Appendix 14.3 Excavation Database Descriptions

August 2023

McCutcheon Halley
CHARTERED PLANNING CONSULTANTS

Appendix 14.3: Excavation Database Descriptions

Licence Number	Excavator	Database Description
A017/005, E3027	Ruth Elliott	The site was identified during testing along the route of the M3 Clonee to north of Kells motorway. Excavation was conducted between 20 February and 20 March 2006. The site was located near the top of a small hill and two distinct groups of archaeological features were uncovered. To the east a series of very substantial post-holes were located. These averaged 0.3m in diameter and 0.3m deep. The majority had vertical sides and flat bases. Most had been deliberately removed from the ground prior to their cuts filling. In some instances there was evidence that the posts had been driven into the ground. In addition to charcoal flecks, fragments of animal bone and mollusc shell were also found within some of the fills. They appeared to form an east–west-oriented semicircular structure with maximum internal dimensions of 2.6m by 4.3m. Two pits lay external to the post-hole setting. Both were relatively small and had U-shaped profiles. Neither contained any evidence of their original function. Two, possibly associated, stake-holes lay just over 1m to the east. These had V-shaped points at the base and both were deliberately removed from the ground. Two patches of in situ burnt clay lay almost 2m apart in the north-eastern part of the site, c. 11m from the post-hole setting. These may have originally been coterminous and represented one large hearth. A large post-hole lay 0.4m west of this. A series of pits and post-holes were situated along a roughly east–west-oriented line in the northern part of the site and spanned a distance of 14m. The function of these features and their possible associations with one another is indeterminate. Dark charcoal-rich fills and burnt-bone inclusions were found within one pit and the remnants of a possible slot-trench was uncovered close by. There were two post-medieval drainage ditches on the site, and a modern sheep burial in the eastern part of the site partially truncated one post-hole.
A017/004., E3026	Ruth Elliott	The site was identified as that of a burnt spread during testing along the route of the M3 Clonee to north of Kells motorway. Excavation was conducted between 6 and 23 January 2006. The site was located in a waterlogged field at the juncture between the River Tolka and a large modern field boundary drain. The burnt spread had surviving dimensions of 4.5 by 11.5m and was truncated by the field boundary which formed the limit of excavation to the north. It was sandwiched between layers of natural peat and marl that had persistently developed along the eastern side of the site, parallel to the river. Only one contemporary feature, a small pit, was excavated.
A017/002, E3024	Ruth Elliott	The site was excavated between 30 March and 23 May 2006 as part of the M3 Clonee to north of Kells motorway scheme. On the western side of a small hill, it was situated in a locality formerly known as Kilbraynan, the location of extensive monastic ruins dating from at least the 13th century. The ruins were demolished in the early 19th century but had probably been centred on a D-shaped enclosure and multivallate ringfort lying just outside the CPO line to the north and south of the site respectively. These were identified through aerial photography carried out by Leo Swan, which also picked up traces of rectilinear features considered to be a possibly contemporary field system. The latter lay within the land-take for the proposed route and linear features picked up during testing appeared to correlate with them. The assessment also identified a large double-oval shape in the landscape, defined by the existing field boundaries and potentially enclosing both the monuments and rectilinear features. One cutting was opened near the top of the hill and central to the inner (possible) oval enclosure (Cutting 1). Another was opened in the location of the rectilinear features to examine the possibility that they may be contemporary with the two enclosures (Cutting 3). Three small cuttings were opened to examine the possible double-oval enclosure (Cuttings 2, 4 and 5). Cutting 1

Licence Number	Excavator	Database Description
		A gravel pit had been located here in the 19th century and large quantities of quarry waste sealed disused quarry features and, in the eastern part of the area, the remains of a rectangular post-built house. Rectangular house The house had been 4m in width and over 12m long. It was orientated north-west to south-east, with the entrance at the south-east. There was a possible entrance portico and beyond this a large gable support, from which two sherds of possibly Late Bronze Age pottery were retrieved. The outer wall foundations were comprised of large post-holes and the roof was supported by pairs of large posts set within the interior. An annexe was built on to the exterior of the south-west wall and an ancillary structure to the south-east may also have originally adjoined the house. There appeared to be an episode of extensive rebuilding, which probably involved complete replacement of the roof. When the structure had ultimately fallen into disrepair, it appeared the major structural elements were deliberately dismantled. There was no evidence for a hearth and no in situ floor-level features survived. Two large pits, almost 10m east of the house, may have been used for food storage. Keyhole kiln A keyhole kiln was located in the south-west and may have been used to produce lime. It was a clay-lined construct with an aboveground clay superstructure defining two bowl-shaped terminals and a central channel. A clay-lined bellows cut adjoined the kiln at the south-west. This latter was badly truncated by the root activity surrounding a tree bole. Two pits to the north-west appeared to contain waste material from the kiln. Cutting 2 A gravel embankment was revealed parallel to the field boundary, but this had been formed during excavation of the boundary ditch and was probably post-medieval in date. No archaeological features were revealed and no evidence to suggest that a medieval (or earlier) enclosure existed in the location. Cutting 3 With the exception of one isolated pit, the only features uncovered were drainage ditches. The earliest three had silted up naturally and no datable evidence was retrieved from them. The remainder comprised a series of very large late post-medieval and modern field drains. The latter corresponded to the rectilinear enclosures picked up by aerial photography and conclusively proved that they did not represent an archaeological field system contemporary to the D-shaped and multivallate enclosure. Cuttings 4 and 5 Cuttings 4 and 5 were placed on either side of the suggested outer oval enclosure and were designed to test that hypothesis. No archaeological features were found within either cutting and no archaeological enclosure was found to exist in the location.
A017/003, E3025	Ruth Elliott	The site was identified as that of a burnt spread during testing along the route of the M3 Clonee to north of Kells motorway. Excavation was conducted at the site between 24 January and 17 February 2006. The site was located in a waterlogged field west of the Tolka River and partially within its flood-plain. Events within the excavation area can be divided into five main phases. The first phase was represented by a burnt spread or fulacht fiadh and related activity. A roughly horseshoe-shaped burnt spread lay at the western edge of the flood-plain opening out towards the water. Roughly concentric settings of post-holes underlay this, suggesting the horseshoe shape may have been formed by two concentric enclosures, the space between which may have been designed to hold the material. A pit and two stake-holes lay within the central area. Additional post-holes and pits lay on higher ground to the west and

Licence Number	Excavator	Database Description
		south-west. In the north-west a series of small pits and post-holes were probably contemporary to the burnt spread. A definite function could not be assigned to the majority, although two clusters of stake- and post-holes may have formed a small semicircular structure opening out to the north-east. The large majority of posts and stakes were deliberately extracted from the ground, which suggested portable structures or reusable structural elements on a temporary or seasonal site. Flooding during excavation demonstrated that the site would have been difficult to occupy during the winter months. The second phase was constituted by continual flooding by the Tolka River, which mixed the burnt-spread material with silt and washed it out across the site. Two large industrial pits, representing the third phase, were located in the central part of the site at the western edge of the flood-plain. The first had a stepped platform within the eastern side of the cut leading to the deeper foundations of a clay superstructure. After collapse of the superstructure the pit was deliberately backfilled. It was located less than 2m from a slightly smaller pit, which lay within the flood-plain at a much lower level. This had a thick watertight lining and filled naturally with water. It is possible the two features could have functioned as a forge and slaking pit. However, no metalworking finds or waste material were found within either feature or in the surrounding area. The fourth phase was represented by continual flooding of the Tolka, which formed a thick layer of alluvium that overlay a 2m-wide margin of the features adjacent to the waterline. Post-medieval and later activity constituted the fifth phase. Two drainage ditches, one curvilinear and the other linear, crossed the site and cut through the Phase 4 flooding. Redeposited natural was set down over the alluvium to fill a waterlogged hollow within the field. On the higher ground in the western part of the site, ploughing appears to have removed spread material and possibly also small features. Although much of the archaeology remained relatively well preserved under the deep alluvium, a modern service trench, 9m wide, cut through the eastern side of the site and is likely to have removed associated features, including the area most likely to have contained a trough.
A017/009	Ruth Elliott	The site at Pace 1 was located 2km north-east of Dunboyne within Contract 1 (Dunboyne to Dunshaughlin) of the proposed M3 Clonee to North of Kells motorway. It was identified as a small burnt spread during testing conducted by Rob O'Hara in 2004 (Excavations 2004, No. 1232, 04E0490) and was fully excavated between 8 September and 18 November 2005. The site lies within a former flood-plain of the River Tolka and the blackened soil deposit covering the north-western part of the site was soon determined to be naturally derived. A small stream, forming the northern border of the area, runs north to meet the Tolka on the other side of the existing N3, and the resultant site stratigraphy is one of alluvial gravels interspersed with episodes of siltation. A wide trench that would have channelled water towards the stream pre-dates the major concentration of archaeological features and may provide evidence of prehistoric land reclamation. A series of pits lay in an arc formation within the former flood-plain and surrounded a small oval setting of stake-holes. Some of the pits contained evidence of circular, flat-based, organic containers that had been packed in place or, in some cases, pinned down with stakes. It is possible that they had been used as cold storage for foodstuffs. Excavation also revealed an oval enclosure, less than 2m in internal diameter, which comprised two roughly double circles of stake- and post-holes. There was a possible entrance at the western side, which was underlain by a pit containing two fragments of coarse pottery, a fragment of clay mould (possibly late Bronze Age) and a fragment of bovine metatarsal. The enclosure contained no hearth and is likely to be too small to represent a dwelling. Its location within a flood-plain suggests that it may have only been used on a seasonal basis.

Licence Number	Excavator	Database Description
		To the south of this area, on a raised level above the flood-plain, a furnace or kiln feature was excavated. This comprised two deep, conjoined pits one of which contained evidence of a clay lining and of the superstructure, which may have collapsed. Evidence for in situ burning was located at the base. With the exception of the burnt bone retrieved from the charcoal-enriched primary fill, there was no evidence of the type of product that had been processed. A number of pits and other features were excavated in the surrounding area, including an arc-shaped setting of post-holes, which may have been used to stretch hides. Evidence of cross-ploughing, in the form of ard marks, was uncovered in the southern and eastern parts of the site above the flood-plain. These ran north-west/south-east and north-east/south-west across the site, in line with the natural contours but completely disrespecting the existing field boundaries and the line of the road. The ard marks held no stratigraphic relationship to any of the chronologically datable layers and, as such, could be placed at any point from the Neolithic to the early medieval period.
A017/011	Ruth Elliott	The site at Pace 3 was located 2km north-east of Dunboyne, within Contract 1 (Dunboyne to Dunshaughlin) of the proposed M3 Clonee to North of Kells motorway. It was identified during testing conducted by Rob O'Hara in May 2004 (Excavations 2004, No. 1232, 04E0490) and was fully excavated between 31 August and 2 September 2005. During testing two circular post-holes (0.25m in diameter and 0.09m and 0.11m in depth), 1m apart, were uncovered. They had vertical sides, flat bases and contained a moderately compact, dark-brown clay with occasional charcoal inclusions. These were fully excavated during testing and were not relocated during excavation. It is possible that the sides had collapsed during the interim period or that their remains were truncated when the area was reopened for excavation. No related features were uncovered on the site. Excavation revealed a modern field boundary situated parallel to the western boundary of the site and was associated with an overlying pit containing charcoal-rich soil.
A017/010	Ruth Elliott	The site at Pace 2 was located 2km north-east of Dunboyne, within Contract 1 (Dunboyne to Dunshaughlin) of the proposed M3 Clonee to North of Kells motorway. It was identified during testing conducted by Rob O'Hara in April 2004 (Excavations 2004, No. 1232, 04E0490) and was excavated fully between 21 November and 5 December 2005.. The site comprised the demolished remains of an L-shaped series of farm buildings surrounding a rectangular, cobbled courtyard. Two phases of activity were represented. The earliest structure, forming the northern building, was rectangular in plan with three ground-floor rooms. Its foundations were shallow and composed of uncoursed limestone blocks bonded with lime mortar. Rubble floor foundations survived in places. The second phase of activity concerned the addition of the western building to this structure and it had deeper, more solid foundations, which possibly supported two storeys. Its walls were constructed of cut limestone blocks with mortar bonding situated beneath a coursed, red-brick setting, two bricks wide, which may have formed the aboveground walls. This second structure had two ground-floor rooms and an adjoining byre at the southern extent. A brick-lined, semicircular hearth was located in the southern-most room. Many sherds of late post-medieval and modern pottery were retrieved from the site and a large deposit of roof slates, which had collapsed from a heat stack, were found to the north-west of the farm buildings.
22E0726	Aidan O'Connell	An archaeological impact assessment was undertaken on a site at Bennetstown, Dunboyne, Co. Meath in advance of a planning application. Geophysical survey of the site under licence 22R0292 identified some linear and curvilinear anomalies of possible archaeological origin. Test excavations in the site investigated the geophysical anomalies and the general area. Seven trenches (735 linear meters) were excavated across the site under archaeological supervision. No features, finds or objects of archaeological significance were identified during the course of testing.

Licence Number	Excavator	Database Description
04E0488	Robert O'Hara	An assessment of the M3 Contract 1 (Clonee- Dunshaughlin), Testing Area 4, along the proposed route of the Dunboyne link road north approaching the proposed Pace Grade Separated Junction was requested by Meath County Council. Located in the townlands of Bennetstown and Dunboyne, the area comprised eight fields on the southern side of the Tolka River. A geophysical survey suggested that the area had the potential to contain archaeological sites. A total of 79 test-trenches were excavated through the area, with a combined length of 4286m (resulting in a total excavated area of 9215m2). The assessment determined that some of the anomalies recorded in the geophysical survey were archaeological sites. Three separate sites, all situated in Bennetstown, were located within this area. Bennetstown 1 was a disturbed spread of heat-fractured stone and charcoal c. 7.2m north-south by 4.8m. An associated circular deposit may represent a trough. Bennetstown 2 was also a disturbed spread of heat-fractured stone and charcoal measuring 8.5m north-south by c. 3.5m wide. Bennetstown 3 comprised two groups of post-holes and pit features within a small area. There was no obvious pattern or layout to these features. A number of examples were tested, but, while charcoal was present, there were no datable finds.
A017/012	Robert O'Hara	Excavation in advance of the M3 Clonee to North of Kells motorway (Contract 1: Dunboyne to Dunshaughlin) revealed a prehistoric settlement comprising a circular structure with associated pits and hearths, which had been truncated by a medieval field system. Also located within the area of excavation were a number of kiln features of unknown date and features associated with ironworking. Tested in 2004 (Excavations 2004, No. 1232, 04E0490), the site was excavated in August and September 2005. The prehistoric settlement probably dates to the Bronze Age. The structure had been severely truncated by medieval agriculture and modern quarrying. Only the base of the deepest pits and post-holes survived, with the exception of one pit feature, probably because it had been buried beneath the bank of the medieval field system. The surviving features suggested a circular structure c. 6m in diameter with evidence for an external hearth. No stratified artefacts or animal remains were recovered from the structure or associated features. The disturbance at the site had, however, dispersed a number of prehistoric artefacts around the site, including several retouched flint and chert flakes, a single fragment of unidentified coarseware pottery and the blade portion of a Group VI tuff axe (most probably from Cumbria in Britain). The site may have some connection to a number of disturbed fulachta fiadh uncovered around the nearby Tolka River and excavated in advance of the M3 (i.e. at Bracetown, No. AD4 above, A017/006, and Bennetstown 2, A017/004). Similarly, possible Bronze Age cremation pits (Dunboyne 1, No. AD8 above, A017/007) and a pit containing Late Neolithic and Beaker pottery (Dunboyne 3, No. AD10 below, A017/013) were discovered at locations elsewhere within the townland. Portions of three separate medieval ditches were recorded. These may have been plot boundaries for properties that fronted onto the Dunboyne–Navan road, a medieval road marked on the 17th-century Civil Survey map of the area. The main ditch formed an L-shape that ran east–west through the centre of the prehistoric structure before turning north under neighbouring properties situated beyond the road-take. This main ditch contained sherds of glazed and unglazed cooking wares, probably 14th century in date, as well as small quantities of animal bone. An iron arrowhead found in topsoil clearance may date to the same period. Two kiln features, probably cereal driers, were located within the site. These were deep, oval-shaped, oxidised cuts. They could not be stratigraphically related to the prehistoric or medieval features on site: one was cut through a buried ploughsoil that sealed the prehistoric features, while the other was truncated by a modern ditch. Two features containing metallic waste were also excavated. One appeared to be either a small bowl furnace or the base of a shaft furnace for the smelting of iron ore. The second contained slag and a large amount of disturbed vitrified clay lining.

Licence Number	Excavator	Database Description
A017/013	Robert O'Hara	Excavation in advance of the M3 Clonee to North of Kells motorway (Contract 1: Dunboyne to Dunshaughlin) revealed a prehistoric site comprising a kidney-shaped pit with associated shallow posts. Tested in 2004 (Excavations 2004, No. 1232, 04E0490), the site was excavated in August 2005. The pit contained a number of sherds of Late Neolithic and Beaker pottery, with flint and chert flakes and debitage. Also present in significant quantities were charcoal and burnt/cremated bone. Analysis of the bone is being undertaken to determine whether it is human or animal. A flint knife was recovered from this feature during testing, along with some sherds of Beaker pottery. Perhaps significantly, the bone was mostly confined to the eastern end of the pit. The site may have some connection to other Bronze Age sites excavated in advance of the planned M3, including possible Bronze Age cremation pits (Dunboyne 1, No. AD8 above, A017/007) and settlement (Dunboyne 2, No. AD9 above, A017/012) and a number of disturbed fulachta fiadh around the nearby Tolka River at Bracetown (No. AD4 above, A017/006) and Bennetstown (A017/004). The features at Dunboyne 3 were situated next to the CPO line. Related features may exist in the vicinity; however, the local landscape has been seriously altered by modern quarrying and their identification may prove problematic

Appendix 14.4 Geophysical Survey Report

August 2023

McCutcheon Halley
CHARTERED PLANNING CONSULTANTS

Geophysical Survey Report

Bennetstown & Dunboyne townlands, Co. Meath

Client
Marina Quarter Ltd.

Detection License
23R0292

TAG Project
2023IE20

Date
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TARGET GEOPHYSICAL SURVEY REPORT 2023IE20, BENNETSTOWN & DUNBOYNE TOWNLANDS, CO. MEATH

PROJECT BACKGROUND

Target Archaeological Geophysics was appointed by Marina Quarter Ltd. to undertake a geophysical survey at the site of a proposed large-scale residential development situated in Bennetstown and Dunboyne townlands, Co. Meath. Located c.1km N of the centre of Dunboyne, immediately S-SW of M3 Parkway, between the M3 Motorway and the R157, the site of the proposed development encompasses c.8ha of agricultural land bound to the E by the Tolka River. A total 6.8ha of high-resolution recorded magnetometry was completed in 7 areas within the site boundary, examining all lands suitable to geophysical investigation.

This geophysical survey forms part of pre-planning archaeological assessment commissioned by Marina Quarter Ltd. in advance of proposed development at the site. The survey was carried out under license from the National Monuments Service, Department of Housing, Local Government & Heritage with the following aims (detection license 23R0292):

- to identify geophysical anomalies of possible archaeological origin within the investigation areas
- accurately locate these anomalies and present the findings in graphical format
- describe the anomalies and discuss their likely provenance in a written report

ITM central coordinate(s): 701566 743558

Townlands: Bennetstown, Dunboyne

County: Meath

Landuse: Grazed pasture

Landscape, soils, geology

The proposed development is located on level good to poor quality pasture land, bordering the Tolka River, which is occupied mostly by fine loamy drift,, typically Luvisols,, with river alluvium (05RIV) to the E -SE (Irish National Soils Map, 1:250,000k, V1b, 2014). Bedrock (100k) is characterised by Lucan formation dark limestone and shale also referred to as Calp (Geological Survey of Ireland Spatial Resources, Public Data Viewer Series).

Archaeology

No recorded monuments and places (RMPs) are located within the boundary of the proposed development. A large number of RMPs are, however, situated in the surrounding landscape, the majority previously identified during achaeological works undertaken in connection with the M3 Clonee-North of Kells Road Scheme. The following extract from the National Monuments Service SMR database provides summary details of all RMPs within a 1km of the site:

SMR No.	Class	Townland	East	North
ME050-027----	Enclosure - large enclo-	Dunboyne	701098	743057
ME050-029----	Church	Dunboyne	700914	743387
ME050-030----	Field system	Dunboyne	700971	743204
ME050-056----	Excavation - miscellane-	Pace	701771	744170
ME050-056001-	Kiln - corn-drying	Pace	701799	744162
ME050-057----	Excavation - miscellane-	Bennetstown	701490	743915
ME050-058----	Burnt mound	Bennetstown	701594	743995
ME050-059----	Burnt mound	Bennetstown	701775	743772
ME050-060001-	Structure	Dunboyne	701885	743642
ME050-060002-	Kiln - corn-drying	Dunboyne	701890	743637
ME050-060003-	Furnace	Dunboyne	701915	743647
ME050-061----	Pit	Dunboyne	702002	743278

Fieldwork	23rd July 2023
Personnel	John Nicholls MSc. (Target) & Ger Dowling PhD.
Geophysical technique	High-resolution recorded magnetometry (fluxgate gradiometry)
Report issue	5th August 2023
Author	John Nicholls MSc.
Detection license no.	23R0292
Client	Marina Quarter Ltd.
Archaeologists	John Cronin & Associates

1 SURVEY METHODOLOGY

1.1 Methodology

1.1.1 Geophysical survey by high-resolution recorded magnetometry was conducted in 7 areas (M1-M7) within the boundary of the proposed development, investigating 6.8ha of suitable land within a site boundary encompassing a total 8ha.

1.1.2 The geophysical survey employed an advanced multichannel fluxgate gradiometer system combined with cm precision GPS, recording magnetometer (fluxgate gradiometer) and GPS data simultaneously at rates of 50Hz and 1Hz respectively. The geophysical data were acquired along parallel instrument traverses 3.64m in width, with the instrumentation installed in 'tow configuration' for use with an ATV.

1.2 Instrumentation

1.2.1 The following table provides a summary of the survey methodology and geophysical instrumentation employed during the course of this work:

Technique	Sensor spacing	Sample rate	Instrumentation	Sensitivity/precision
Magnetometry (fluxgate gradiometry)	0.28 to 0.5m	50Hz	Multi-channel fluxgate gradiometer array	<75pT/√Hz @ 1Hz (650mm baseline)
GPS	2 to 3.92m	1Hz	Trimble R10 (VRS)	<0.1m

1.2.2 The instrumentation and software employed for this geophysical survey were configured to apply a spatial resolution of c.40-80 magnetometer measurements per m^2. This spatial resolution meets with ease the 'Level 3 – Characterisation' EAC Guidelines for geophysical survey in archaeology (Schmidt et al, 2016).

1.3 Data processing

1.3.1 Post-fieldwork geophysical survey data processing was undertaken as follows:

Process	Description
i	Positioning of geophysical data based on real-time GPS measurements (WGS84 Geodetic CRS)
ii	Zero median transect processing for multi-sensor magnetometer data collected along parallel transects
iii	Transformation from WGS84 geodetic coordinate system to ITM (IRENET95) projected CRS
iv	Gridding (ordinary kriging)
v	Export of greyscale images georeferenced in ITM (IRENET95) projected CRS

1.3.2 To maintain the integrity of the processed geophysical data, and its correlation with the original raw on-site measurements, no further processing, filtering or 'smoothing' of the data was undertaken following steps i-v.

1.4 Data display

1.4.1 Figure 1 presents a site location diagram (scale 1:15,000), highlighting the boundary of the proposed development situated to the N of Dunboyne, S-SW of M3 Parkway and E of the R157, with RMPs in a 1km radius indicated.

1.4.2 Figure 2 presents a greyscale of the survey results from areas M1-M7 completed across the available portions of the proposed development (scale of 1:1500).

1.4.3 An interpretation of the results from M1-M7 is presented in figure 3 (scale 1:1500). Numbers included on the interpretation diagram refer to notable anomalies recorded from this geophysical survey, and these are discussed in the results section of this report.

2 GENERAL CONSIDERATIONS

2.1 Ground conditions & access

2.1.1 The site of proposed development encompasses c.8ha of good to poor quality pasture land which becomes increasingly wet with a difficult ground surface to the E towards the Tolka River. Fieldwork was conducted across M1-M7 investigating the accessible and level portions of site, traversing 4-5 fields sub-divided by post and wire fencing and electrical fences. Very poor quality land and high vegetation to the SE within the boundary of the proposed development was excluded from the geophysical survey.

2.2 Modern interference

2.2.1 The results from geophysical survey in M1-M7 display an abundance of modern ferrous responses throughout. These are a common occurrence in magnetometer data and relate mostly to metallic debris contained in the topsoil. Large ferrous anomalies reflecting metal borehole caps located in M1 to the N and M4 at survey centre are also apparent in the results. Broad ferrous responses at the perimeter of M1-M7 derive from ferrous material in proximity to existing boundaries, with further ferrous disturbance caused by an electric fence traversing M6 roughly NW-SE.

2.2.2 Bands of magnetic interference caused by overhead power cables are also evident to the NE in M2-M3, with modern magnetic disturbance to the NE in M2 and NW-W in M3 likely deriving from previous works connected with construction of M3 Parkway located immediately to the N.

2.3 Recent landuse & cultivation

2.3.1 Remnants of a former field boundary are indicated at survey centre and to the SE in M7, with traces of past cultivation evident in M1 as closely spaced parallel linear trends oriented roughly NW-SE.

2.3.2 A network of land drains has also been detected across the northern portion of M4.

3 GEOPHYSICAL SURVEY RESULTS

3.1 General overview

3.1.1 The results from geophysical survey in M1-M7 at the site of proposed development demonstrate a mostly quiet magnetic background within a range of +/-1.5nT, and this is punctuated by different sources of modern interference/disturbance, including magnetic disturbance to the N, W and NW in M2-M3 from previous construction of M3 Parkway; interference from pylons and overhead cables to the NE in M2 and M3; land drains in M4; and former cultivation in M1. Small-scale ferrous indicative of modern metal debris also occurs in the results, with larger zones of modern ferrous occurring mostly adjacent to existing boundaries and electric fencing.

3.1.2 Despite the varied modern disturbance/interference across the site, the geophysical survey has identified the location of 2 archaeological sites within the proposed development boundary. These include a small levelled enclosure, most likely a ring-ditch, to the SE in M3; and a larger circular ditched enclosure, probably a rath - ringfort, to the E in M4.

3.1.3 The results also highlight groups of weakly magnetic linear anomalies and trends extending from survey centre to the E-NE across M3, and from SE to W-NW in M4. These linear anomalies are expected to represent early field system remains.

3.1.4 Further small-scale positives and trends are apparent in the data. These display no clear archaeological character or patterning to warrant a definite archaeological interpretation, and a recent landuse, natural soil/geological and/or modern ferrous origin is expected for the majority.

3.2 Survey results (figures 2-3)

3.2.1 The following table provides details of notable anomalies recorded during the course of this geophysical survey:

Area	Anomaly	Location	Description & likely provenance
M1	NA	NA	*No significant responses recorded* No responses of archaeological character or significant potential are indicated by the results from M1. Responses from modern ferrous and past cultivation extend throughout, with 1 curving linear trend of limited interest noted to the SE.
M2	NA	NA	*No significant responses recorded* No responses of archaeological character or significant potential are indicated by the results from M2. Interference from overhead power cables, modern magnetic disturbance and ferrous traverse the results from this survey location.
M3	1-3	E of centre	*Archaeology | Anomaly of uncertain origin | Trend* Small circular enclosure (1) c.10m in diameter, indicative of a ring-ditch, with probable early field system remains (2-3) indicated from survey centre to the E-NE.
M3	4	E	*Archaeology | Trend* Circular ditched enclosure c.40m in diameter, probably a rath – ringfort, with trends of unknown significance suggested at the interior.
M4	5	NE	*Anomaly of uncertain origin | Trend* Poorly defined positives and trends of uncertain origin. A recent landuse and/or natural soil/geological explanation is expected.

M4	6-7	SE-W/NW	*Anomaly of uncertain origin* | *Trend* Weakly magnetic positives linear responses and trends of possible interest. 6-7 are generally indicative of former field system remains. The possibility that these anomalies represent remains of a former trackway/road should not be ignored. Anomaly 6 may potentially continue northwards in to M2. However, modern interference from overhead power cables may have masked the location of such responses, if present.
M5	8	S	*Anomaly of uncertain origin* Discrete positive of uncertain origin. The significance of 5 is highly tentative, and a modern ferrous origin should also be considered.
M6	NA	NA	*No significant responses recorded* No responses of archaeological character or significant potential are indicated by the results from M6. Modern ferrous from an adjacent field boundary and electrical fencing are apparent across the results from this survey location.
M7	NA	NA	*No significant responses recorded* Broad ferrous responses across survey centre and to the SE in M7 overlie the townland boundary between Dunboyne and Bennetstown. No responses indicative of archaeological settlement or activity are indicated by the results from this location.

4 CONCLUSION

4.1 Geophysical survey at the site of the proposed development in Bennetstown & Dunboyne townlands has recorded the location of 2 previously unknown archaeological sites. These are situated in the eastern portion of the proposed development within c.90m of the Tolka River. Further weakly magnetic linear responses and trends of potential note have also been recorded in the vicinity, and these could represent early field system remains, a trackway or former road.

4.2 Elsewhere, the results from geophysical survey in M1-M7 highlight responses associated with recent landuse in the form past boundaries, modern ferrous, magnetic disturbance and interference from overhead power cables.

BIBLIOGRAPHY

QGIS Development Team, 2021, QGIS Geographic Information System, Open-Source Geospatial Foundation Project http://qgis.osgeo.org.

Schmidt A, (2002), Archaeology Data Service. Geophysical Data in Archaeology. A guide to good practice.

Schmidt A, Linford P, Linford N, David A, Gaffney C, Sarris A, and Fassbinder J, (2016), EAC Guidelines for the Use of Geophysics in Archaeology.

ONLINE RESOURCES

Archaeological Survey of Ireland SMR Database: http://webgis.archaeology.ie/historicenvironment/

Bing Maps: https://www.bing.com/maps

Geological Survey of Ireland Spatial Resources, Public Data Viewer Series: https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228

Google Maps: https://www.google.com/maps

Geohive Mapviewer: http://www.geohive.ie

Irish National Soils Map, 1:250,000k, V1b (2014). Teagasc, Cranfield University (jointly funded by the EPA STRIVE Research Programme 2007-2013 & Teagasc): http://gis.teagasc.ie/soils/map.php

LIST OF FIGURES

APPENDIX

MAGNETOMETRY

Introduction

Magnetometry represents one of a suite of geophysical techniques employed in archaeological prospection to inform invasive work such as trial trenching and excavation.

Frequently used to determine the often non-visible boundaries of archaeological remains, magnetometer surveys enable archaeologists to identify the location, form and extent of a diverse array of archaeological features no longer visible at the surface.

Buried archaeological remains successfully identified using magnetometry include sites such as enclosure systems and deserted villages, hillforts and military encampments, henges and tumuli, villa/castle foundations, ecclesiastical settlements and formal gardens.

Background to application

The basis for use of magnetometry in archaeological prospection derives from the abundance of natural iron oxides in most soils, and our ability to measure subtle variations in the magnetic properties of these iron oxides caused by human activity. Discrete variations in soil magnetism associated with buried archaeological remains derive typically from in situ burning and organic enrichment of the soil, through activities such as cooking and heating; pottery manufacture and metal working; as well as use of fired building materials such as ceramic tiles and brick. These burnt, fired and organic rich deposits create subtle magnetic contrasts visible as discrete magnetic anomalies superimposed on the earth's geomagnetic field.

1. Magnetometer survey data in greyscale format highlighting pit remains SE of an enclosure and Roman villa.

2. Burnt-fired debris uncovered during excavation of the highlighted area SE of the same enclosure and Roman villa.

Magnetometer surveys conducted in both commercial and research archaeological investigations enable determination of the location, form and extent of buried archaeological remains. Data acquired from these surveys can be quickly generated into georeferenced images and interpretation layers to inform subsequent trial trenching and excavation.

Technology

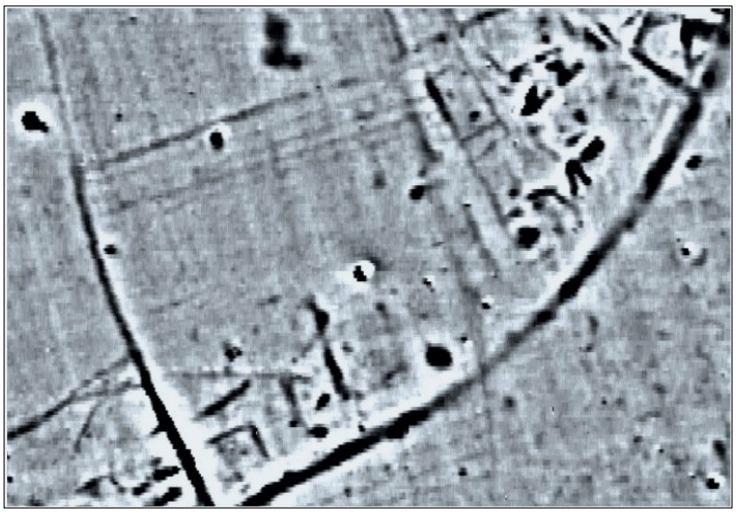
TARGET provides precise mapping and characterization of buried archaeological remains by employing an array of highly stable and sensitive fluxgate gradiometers, combined with an advanced data logging system and cm precision GPS. This state-of-the-art geophysical instrumentation, which is capable of collecting extremely dense data sets, permits detailed high-resolution survey of archaeological sites from as small as 1ha in size, to larger scale investigation of sites up to 150ha or more.

High resolution magnetometer surveys are undertaken as standard, recording data at c.5cm intervals with probe separations of 0.3m for precise measurement and characterization of buried archaeological remains. This spatial resolution meets with ease the 'Level 3 – Characterisation' EAC Guidelines recommendation for geophysical survey in archaeology (Schmidt et al, 2016).

Instrumentation is used in combination with cm precision GPS and data collected along parallel traverses with the system installed in 'tow configuration' for use with an ATV or in push mode.

Data Display

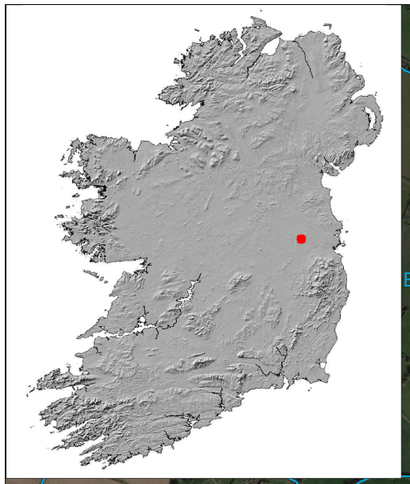
Greyscale plots are the most common format for displaying magnetometer data. This display format assigns a cell to each datum according to its location on the grid. The display of each data point is conducted at very fine increments, allowing the full range of values to be displayed within a given data set. This display method also enables the identification of discrete responses barely visible above natural 'background' magnetic variation on site.



6. Greyscale from survey at the site of a deserted medieval village.

XY trace plots provide a near-perspective representation of measurements along individual lines of data recorded from each magnetometer sensor. The XY trace format is used as a conventional method for identifying responses of modern ferrous debris, and also as an aid in identifying locations of potential industrial features, such kilns and metal working.

7. XY trace from survey at the site of a deserted medieval village.



Site location
1km radius from site boundary
SMR Zone & National Monument
Townland boundary
Aerial imagery © Google & Maxar Technologies 2023

RECEIVED: 21/09/2023

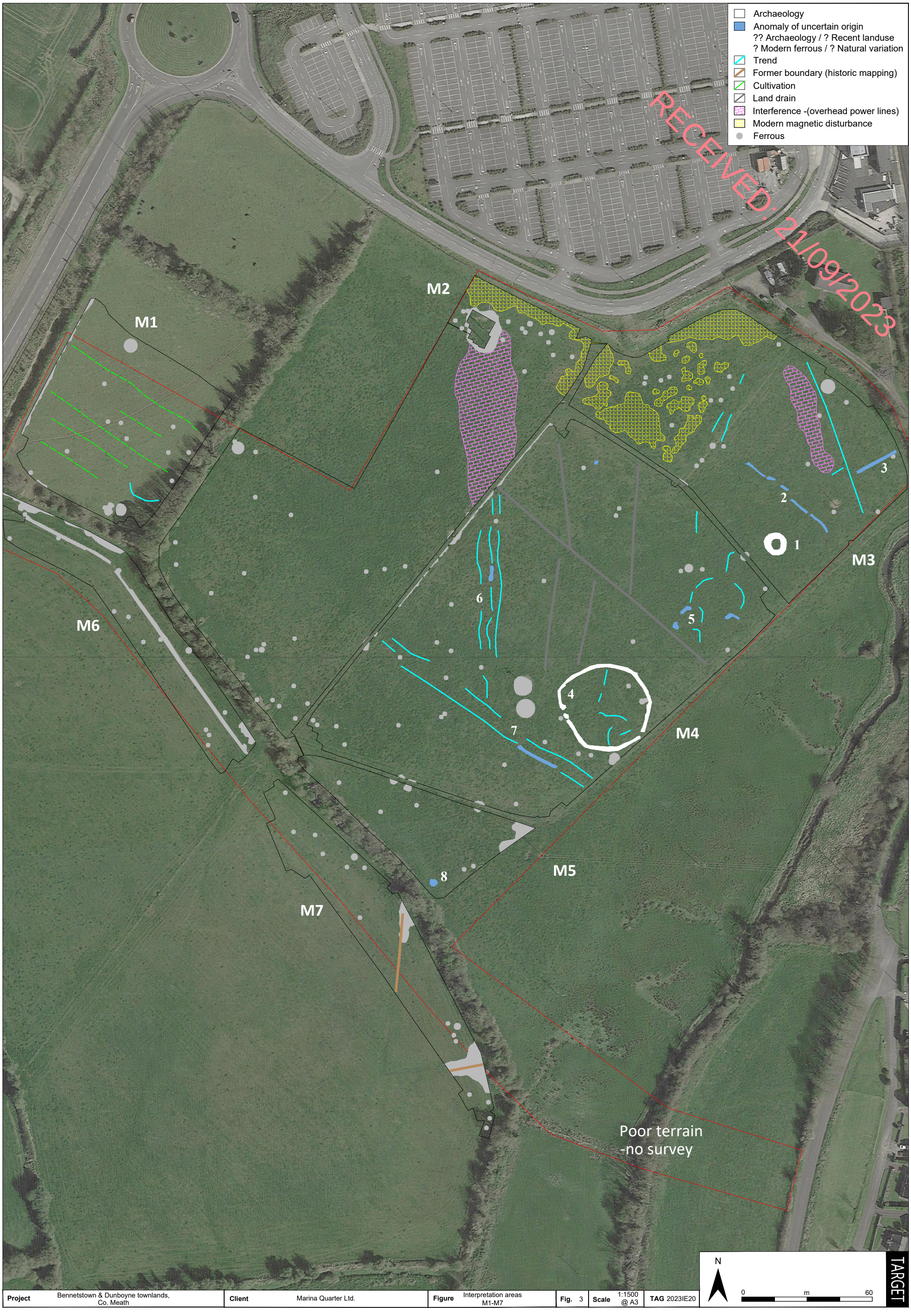
Piercetown
Cradockstown
Ballymagillin
Stokestown
Beggstown
Woodpark
Whitesland
Kinoristown
Rowan
Warrenstown
Pace
ME050-056
ME050-056001
Naulswood
Normansgrove
ME050-058
M3 Motorway Junction 5
ME050-057
M3 Parkway
Portmanna
Bennetstown
ME050-059
ytownpark
ME050-060001-003
Paddingstown
Cushinstown
ME050-029
ME050-062001
ME050-062002
R147
ME050-061
ME050-030
Bracetown Business Park
Bracetown
ME050-027
R157
Dunboyne Business Park
Dunboyne
Collierstand North
Gunnocks
Sarney
Collierstand South
Loughsallagh
Portan
Hamwood

N
0 m 600

Project	Bennetstown & Dunboyne townlands, Co. Meath	Client	Marina Quarter Ltd.	Figure	Site location diagram	Fig. 1	Scale 1:15,000 @ A3	TAG 2023IE20

TARGET

Project	Bennetstown & Dunboyne townlands, Co. Meath	**Client**	Marina Quarter Ltd.	**Figure**	Greyscale areas M1-M7	**Fig.** 2	**Scale**	1:1500 @ A3	**TAG** 2023IE20


Archaeology
Anomaly of uncertain origin
?? Archaeology / ? Recent landuse
? Modern ferrous / ? Natural variation
Trend
Former boundary (historic mapping)
Cultivation
Land drain
Interference -(overhead power lines)
Modern magnetic disturbance
Ferrous
RECEIVED: 21/09/2023
M1
M2
M3
M4
M5
M6
M7
1
2
3
4
5
6
7
8
Poor terrain
-no survey
N
0
m
60
TARGET
Project Bennetstown & Dunboyne townlands, Co. Meath
Client Marina Quarter Ltd.
Figure Interpretation areas M1-M7
Fig. 3
Scale 1:1500 @ A3
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