

N8 Glanmire – Watergrasshill Road Scheme

**Archaeological Excavation at
Mitchellsfort, Co Cork**
Site Number AR 31

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Licence Number 01E0970
Final Report: March 2004

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NATIONAL ROADS AUTHORITY



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Abstract

This site was originally identified following the excavation of a silt trap on a drain on the N8 Glanmire – Watergrasshill Road Scheme. It was initially considered to be of archaeological interest due to the presence of a burnt stoney material similar to that found in a typical *fulacht fiadh* and upon excavation the site was found to probably have been such a monument, though it had been heavily truncated in recent times. The deposit of burnt stoney material measured 10.1m long (east-west) by 3.7m wide and was generally 0.15m to 0.26m deep, though the original width of the feature would clearly have been significantly greater prior to the truncation of the monument. No trough was found at the site and no finds were recovered. One sample of oak charcoal from the burnt stoney material was sent for conventional radiocarbon dating to the University of Groningen and the date returned, $3720 \pm 30\text{BP}$, places the site in the Irish Early Bronze Age. The site was excavated over one week in October 2001.

1 Introduction

1.1 General

- 1.1.1 AR 31 was initially noted following the excavation of a silt trap on a drain on the route of the N8 Glanmire - Watergrasshill Road Scheme. The area around the feature was then stripped of topsoil under archaeological supervision by Avril Purcell under Excavation Licence no. 01E0204. The site was given a specific number, AR31, in the sequential series used to identify different sites on the route. This 10km dual-carriageway road improvement scheme, running from Riverstown to Skahanagh North, is part of the National Development Plan and the archaeological excavations on the route were carried out on behalf of Cork County Council and were funded in full by the Irish Government through the National Development Plan (2000-2006) and administered by the National Roads Authority. The main civil engineering contractor for the scheme was Bowen Mowlem and the mechanical excavation subcontractor was Howleys Civil Engineering Ltd.
- 1.1.2 The site was situated in Mitchellsfort townland at National Grid ref. W175967, 83060 and at an elevation of 139m OD. It was located in the vicinity of the settlement pond to the west of the roadline at chainage 6480.
- 1.1.3 AR 31 was excavated under licence number 01E0970 between October 1st and 5th 2001 by Rory Sherlock of Sheila Lane & Associates on behalf of Cork County Council and the National Roads Authority.
- 1.1.4 As AR 31 was found through development works associated with the N8 Glanmire-Watergrasshill Road Scheme and was thought to be of archaeological importance, the excavation was conducted with a view towards fulfilling the following research goals:
- Establishment of the nature and extent of the archaeological remains
 - Preservation by record of the archaeological remains
 - Establishment of the age of the archaeological remains

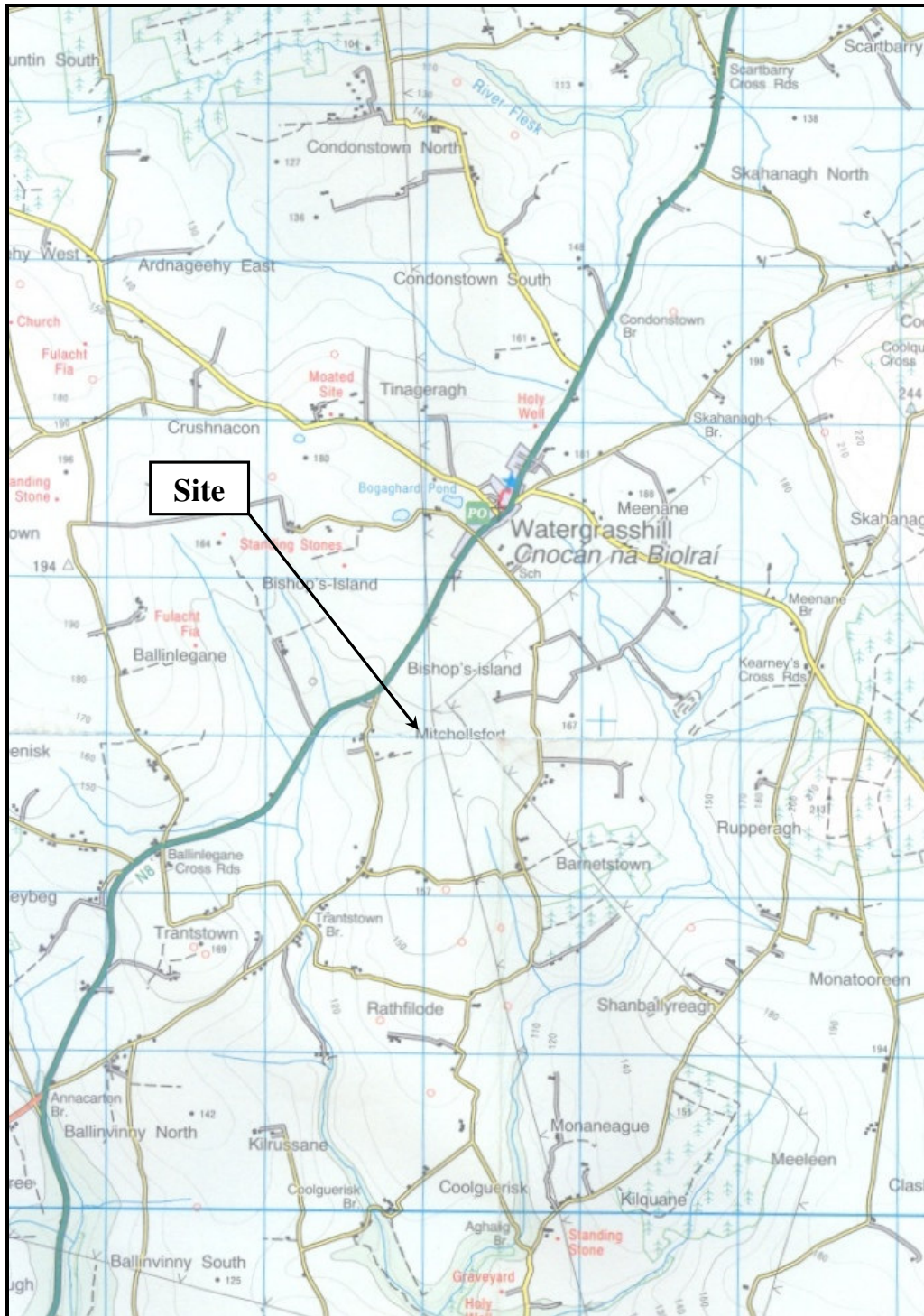


Figure 1: Location Map (extract from OS Discovery map, Sheet 80)

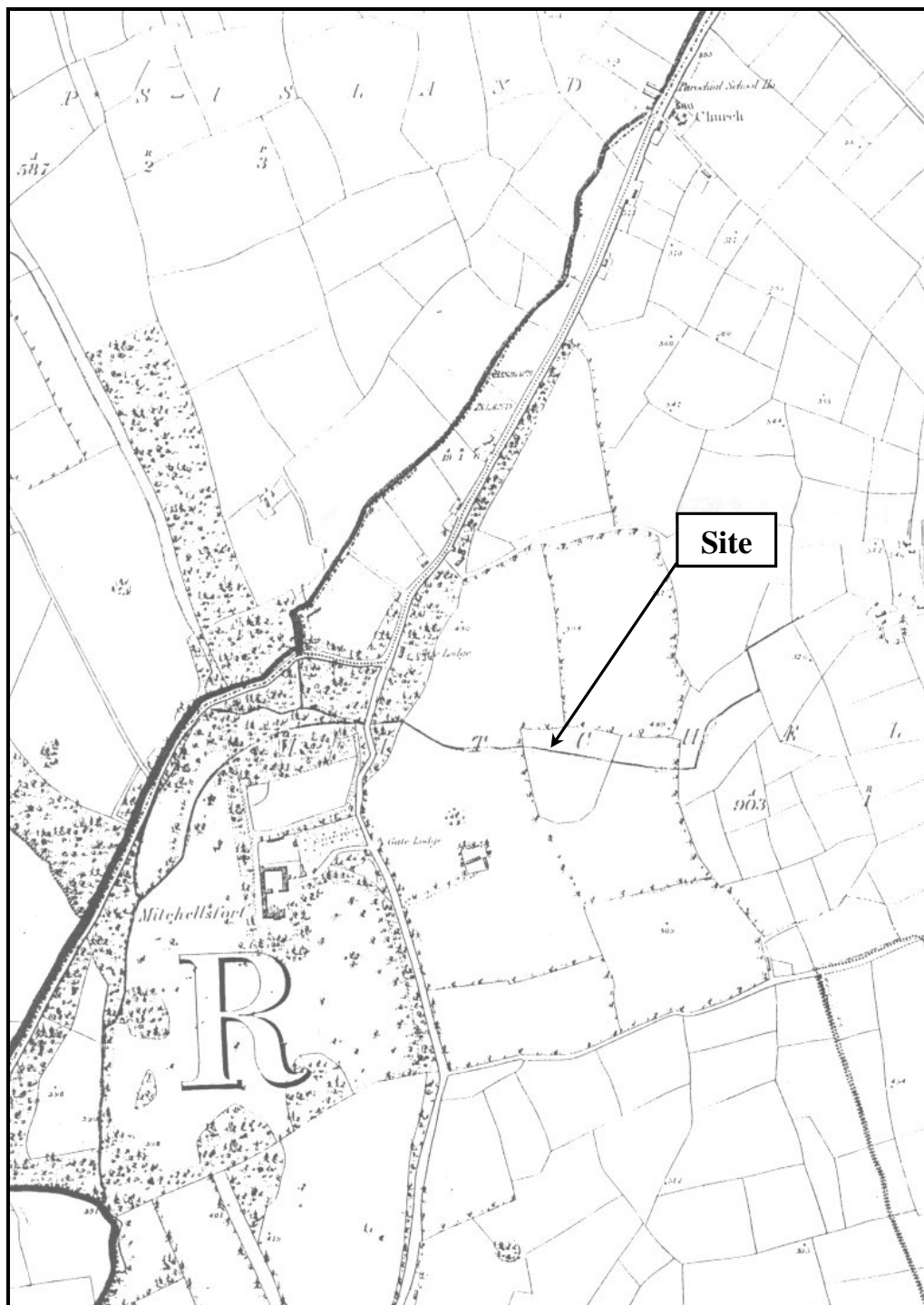


Figure 2: Location Map (extract from Ordnance Survey 6" map, 1st ed., Sheet 53)

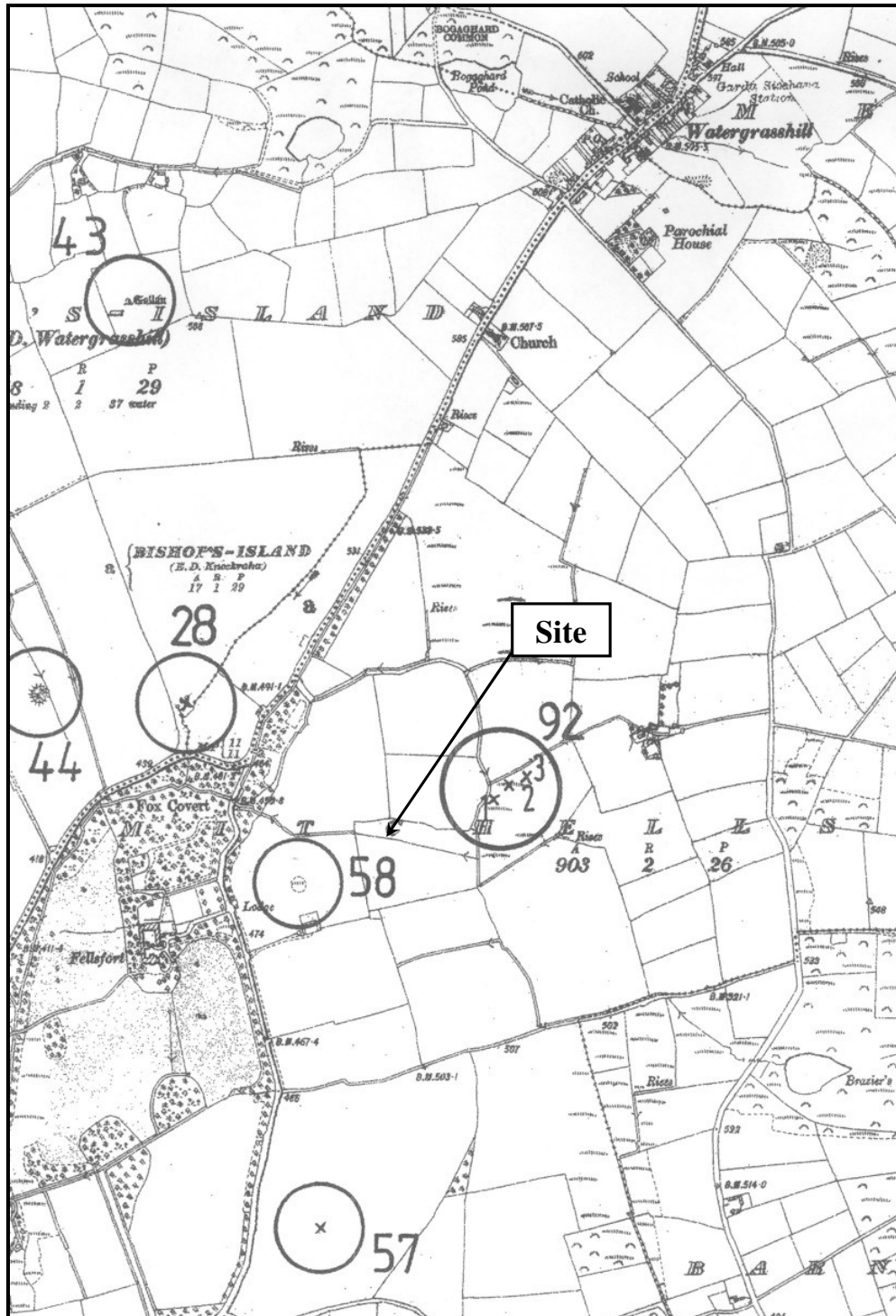


Figure 3: Location Map (extract from RMP map, Sheet 53)

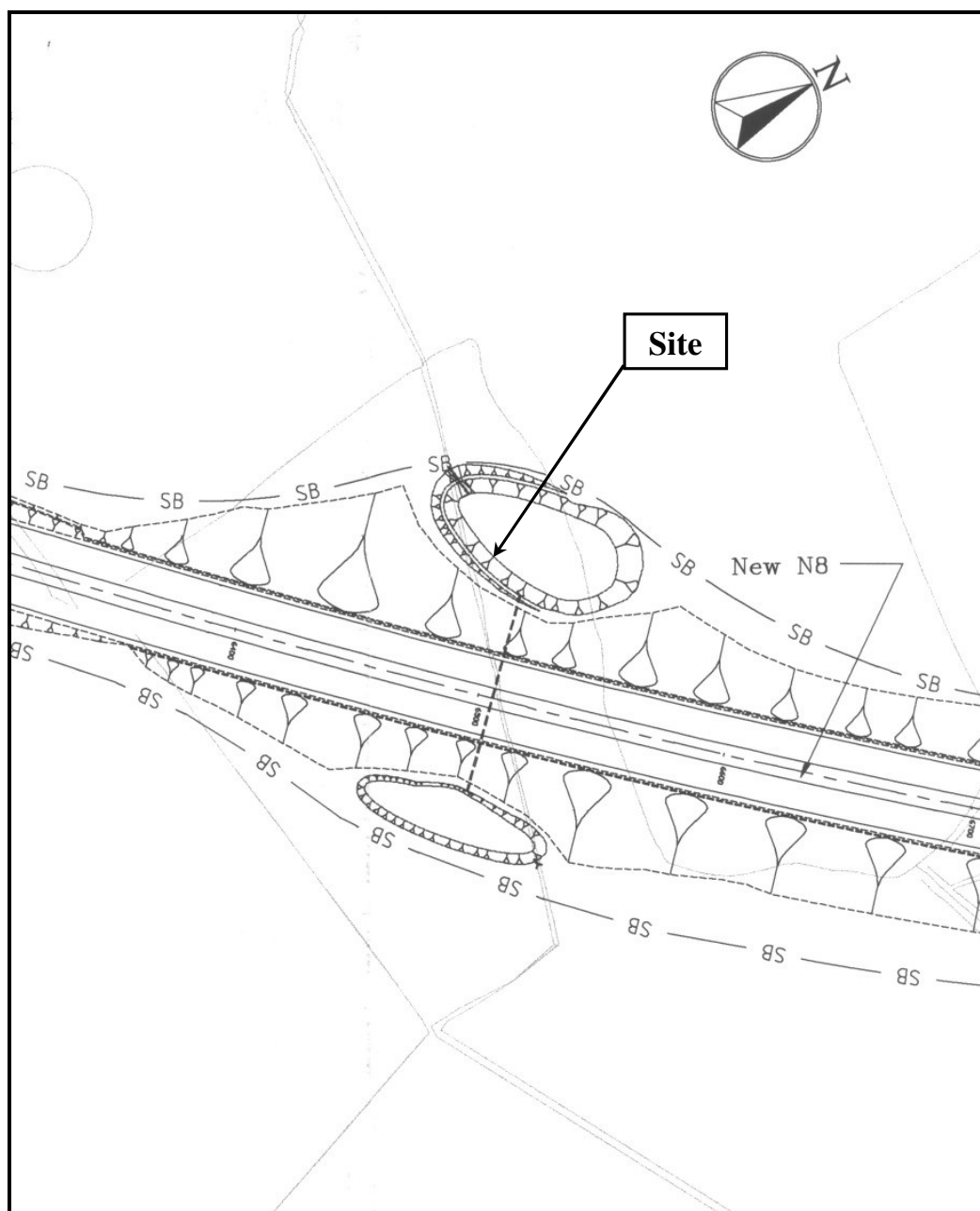


Figure 4: Location Map (extract from relevant engineering plan)

1.2 Geographic Setting

- 1.2.1 AR 31 was located in a field of rough poor quality pasture prior to the construction of the new road and lay approximately 500m east of the existing N8 Cork - Dublin road. The landscape of the area is dominated by gentle to moderate slopes and the archaeological site was discovered in low ground where a small watercourse flowed east - west across the new road corridor.
- 1.2.2 The site has poor views of the surrounding landscape due to the rising ground around it, particularly to the north-west and north, and so the views in these directions are somewhat limited.

1.3 Archaeological Background

- 1.3.1 There are a number of archaeological sites within approx. 1km of AR 31:
- A tree ring (SMR No. CO053-058---) lies 145m south-west in Mitchellsfort.
 - Two *fulachta fiadh* and a third possible example (SMR No. CO053-092-01-, 02-, 03-) lay 245m, 280m and 315m north-north-east respectively in Mitchellsfort.
 - A possible *fulacht fiadh* (SMR No. CO053-028---) lies 420m north-west in Bishop's-Island.
 - A circular enclosure (SMR No. CO053-044---) lies 660m west-north-west in Bishop's-Island.
 - A circular enclosure (SMR No. CO053-057---) lies 755m south in Mitchellsfort.
- 1.3.2 Three of the above mentioned sites, the *fulachta fiadh* and possible *fulacht fiadh* at Mitchellsfort (SMR no. CO053-092-01-; -02-; -03-), were excavated by Eamonn Cotter in March 2000. The sites were first identified in 1995 during fieldwalking along the N8 Glanmire – Watergrasshill Road Scheme and were subsequently excavated in order to facilitate their preservation by record in advance of the road development.

Site A (SMR no. CO053-092-01-) consisted of a small spread of burnt, shattered stone that measured c. 4m long (east-west) by c. 3m wide and had an average depth of 0.56m. Two troughs, which had been cut into the natural clay, were found and these measured 2m by 1.5m by 0.25m deep and 1.5m by 1.5m by 0.38m deep

respectively. The site had clearly suffered disturbance through relatively recent drainage works and no hearth was found (Cotter 2000, 3-5).

Site B (SMR no. CO053-092-02-) consisted of an irregularly shaped mound of burnt, shattered stone that measured 5.5m long (north-south) by 3.5m wide and had an average depth of 0.5m. An oval-shaped trough measuring 2.3m by 1.6m by 0.35m deep was found to have been cut into the natural clay beneath the mound (Cotter 2000, 6).

Site C (SMR no. CO053-092-03-) consisted of a sub-rectangular spread of burnt, shattered stone that measured 6m long (east-west) by 4m wide and had an average depth of 0.2m. No trough was found, but the excavator suggested that this may have been truncated by a later drainage feature (Cotter 2000, 7).

1.3.3 A number of sites of potential archaeological interest were revealed within 200m of AR 31 during archaeological monitoring of topsoil stripping:

- AR 17, excavated by Avril Purcell under licence 01E0627, proved to be of limited archaeological significance and was primarily composed of three spreads of displaced *fulacht fiadh* material lying within the course of a backfilled stream. This site was located approximately 80m south-east of AR 31.
- AR 18, excavated by Avril Purcell under licence 01E0628, proved to be of little archaeological significance. It comprised a small natural hollow, which had been backfilled with stoney material, and was probably related to relatively recent land improvement works in the area. It was situated 70m east of AR 31.
- AR 30, excavated by Avril Purcell under licence 01E0853, was situated 110m south-east of AR 31 and consisted of the ploughed-out remains of a *fulacht fiadh*. No cut features were found during the excavation, but the site had suffered considerably from extensive drainage works in the area.
- AR 32, excavated by Avril Purcell under licence 01E0996, was situated 30m north of AR 31 and was found to consist of an isolated cremation burial. The feature had apparently been heavily truncated and no finds were discovered in association with the deposit of cremated bone and charcoal.

1.4 Methodology

This site was excavated by hand and the recording strategy adopted involved the use of feature numbers and context numbers in order to record accurately the features of archaeological interest. The site was excavated by a crew of five people.



Plate 1: Site prior to excavation from east

2 Site Description: The Excavated Evidence

- 2.1 This site was originally identified as a dark deposit of burnt, shattered stone and charcoal-rich material and was interpreted prior to excavation as a possible *fulacht fiadh*. After the completion of topsoil stripping around the site, an area measuring up to 7m north-south by 17m east-west was cordoned off and cleaned back manually. The deposit of dark stoney material was then found to extend up to 4m north-south by up to 11m east-west and had clearly been heavily truncated along its southern side (Plate 1). The northern edge of the dark, stoney deposit was generally well defined and the irregular curve of this edge would suggest that between half and one third of the original monument had survived truncation, the apparently larger southern part being completely lost through excavations associated with the realignment of the stream/drain immediately to the south of the site.
- 2.2 On the commencement of manual excavation, a silty topsoil had already been removed from the site by a mechanical excavator using a toothless grading bucket under close archaeological supervision and so the effect on the remains of the newly discovered site was minimal. The entire area within the site was trowelled and shovel-scraped clean in order to reveal the full extent of the features in the area, but apart from the mound of burnt stoney material (Feature 1), just one other feature was noted. This consisted of a land drain (Feature 2) which appeared to have barely truncated the eastern edge of Feature 1, but did not have a significant negative effect on the archaeological remains. The drain was 0.5m wide and ran in a north-south direction from where it had recently been truncated at the south to beyond the limit of excavation at the north. It was, therefore, exposed for c. 5.4m of its length and when a narrow section was dug across the feature it was found to have sloping sides and a silty fill which had some re-deposited burnt, stoney material from Feature 1 within it.
- 2.3 Feature 1, the truncated remains of the probable *fulacht fiadh*, was excavated in two stages. Firstly a central 1m wide section and two one-sided end sections were excavated in order to allow four north-south section drawings of the feature to be created (Figure 4). The two intervening baulks were then excavated in order to complete the excavation of the feature. The burnt stoney material (**Context 1**) of the probable *fulacht fiadh* comprised heat-shattered fragments of sandstone which were

mixed with a blackened silty soil. The stones were generally 20mm to 50mm in length, though some up to 0.1m in length were noted. The deposit was firmly compacted and dark brown/black in colour and was generally 0.15m to 0.26m in depth. The deposit measured 10.1m in length (east-west) and up to 3.7m in width, though it should be noted that while this east-west measurement is probably close to the original size of the feature, the north-south measurement quoted is clearly significantly less than the original due to the severe truncation of the feature to the south.

Context 1 overlay a firm stoney pale brown layer (**Context 3**) and the stone in this deposit was similarly burnt and heat-shattered to that noted in C1. This deposit was interpreted as the *fulacht fiadh* material, similar to C1, which had slipped from the mound and had become embedded in the natural subsoil, some of it being subsequently sealed by successive deposits of C1. Context 3 was found to extend in a band around the outer edge of C1, extending beyond it by between 0.3m and 1.4m and underlying it by up to 1.9m (Figures 3 & 4). The inner limit of C3 was generally marked by a rise in the underlying natural subsoil and this depositional pattern supports the theory that C3 was primarily composed of slippage from the mound (Figure 4). The lack of charcoal in C3 when compared to C1, and therefore the lighter colour of C3, may be explained by the likely tendency of the shattered stones to roll off the mound, while the charcoal and burnt, blackened soil were more likely to remain *in situ*. The total volume of Contexts 1 and 3 as excavated was c. 4270 litres, though the original volume of the *fulacht fiadh*-type material would clearly have been significantly greater prior to the truncation of the feature. Contexts 1 and 3 were overlain by a fine silty material, **Context 2**, which was quite deep in places and appears to be natural in origin.

- 2.4 No finds were recorded during the excavation and no evidence of a trough, or of any cut feature contemporary with Feature 1, was found.

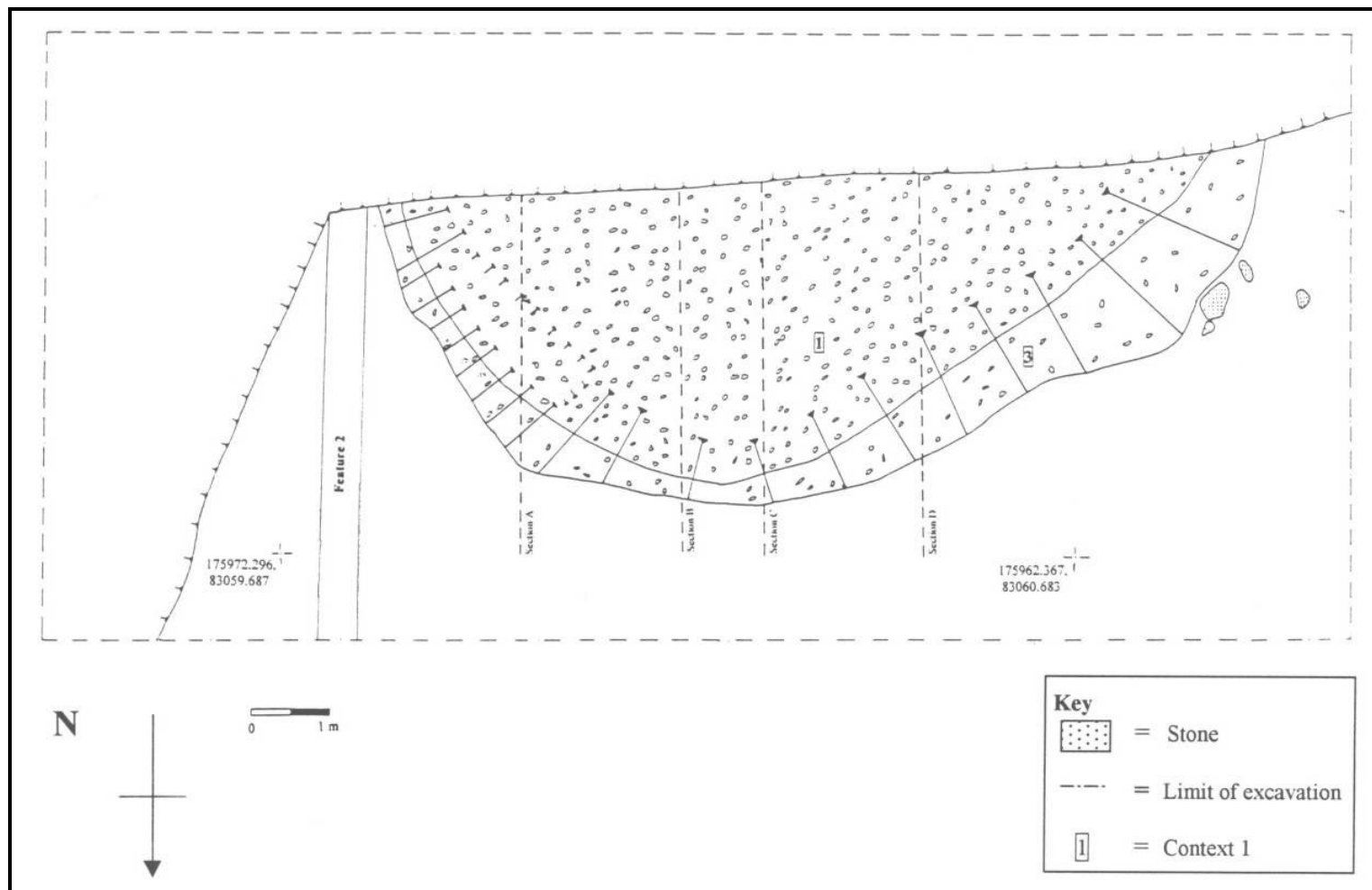


Figure 5: Site Plan

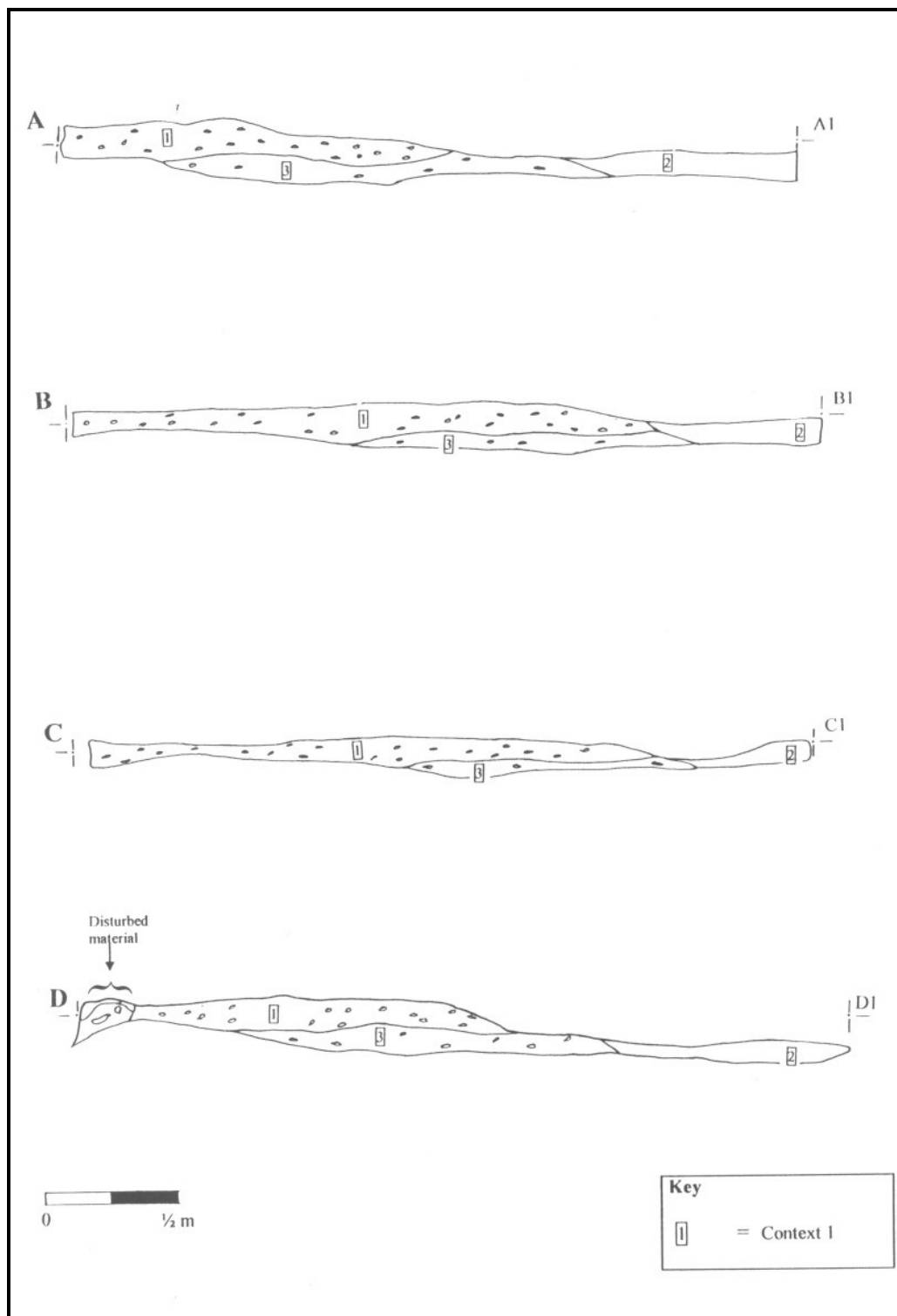


Figure 6: Sections through Feature 1



Plate 2: Feature 1, Section A, with F2 (drain) visible in the foreground



Plate 3: Feature 1, Section C



Plate 4: Feature 1, Section B



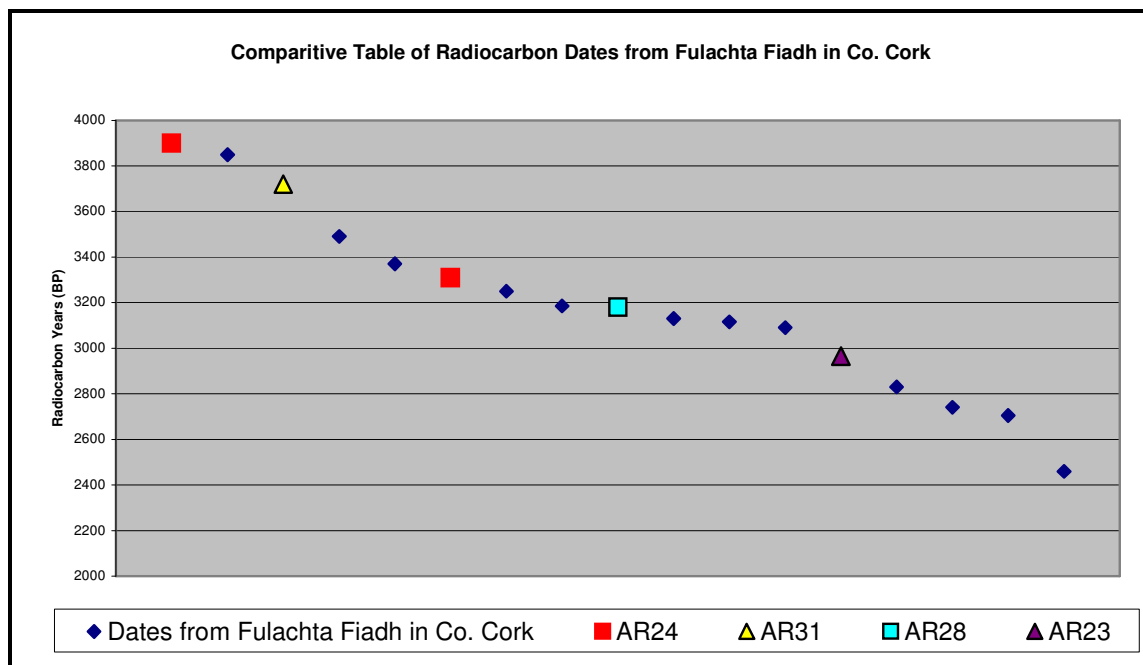
Plate 5: Feature 1, Section D

3 Interpretation

- 3.1 It is apparent, from the excavated evidence, that Feature 1 at this site represents the remains of a probable *fulacht fiadh*. This term is used to describe a particular site type which usually date to the Bronze Age, though a significant minority of excavated examples have been dated to the Medieval period. References in old Irish literature describe how *fulachta fiadh* were used as cooking places and this is the common interpretation of the sites today. In general, a water-filled trough was brought to the boil through the immersion of fire-heated stones and the trough was then used for cooking. Before the trough could be used again, the burnt and heat-shattered stones, which remained in situ from the previous usage, had to be cleaned out of the trough and this process, over time, would cause a mound of burnt material to accumulate around the trough. Contexts 1 and 3 would appear to represent this material at AR 31, though no trough or hearth was found at the site, probably due to the truncation of the feature.
- 3.2 It is clear from the underlying subsoil that the probable *fulacht fiadh* was located in an area of poor drainage and a trough cut into the natural subsoil would probably have held water naturally without the need for an artificial lining. Contexts 1 and 3 probably represent the burnt stoney material which was removed from the trough after its use and their generally homogenous nature, together with the absence of any intervening lenses or layers of sod-like material, suggest that the site was not abandoned and then subsequently revisited, but was used at regular intervals over its active lifespan. The lack of diagnostic finds from the *fulacht fiadh* at AR 31 is not unusual in the wider context of these features.
- 3.3 Feature 2 was identified as a drain which barely truncated the eastern end of F1 and was stratigraphically later than it, though the actual age of the feature could not be determined through the available evidence.

4 Specialist Contributions and Discussion

- 4.1 Two samples were taken from Context 1, the dark stoney burnt material which resembled that normally associated with *fulachta fiadh*, and these were examined by Lorna O'Donnell of Margaret Gowen & Company Ltd. Both of the samples contained significant amounts of oak (*Quercus*) charcoal, with one also containing limited amounts of alder (*Alnus*) and the other containing limited amounts of hazel (*Corylus avellana*). The detailed results of the analysis are presented in Appendix A.
- 4.2 One sample of oak charcoal from Soil Sample 1 was sent for radiocarbon dating to the University of Groningen. The sample, which was analysed conventionally, was dated to 3720 ± 30 BP. The detailed results of the dating analysis are presented in Appendix B.
- 4.3 When considering the wider context of the radiocarbon date from AR31, all of the dates relating to *fulachta fiadh* in county Cork that were registered on the Irish Radiocarbon Date Database (www.ucc.ie/archaeology/radiocarbon/index.html) were consulted. Of the sixteen dates found, four unreliable dates from laboratories in Dublin and Chicago were discounted, having been superseded by more accurate dates from the Groningen laboratory. The remaining twelve dates ranged from 3850 ± 30 BP to 2460 ± 50 BP. These dates, which came from sites at Ballyclogh, Clashroe, Drombeg, Dromnea, Kilcor South, Killalough and Killeens, suggest that the AR31 date is relatively early in the dating sequence for *fulachta fiadh* in county Cork that has been established to date, though more dates are clearly needed to strengthen this suggestion.
- Samples from one *fulacht fiadh* and two possible *fulachta fiadh* that were excavated during the course of the N8 Glanmire – Watergrasshill Road Scheme were also dated by radiocarbon analysis. The definite site, at Meenane (AR24; R. Sherlock; 01E0806) returned dates of 3900 ± 80 BP and 3310 ± 70 BP, while the possible sites, at Meenane (AR23; B. Halpin; 01E0691) and Trantstown (AR28; B. Halpin; 01E0647), returned dates of 2965 ± 40 BP and 3180 ± 60 BP respectively.

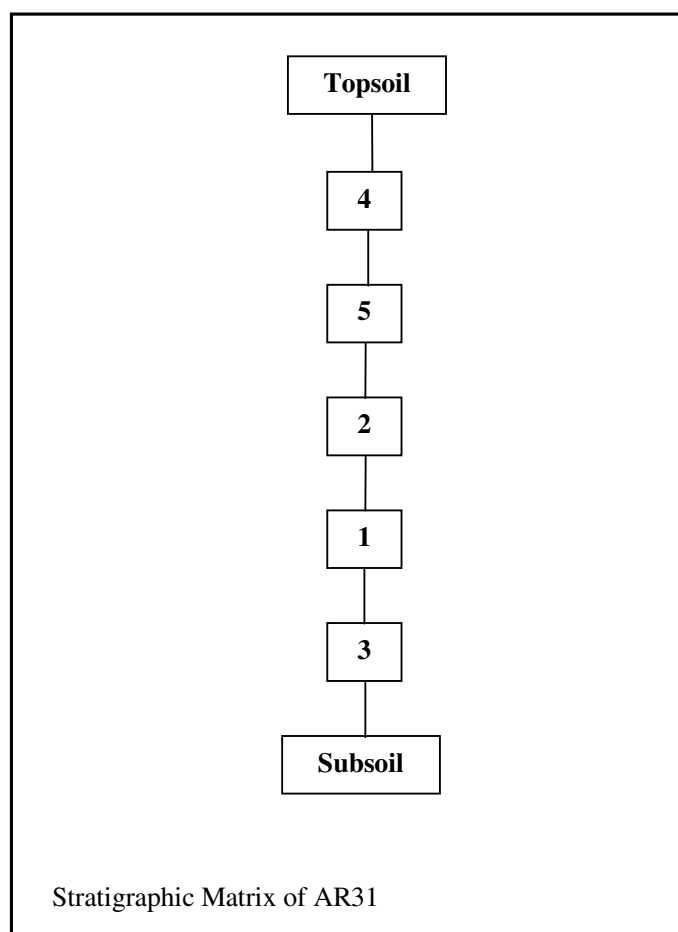


5 Conclusion

- 5.1 AR 31 was found, upon excavation, to be a probable *fulacht fiadh* and has been dated to the Bronze Age. The calibrated date range for the sample from the site (sigma 2) is 1985 BC to 2199BC. The truncation of the site prior to excavation, the subsequent non-survival of a trough or hearth and the absence of diagnostic finds from the site make the feature somewhat difficult to interpret fully, as the original extent and complexity of the site cannot be accurately assessed.
- 5.2 The radiocarbon date for Sample 1 was $3720 \pm 30\text{BP}$. This would appear to be relatively early in the general chronology for Irish *fulachta fiadh* and other burnt mounds as discussed by Brindley, Lanting and Mook (1989/90), though since this article was published significantly more radiocarbon dates have been derived for Irish *fulachta fiadh*.

6 List of features and contexts excavated at AR 31

Feature 1	Probable <i>Fulacht fiadh</i> :	Context 1:	Dark stoney mound material
		Context 2:	Soft light-brown silty layer
		Context 3:	Lower stoney mound layer
Feature 2	Drain	Context 4:	Silty brown fill
		Context 5:	Cut of drain



7 Bibliography

- Brindley, A.L., J.N. Lanting & W.G.Mook, 1989/90, Radiocarbon dates from Irish Fulachta Fiadh and Other Burnt Mounds, *The Journal of Irish Archaeology*, **V**, 25-33.
- Cotter, E. 2000, *Archaeological Excavations at Mitchellsfort, Co. Cork*, Unpublished report.

8 The Site Archive

The site archive, which will remain with the excavator at the offices of Sheila Lane & Associates in Cork, consists of:

- 3 context sheets
- 35 colour photographs (6x4) + negatives
- The specialist report relating to soil sample analysis
- The site diary
- The site drawings, consisting of:
 - 1 pre-excavation plan of the site (1:50) & 4 sections (1:20)
(pencil on medium-sized Permatrace sheet)
 - 1 pre-excavation plan of the site (1:50) & 4 sections (1:20)
(pencil on medium-sized Permatrace sheet) {copy}
 - 1 post-excavation plan of the site (1:50) (pencil on medium-sized Permatrace sheet)

Appendix A: Extracts from Charcoal Identification Report by Lorna O'Donnell

Charcoal identifications
Glanmire-Watergrasshill Road Scheme
Co. Cork

Licence Nos. 01E0111 01E0481 01E0494
01E0496 01E0633 01E0647
01E0691 01E0701 01E0802
01E0806 01E0970

By
Lorna O'Donnell
Margaret Gowen and Co. Ltd.

For
Sheila Lane and Associates

21st July 2003

Illustrations

Figures

- Figure 1 Total charcoal identifications from *fulachta fiadh*
- Figure 2 Total charcoal identifications from Mitchellsfort (01E0970)
- Figure 3 Charcoal identifications from medieval and post medieval sites
- Figure 4 Charcoal identifications from Ballyvinny South

Appendix 1

Charcoal identification details

1 Introduction

- 1.1 This report details the results of charcoal analysis from sites along the Glanmire–Watergrasshill road scheme Co. Cork, excavated by Sheila Lane & Associates. The work follows recommendations from previous work (O'Donnell & Johnston, 2002). Samples were analysed from eleven different sites; Ballyvinny South (01E0111), Killydonoghoe (01E0481), Killydonoghoe (01E0494), Killydonoghoe (01E0496), Ballyvinny South (01E0633), Transtown (01E0647), Meenane (01E0691), Kilrussane (01E0701), Ballyvinny North (01E0802), Meenane (01E0806) and Mitchellsfort (01E0970). These sites covered a range of time periods ranging from the Bronze Age to the post-medieval period.
- 1.2 The primary objective of this project was the selection of charcoal for radiocarbon dating. Charcoal identifications by themselves, however, carry additional information on environmental conditions in the immediate vicinity of the sites. Local vegetation patterns may be reconstructed from charcoal analysis based on the idea that wood was often collected randomly near the site. Dry branches on the forest floor or fallen trees, when present, were used to kindle the fires. Larger pieces thrown on the fires may have been bigger branches from trees. When settlement was close-by, discarded timbers, or other rotten wood from fences, may have been used. A further aim of the study was to see if charcoal use changed through time.

2 Methods

- 2.1 Samples were collected on site as bulk soil and these were processed using a simple flotation technique. The flot was collected in a sieve mesh measuring 300 µm and the retent was collected in meshes measuring 2 mm.
- 2.2 The flot was initially scanned for charcoal under a Nikon microscope (magnification 4.8x-56x), and the largest pieces of charcoal were selected. Each charcoal piece was broken to reveal its transverse, tangential and longitudinal surfaces. The charcoal was identified using a binocular microscope with dark ground light and magnifications generally of 200x and 400x. The age and growth patterns were established by studying the transverse section at a magnification of 40x. The wood was identified using the key devised by Schweingruber (1978).

3 Species identifications

- 3.1 Overall 12 species types were identified within the Watergrasshill–Glanmire material including large trees such as oak (*Quercus*) and elm (*Ulmus*), scrub trees such as alder (*Alnus*), hazel (*Corylus avellana*), holly (*Ilex aquifolium*), birch (*Betula*) ash (*Fraxinus*), ivy (*Hedera helix*), willow (*Salix*), gorse (*Ulex*) and blackthorn (*Prunus spinosa*) and fruit trees such as pomaceous-fruitwood (*Pomoideae*) which includes wild apple, wild pear, mountain ash and hawthorn, wild/bird cherry (*Prunus avium/padus*) and stone-fruit (i.e. trees which bear fruit with stones, such as *Prunus*)

4 Data analysis

- 4.1 Sites from the same general time period were grouped together for analysis. These include four *fulachta fiadh*, one Early Christian Site, four sites with possible medieval & post medieval-structures and two sites of indeterminate age.

5 Fulachta fiadh

5.1 Introduction

5.1.1 Charcoal was identified from four different *fulachta fiadh* sites including Transtown (01E0647) (one sample), Meenane (01E0691) (two samples), Meenane (01E0806) (one sample) and Mitchellsfort (01E0970) (two samples).

5.1.2 *Fulachta fiadh* generally date from the Bronze Age (Baillie, 1990). These features are normally found in areas where a pit in the soil fills readily with water, such as found close to bog margins. Therefore in most *fulachta fiadh* some indicators for a wet environment can be expected, such as alder, willow or birch (Stuijts, 2001).

5.1.3 The four sites investigated yielded a total of 7 wood types. These include alder, hazel, oak, holly, pomaceous-fruitwood, birch and stone-fruit (Fig. 1). All of the species identified were native. Oak was the most frequent species identified accounting for 72% of the charcoal, yet it may be over represented in the samples as a consequence of the resistance of oak charcoal to the degradation process. The next most important species are hazel (14%) and alder (9%). Less important types were holly, birch and the apple-type. Some of the species identified such as pomaceous-fruitwood and holly can point to forest edges as well as hedges. The dominance of oak and hazel may also indicate oak woods nearby with undergrowth of hazel shrubs. There was no evidence of coppicing in the samples. Alder and birch probably grew near the site, as these species prefer wet conditions like those normally associated with *fulachta fiadh*. Mitchellsfort (01E0970) and Meenane (01E0691) were comparable in that they each contained only oak, hazel and alder while 5 species types were found in the other two sites.

5.1.4 Some notable absent species are yew (*Taxus baccata*), ash and elm. These species are regularly found in Bronze Age sites elsewhere in Ireland (Caseldine, 1996). The absence of them in the samples suggests that they did not grow close to the *fulachta fiadh*. Previous work in West Cork revealed an absence of the same

species types (Stuijts, 2001), however this may be due to the small amount of samples analysed.

5.2 01E0970 – Mitchellsfort

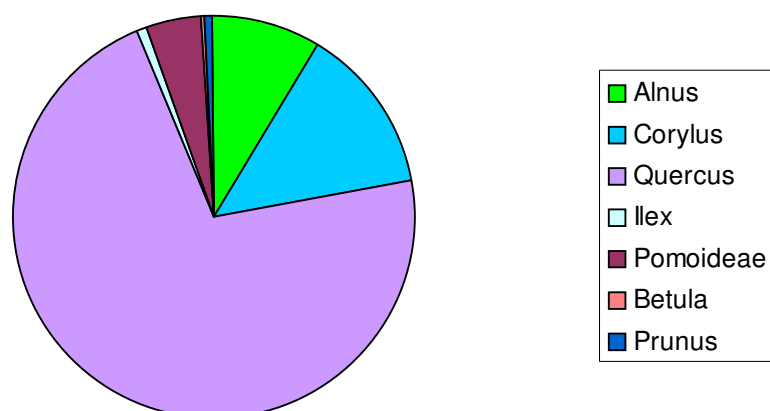
- 5.2.1 This site consisted of a heavily truncated *fulacht fiadh*. Two samples with a high charcoal content were examined from here, both from feature 1. Oak, alder and hazel were identified. Oak was the most important species on the site (Fig. 2). Oak was found in both of the samples, while hazel was found in sample 1 and alder in sample 2. No insect channels were present, suggesting freshly gathered wood. Most of the oak charcoal was derived from large branches. Oak prefers open, acidic conditions and the presence of so much oak in the samples suggests it had optimum growth conditions (Orme & Coles, 1985).

Advice for radiocarbon dating

- 5.2.2 There is enough in each of the samples for a conventional radiocarbon date. It would be best to date the oak in both cases.

References

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Fig. 1 Total charcoal identifications from fulachta fiadh.**Table 1: Charcoal sample information and total weight**

Licence number: 01E0970		Site code:			
Job name: Mitchellsfort					
Sample no.	Licence no.	Feature no.	Feature type	Weight (g)	Residue (g)
1	01E0970	1		29.13	191.25
2	01E0970	1		34.49	312.05

Table 2: Total results of charcoal identifications

Licence number: 01E0970		Site code:		
Job name: Mitchellsfort				
Species	Common name	Weight (g)	Sample Score	Score
<i>Alnus</i>	Alder	1.45	1	3
<i>Corylus avellana</i>	Hazel	0.07	1	1
<i>Quercus</i>	Oak	62.10	2	188

Table 3 - Charcoal Identification Details

Licence number: 01E0970		Site code:	
Job name: Mitchellsfort			
Sample number: 1		Feature number: 1	
Feature type:			
Species	Score	Weight (g)	Rings 1-2% 3-5% 5-10% 10-15% 15-20% 20%+
<i>Corylus avellana</i>	1	0.07	0 100 0 0 0 0
Insect channels:	Channel size:	Diameter min:	Diameter max: Growth: Cutting season: Curl wood:
none		0 (mm)	10 (mm) medium 0
Growth comment:		Branch: 100	
Species	Score	Weight (g)	Rings 1-2% 3-5% 5-10% 10-15% 15-20% 20%+
<i>Quercus</i>	85	29.06	0 100 0 0 0 0
Insect channels:	Channel size:	Diameter min:	Diameter max: Growth: Cutting season: Curl wood:
none		0 (mm)	0 (mm) medium 0
Growth comment:		Branch: 100	
Sample number: 2		Feature number: 1	
Feature type:			
Species	Score	Weight (g)	Rings 1-2% 3-5% 5-10% 10-15% 15-20% 20%+
<i>Alnus</i>	3	1.45	0 100 0 0 0 0
Insect channels:	Channel size:	Diameter min:	Diameter max: Growth: Cutting season: Curl wood:
none		6 (mm)	7 (mm) medium 0
Growth comment:		Branch: 90	
Species	Score	Weight (g)	Rings 1-2% 3-5% 5-10% 10-15% 15-20% 20%+
<i>Quercus</i>	103	33.04	0 0 50 50 0 0
Insect channels:	Channel size:	Diameter min:	Diameter max: Growth: Cutting season: Curl wood:
none		5 (mm)	10 (mm) medium 0
Growth comment: Half the sample is of medium growth and half is of slow growth.		Branch: 90	

Appendix B: Radiocarbon Dating Information from the University of Groningen

The following graphs and calibrated dates were derived by the author using CAL25 software created by the CIO at the University of Groningen. The information presented consists of the calibrated dates to 1 sigma and 2 sigma and two calibration graphs.

Date A: GrN-28180 – Quercus charcoal from Feature 1

ANALYSIS OF PROBABILITY DISTRIBUTION:

Seattle/Groningen Method

1 / 2 sigma confidence interval analysis

68.3 % (1 sigma) confidence level yields the following ranges:

2193 cal BC ... 2177 cal BC

2143 cal BC ... 2121 cal BC

2097 cal BC ... 2089 cal BC

2085 cal BC ... 2039 cal BC

95.4 % (2 sigma) confidence level yields the following ranges:

2199 cal BC ... 2155 cal BC

2149 cal BC ... 2031 cal BC

1989 cal BC ... 1985 cal BC

