, BAR International Series 1063

Tutin, T G, Heywood, V H, Burges, N A, Valentine, D H (eds), 1964-1980, *Flora Europaea*, Volumes 1-5, Cambridge University Press

Wheeler, E A, Bass, P and Gasson, P E, 1989, *IAWA list of microscopic features for hardwood identification*, IAWA Bulletin Nos **10(3)**, Leien, Rijksherbarium, 219-332

Appendix 1: Catalogue of features and deposits

Cut	Deposit	Group number	Description	Samples	Finds
1	52	-	Pit	1	11-12 = bone
2	53	-	Pit	2	13 = bone
3	54	-	Pit	-	14 = bone
4	55	-	Pit	-	-
5	56	-	Pit	4	15 = bone
6	57	-	Pit	3	16 = bone
7	58, 64, 65	-	Pit	5, 26	17-18 = bone
8	61, 62, 63	-	Pit	7, 8, 9	19-21 = bone
9	59	-	Pit	6	22-23 = bone
10	66	-	Pit	11	-
11	-	11	Ditch – group number	-	-
12	67, 68, 69, 70	-	Pit	12, 23, 24, 25	24-27 = bone
13	71, 72	11	Ditch slot	13, 14	28-30 = bone, metal
14	74, 75	-	Pit	15, 16	31-33 = bone
15	76, 77	11	Ditch slot	17	34-36 = bone
16	78	-	Pit	-	-
17	79	-	?Posthole	-	-
18	-	18	Ditch – group number	-	-
19	80	11	Ditch slot	-	37 = bone
20	81	18	Ditch slot	-	-
21	82	18	Ditch slot	-	38 = bone
22	83, 84, 89, 90, 91	11	Ditch slot	-	39 = bone
23	85	18	Ditch slot	-	-
24	86	11	Ditch slot	-	-
25	87	-	Pit	-	-
26	88	18	Ditch slot	-	40 = bone
27	92	-	Pit	18	41 = bone
28	94	18	Ditch slot	-	-
29	93	18	Ditch slot	-	-
30	95	11	Ditch slot	-	43 = quartz
31	96	18	Ditch slot	-	44-45 = chert, quartz
32	97	-	Pit	-	-
33	98, 99	-	Pit	19	-
34	150, 152	-	Pit	21	46 = bone
35	151	-	Pit	-	-
36	153, 154	-	Pit	22	-
37	157	41	Gully slot	-	-
38	156	41	Gully slot	-	-
39	155	41	Gully slot	-	-
40		-	Not used	-	-
41		41	Gully – group number	-	-
-	50	-	Peat deposit	27	1 = wooden bowl
-	51	-	Burnt stone deposit	20	2-3 = bone
-	60	-	Burnt stone deposit	10	4 = bone
-	73	-	Topsoil	-	5-10 = bone, chert, quartz
-	158		Peat in hollow	-	47 = wood

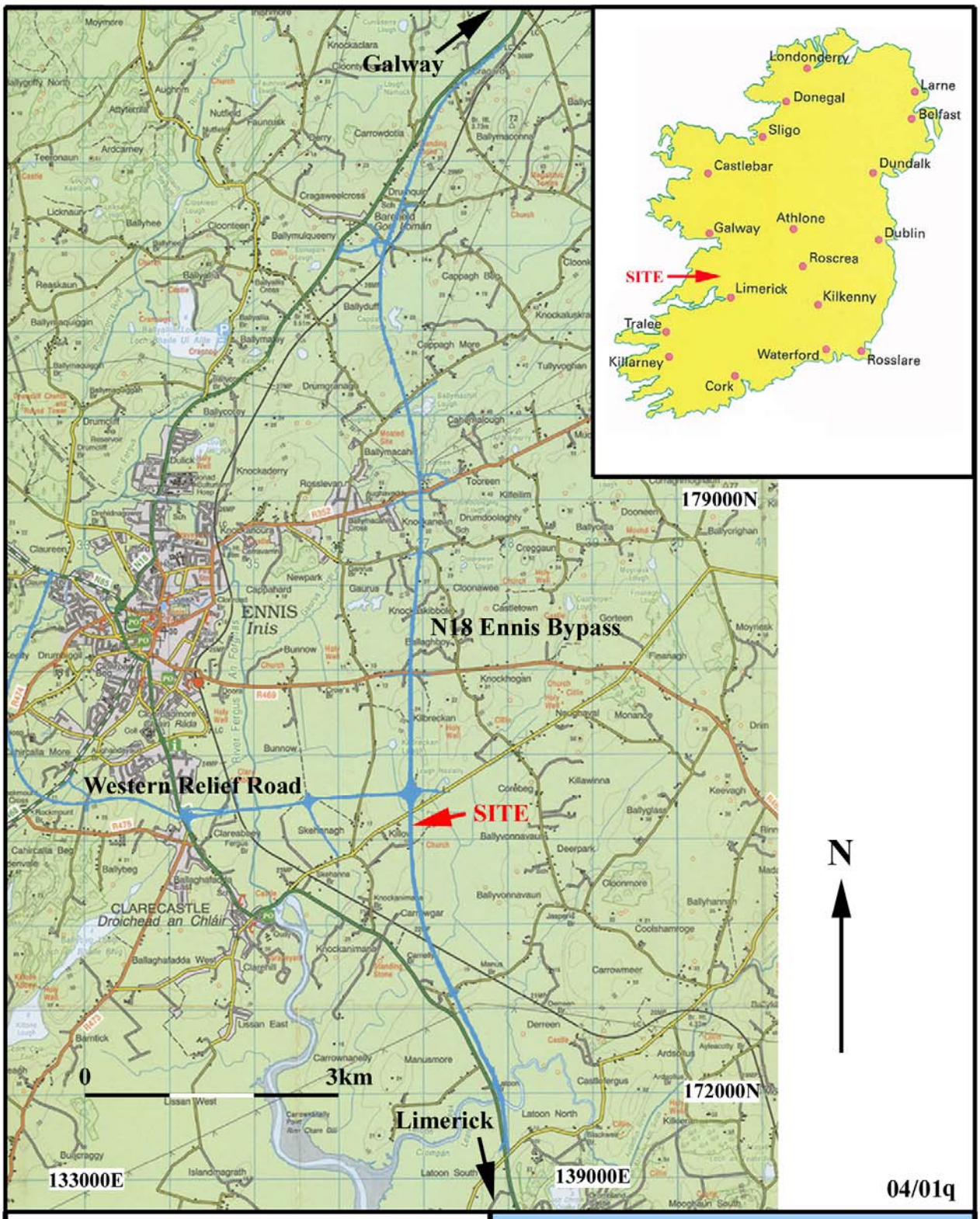
Appendix 2: Catalogue of artefacts

Find No	Cut	Deposit	Group No	Sample No	Category	Description	No pieces	Weight
1	-	50			Wood	Bowl	7	81
2	-	51		20	Bone	Small fragments	5	<1
3	-	51-surface/spoil			Bone	Bone	1	56
4	-	60		10	Bone	Fragments - some burnt	59	36
5	-	73	cleaning over 11		Bone	Fragments	4	127
6	-	73	cleaning over 18		Bone	Fragments	5	332
7	-	73 - over 21	cleaning over 18		Bone	Bones	2	118
8	-	73 - SE end of site			Lithic	Chert	1	5
9	-	73 - test trench			Lithic	Chert	1	12
10	-	73	cleaning over 11 & 18		Stone	Quartz - possibly worked	11	16
11	1	52			Bone	Fragments	2	16
12	1	52			Bone	Fragments	1	<1
13	2	53		2	Bone	Fragments - some burnt	8	8
14	3	54			Bone	Almost entire skeleton?	Lots	677
15	5	56		4	Bone	Fragments	15	243
16	6	57		3	Bone	Burnt fragments	10	1
17	7	58		5	Bone	Burnt fragments	80	51
18	7	64		26	Bone	Burnt fragments	13	1
19	8	61		7	Bone	Burnt fragments	10	24
20	8	62		8	Bone	Burnt fragments	10	<1
21	8	63		9	Bone	Burnt fragments	5	<1
22	9	59			Bone	Fragments	7	84
23	9	59		6	Bone	Burnt fragments	8	<1
24	12	67		12	Bone	Fragments - some burnt	40	10
25	12	68		23	Bone	Fragments - some burnt	5	<1
26	12	69		24	Bone	Fragments - some burnt	3	82
27	12	70		25	Bone	Burnt fragments	14	1
28	13	71	11	13	Bone	Burnt fragments	4	<1
29	13	71	11	13	Metal	?Iron fragments	2	<1
30	13	72	11	14	Bone	Fragments	11	39
31	14	74			Bone	Fragments - some burnt	5	6
32	14	74		15	Bone	Fragments - some burnt	15	<1
33	14	75		16	Bone	Burnt fragments	11	<1
34	15	76	11		Bone	Fragments	7	34
35	15	76	11	17	Bone	Burnt fragments	4	<1
36	15	77	11		Bone	Burnt fragments	1	2

Find No	Cut	Deposit	Group No	Sample No	Category	Description	No pieces	Weight
37	19	80	11		Bone	Fragments	14	18
38	21	82	18		Bone	Fragments	2	36
39	22	91	11		Bone	Burnt fragments	15	8
40	26	88	18		Bone	Fragments	6	4
41	27	92		18	Bone	Burnt fragments	41	15
42	29	93	18		Bone	Fragments	6	77
43	30	95	11		Stone	Quartz - possibly worked	3	27
44	31	96	18		Lithic	Chert	1	1
45	31	96	18		Stone	Quartz - possibly worked	2	7
46	34	150			Bone	Burnt fragments	4	<1
47	-	158			Wood	Stake, pieces co-joining	2	

Appendix 3: Catalogue of samples

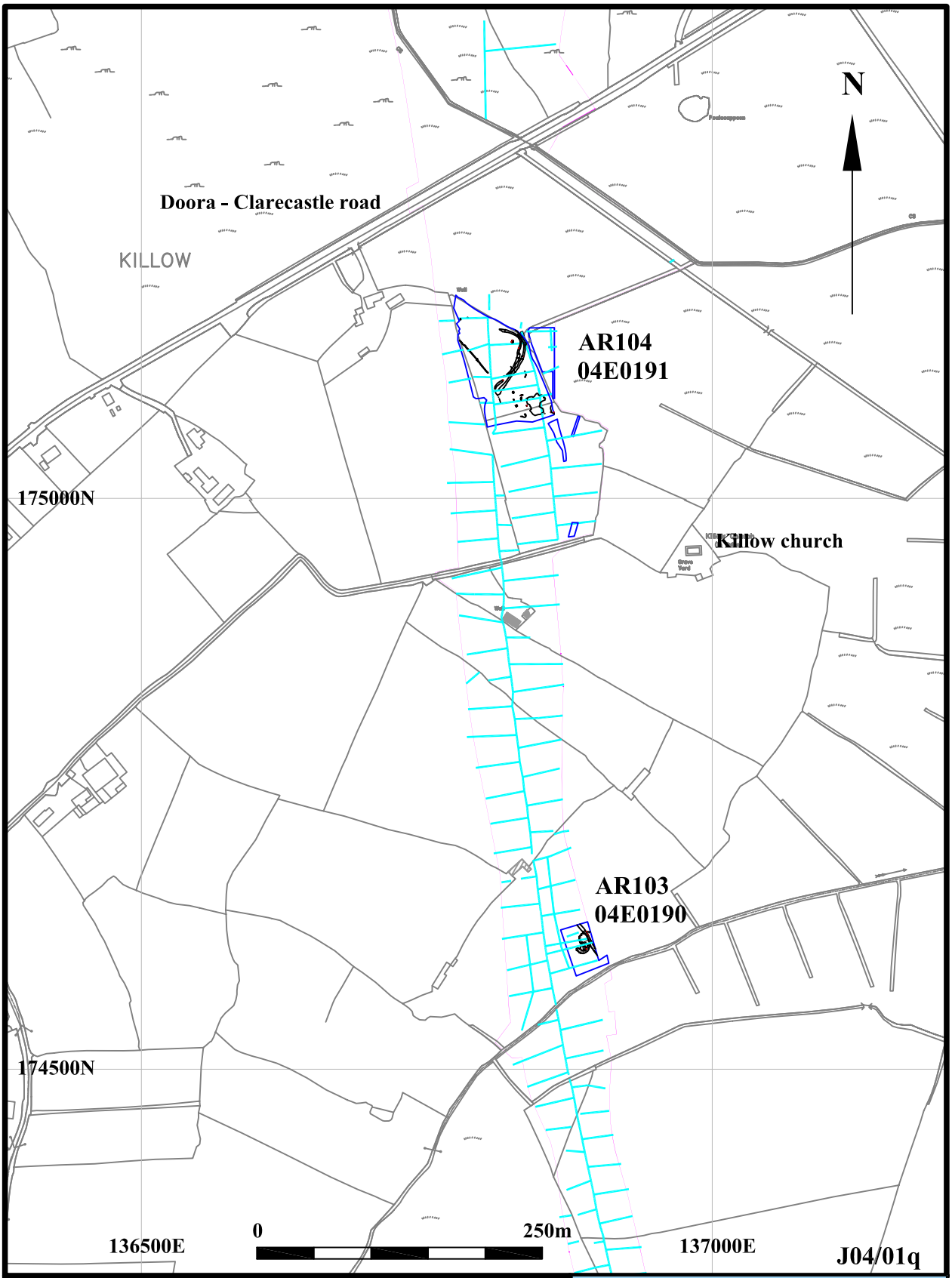
Sample number	Cut	Deposit	Group number	Volume sieved (L)	Volume floated (L)	Finds?	Stone sample?	Flot?
1	1	52	-	2	2	Bone	N	Y
2	2	53	-	2	2	Bone	N	Y
3	6	57	-	4	4	Bone	N	Y
4	5	56	-	1	1	Bone	N	Y
5	7	58	-	6	6	Bone	N	Y
6	9	59	-	1	1	Bone	N	Y
7	8	61	-	0.5	0.5	Bone	N	Y
8	8	62	-	0.5	0.5	Bone	N	Y
9	8	63	-	0.5	0.5	Bone	N	Y
10	-	60	-	10	10	Bone	Y	Y
11	10	66	-	1	1	Bone	N	Y
12	12	67	-	1	1	Bone	N	Y
13	13	71	11	12	12	Bone; metal	N	Y
14	13	72	11	15	15	Bone	N	Y
15	14	74	-	0.5	0.5	Bone	N	Y
16	14	75	-	1	1	Bone	N	Y
17	15	76	11	1	1	Bone	N	Y
18	27	92	-	10	10	Bone	N	Y
19	33	99	-	-	-	-	-	-
20	-	51	-	10	10	Bone	Y	Y
21	34	150	-	10	10	Bone	N	Y
22	36	153	-	-	-	-	-	-
23	12	68	-	1	1	Bone	N	Y
24	12	69	-	1	1	Bone	N	Y
25	12	70	-	1	1	Bone	N	Y
26	5	64	-	4	4	Bone	N	Y
27	-	50 beneath bowl	-	-	-	-	-	wood



N18 Ennis Bypass, Site AR104,
Killow, Co. Clare
04E0191

Figure 1: Site location

TVAS IRELAND LTD



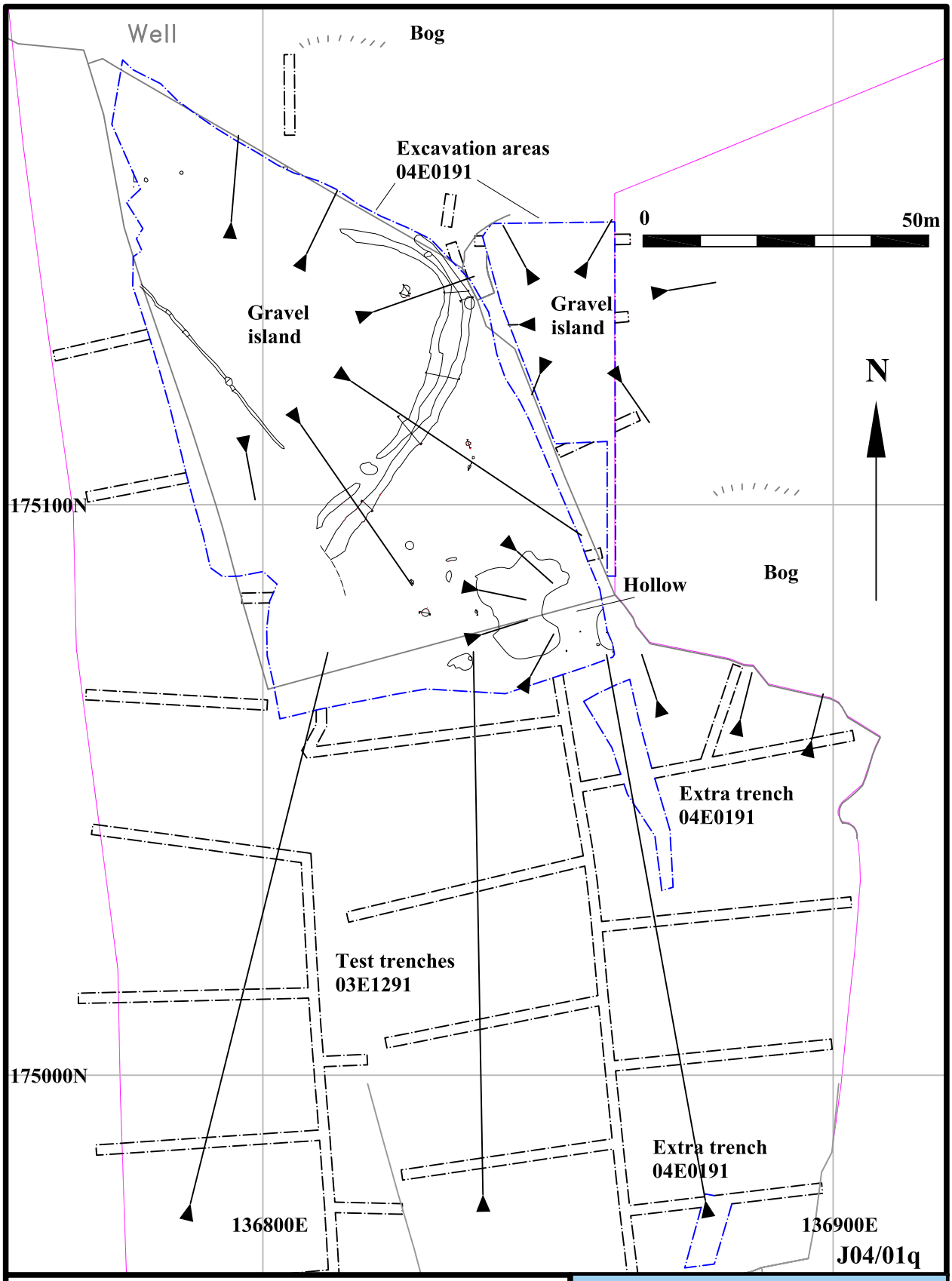
N18 Ennis Bypass, Site AR104, Killow, Co. Clare

04E0191

Figure 2: Location of site in local landscape, showing test trenches (03E1291)

Scale 1:5000 OSI Licence: AR0049406 Copyright OSI & Govt. of Ireland

TVAS IRELAND LTD



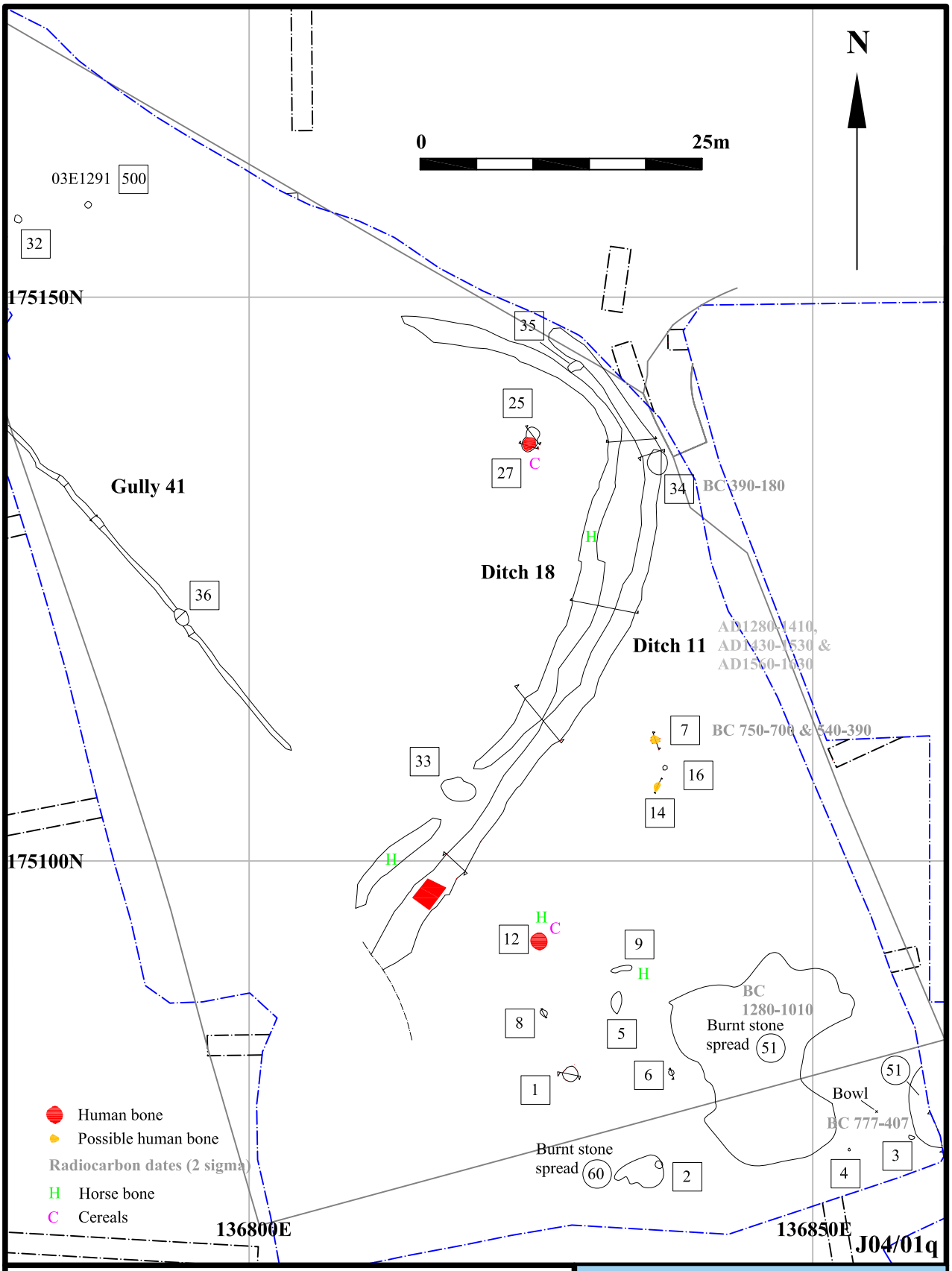
N18 Ennis Bypass, Site AR104, Killow, Co. Clare

04E0191

Figure 3: Site plan showing additional test trenches to south

Scale 1:1000 OSI Licence: AR0049406 Copyright OSI & Govt. of Ireland

TVAS IRELAND LTD



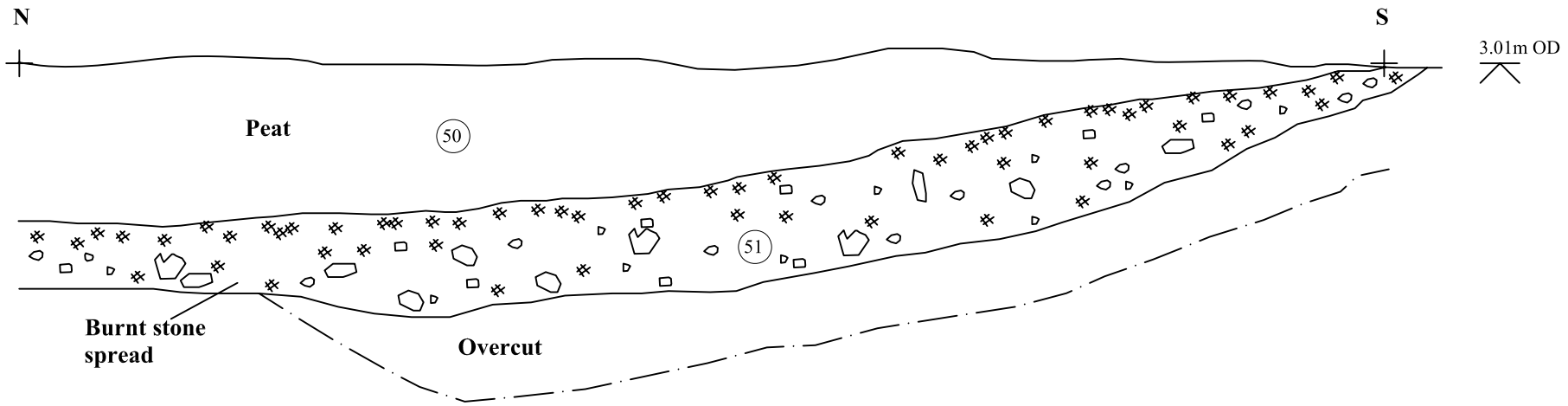
N18 Ennis Bypass, Site AR104, Killow, Co. Clare

04E0191

Figure 4: Plan of main excavation area showing archaeological deposits and test trenches (03E1291)

Scale 1:500 OSI Licence: AR0049406 Copyright OSI & Govt. of Ireland

TVAS IRELAND LTD



J04/01q

0 1m

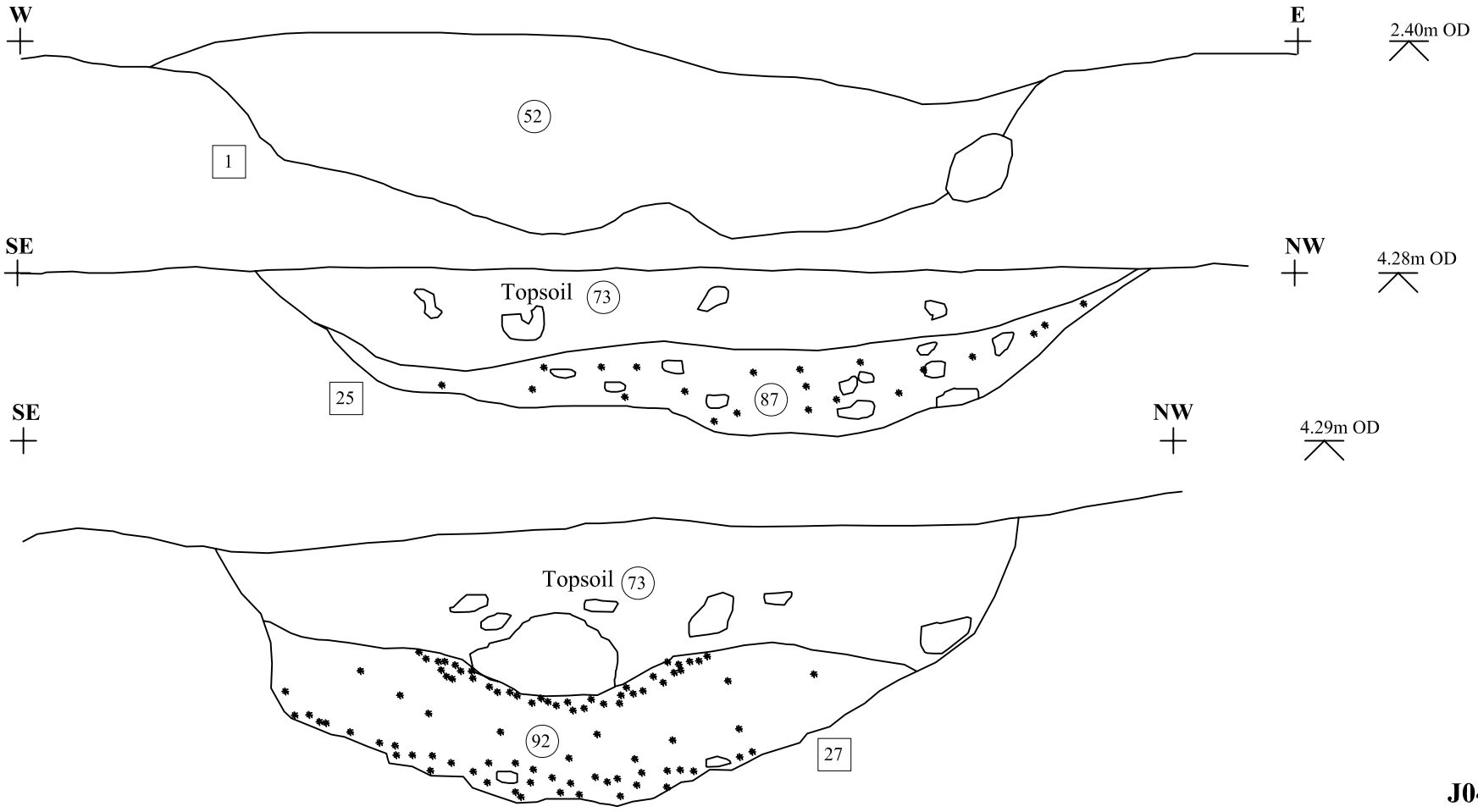
N18 Ennis Bypass, Site AR104, Killow, Co. Clare

04E0191

Figure 5: Section of burnt stone spread 51

Scale 1:20

TVAS IRELAND LTD



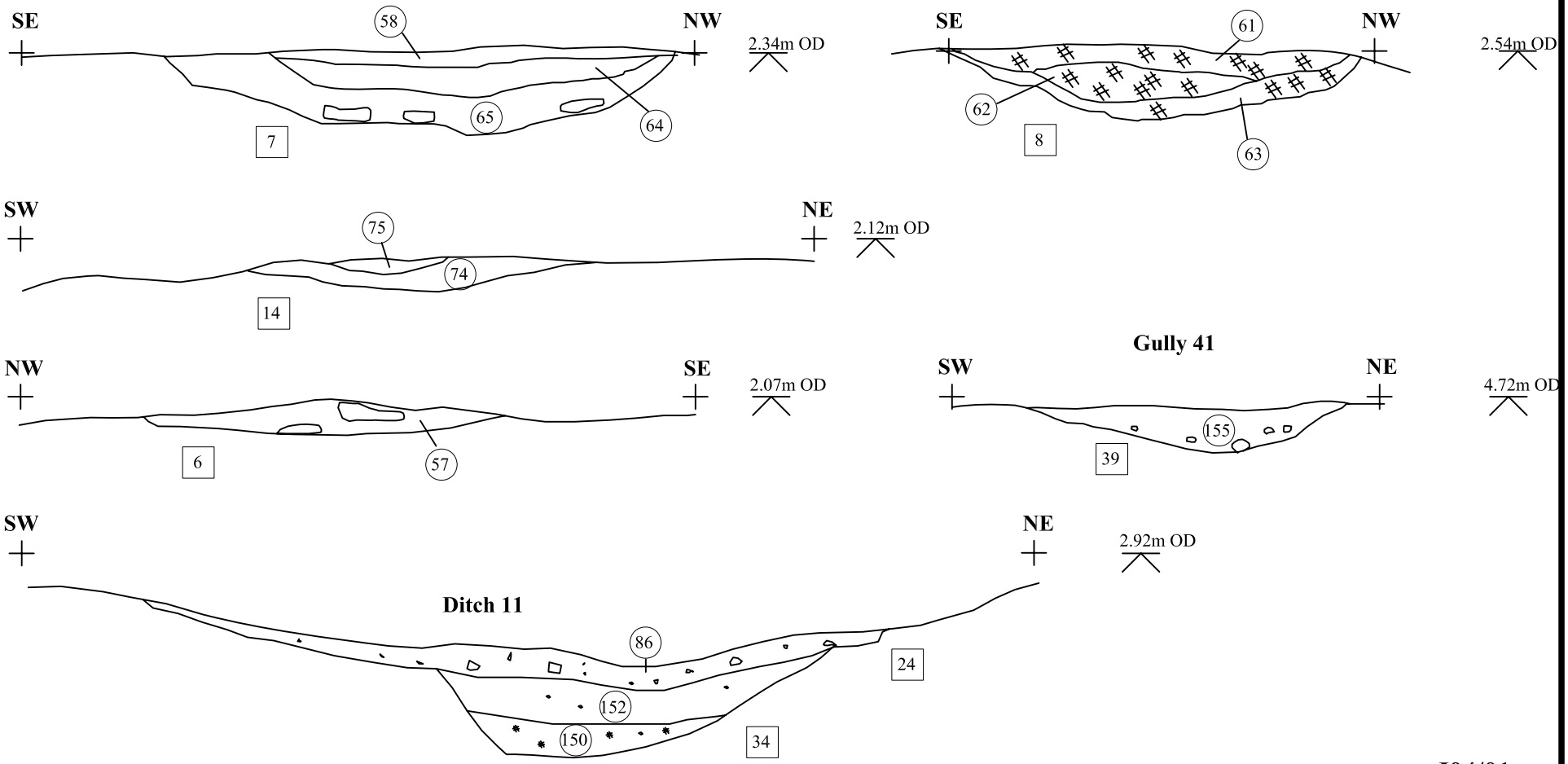
N18 Ennis Bypass, Site AR104, Killow, Co. Clare

04E0191

Figure 6: Sections of pits 1, 25 and 27

Scale 1:10

TVAS IRELAND LTD



J04/01q

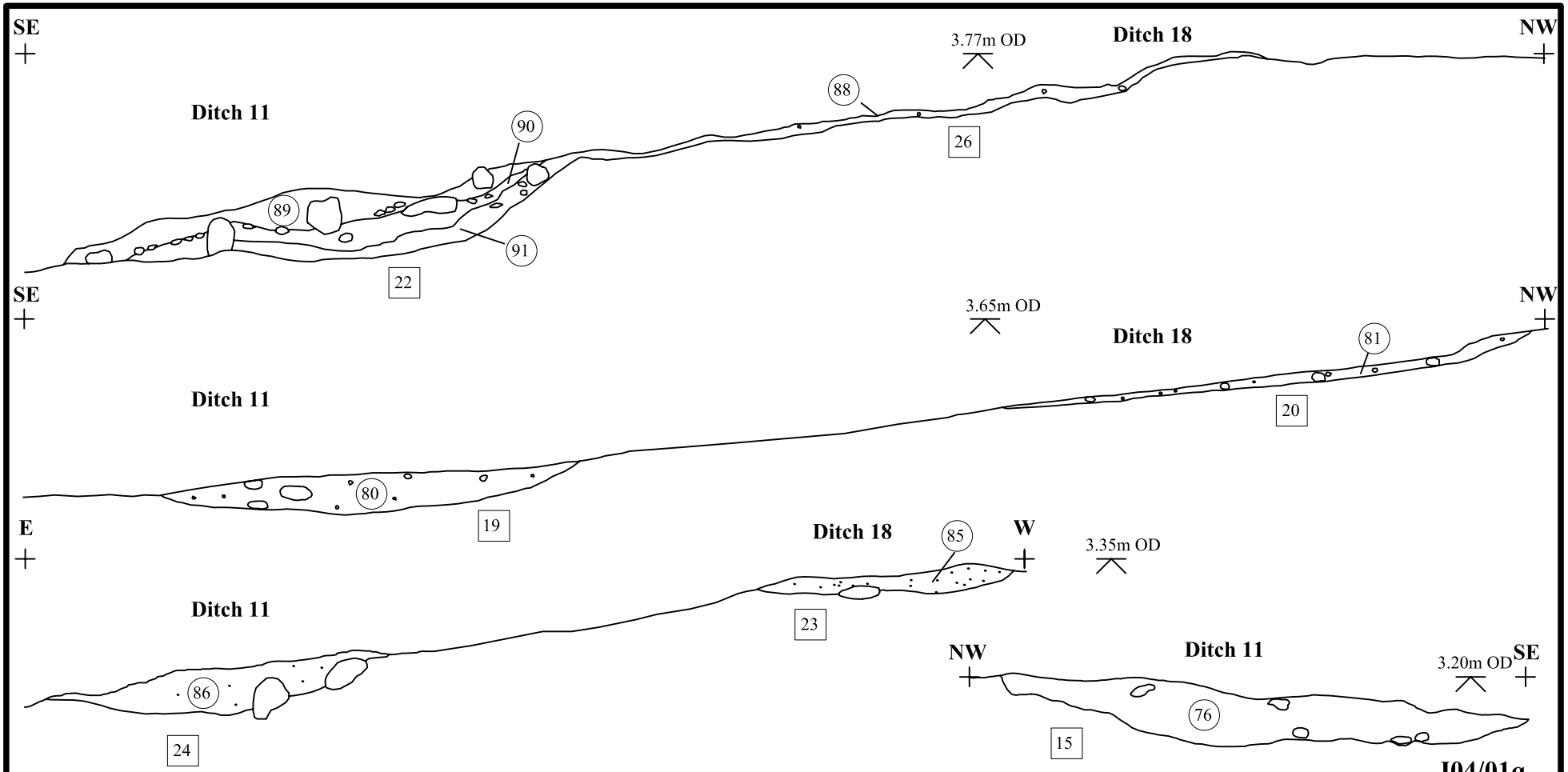
N18 Ennis Bypass, Site AR104, Killow, Co. Clare

04E0191

Figure 7: Sections of pits 6, 7, 8, 14 and 34
Sections of ditch 11 and gully 41

Scale 1:10

TVAS IRELAND LTD



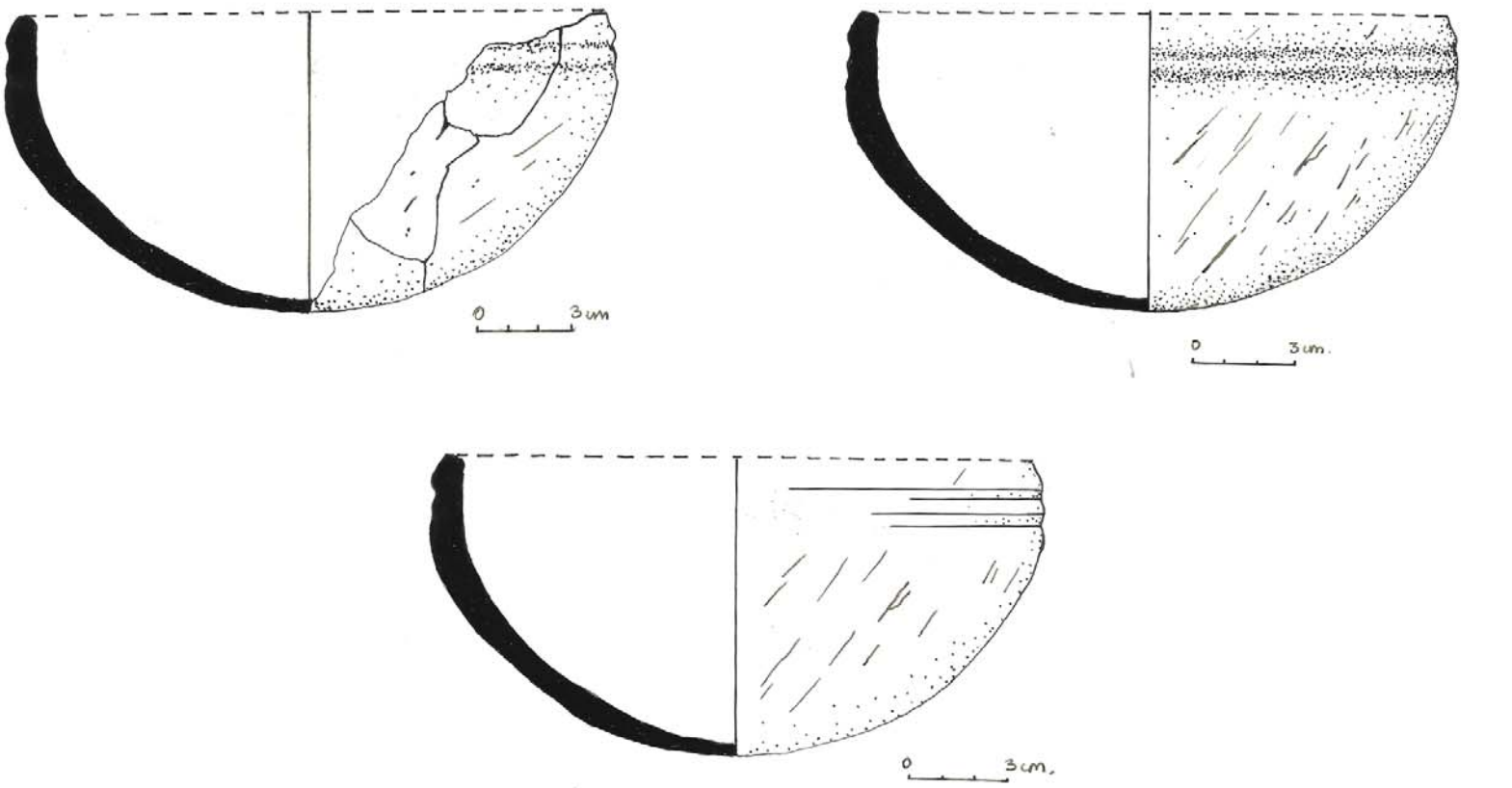
N18 Ennis Bypass, Site AR104, Killow, Co. Clare

04E0191

Figure 8: Sections of enclosure ditches

Scale 1:25

TVAS IRELAND LTD



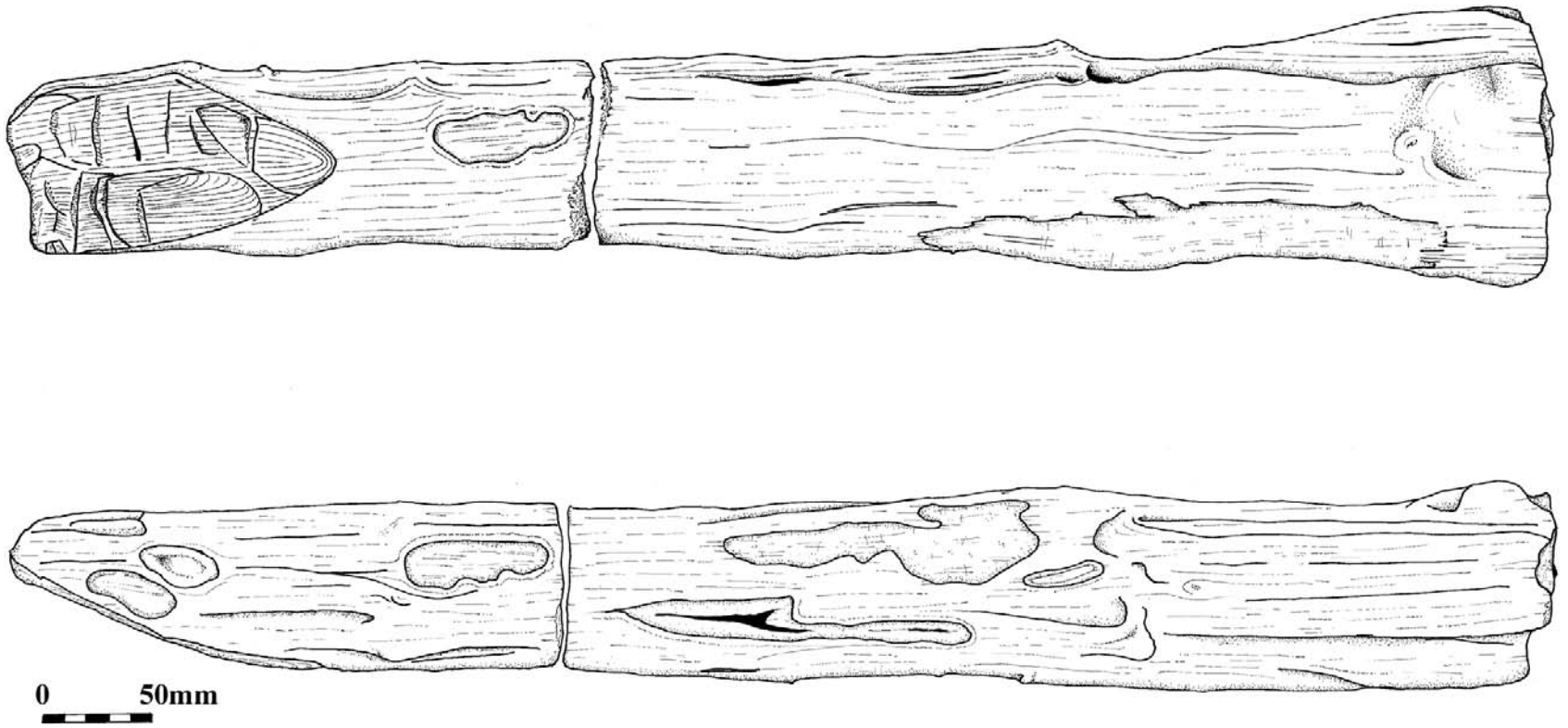
J04/01q

N18 Ennis Bypass, Site AR104, Killow, Co. Clare

Figure 9: Wooden bowl 04E0191:1.

Drawn Astrid Nathan

TVAS IRELAND LTD



J04/01q

N18 Ennis Bypass, Site AR104, Killow, Co. Clare

Figure 10: Worked stake 04E0191:47

Drawn Astrid Nathan

TVAS IRELAND LTD

Plate 1. Site AR104 in local landscape. Looking west

Plate 2. Site AR104. Looking south-west

04E0191

Plate 3. Burnt spread 51. looking east. Scale 1m

Plate 4. Wooden bowl. Scale 0.3m

Plate 5. Ditch 11. Looking north-east. Scale 1m

Plate 6. Ditch 11 (centre) and Ditch 18 (right). Looking west. Scales 1m, 0.5m and 0.3m

Plate 7. Pit 7, quartered. Looking north-east. Scales 0.5m and 0.1m

Plate 8. Pit 27, half-sectioned. Looking south-west. Scale 1m

Plate 9: Iron Age bowl 04E0191:1. Cleaned external surface

Plate 10: Iron Age bowl 04E0191:1. Cleaned internal sufaces

Plate 11: Iron Age ash bowl, 04E0191:1. After conservation