Geophysical Survey Report
Tinakelly & Newrath, Co. Wicklow

License No. 22R0023
RMP: N/A

ITM 729373, 695688

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Summary

This report details the results of a geophysical survey (Licence No.: 22R0023) conducted at lands Tinakelly and Newrath, Co. Wicklow. The investigation on behalf of Irish Archaeological Consultancy in respect of a pre-planning study (archaeological reconnaissance).

The geophysical survey, comprising high resolution magnetic gradiometry, was undertaken by Ger Dowling in mid-February 2022 and encompassed an area measuring some 14ha. in total size. The investigation has revealed several features of potential archaeological interest, as well as other remains indicative of modern agriculture and land division

Further work is required to determine the precise nature and significance of the features identified by the present investigation.

Survey details

Site Name: Tinakilly
Townlands: Tinakelly & Newrath
County: Wicklow

Parish: Rathnew
Barony: Newcastle

RMP No.: N/A
ITM (Survey Area Centroid): 729373, 695688

Land use: Pasture
Geology: Dark blue-grey slate, phyllite & schist (Maulin Colleen Formation)
Soils: Fine loamy drift with sillceous stones (Clonroache series)

Survey License No.: 22R0023
Planning Reference No.: N/A

Survey Type: Fluxgate Gradiometry
Traverse Interval: 0.5m
Area Surveyed: *c.*14ha.

Instrument: Five-channel magnetometer
Sample Interval: 0.05m

License Holder: Ger Dowling
Report Author: Ger Dowling
Report Date: February 2022

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Abbreviations

ASL	Above Sea Level
GIS	Geographical Information Systems
GPS	Global Positioning System
IAC	Irish Archaeological Consultancy Ltd
ITM	Irish Transverse Mercator
nT	nanoTesla (unit of magnetic measurement)
OS	Ordnance Survey
RMP	Record of Monuments and Places
SMR	Site and Monuments Record
WI	Wicklow

Coordinate System

All GPS coordinates given in this report are in Irish Transverse Mercator (ITM).

1 Introduction

This report details the results of a geophysical survey (Licence No.: 22R0023) at Tinakelly & Newrath townlands, Co. Wicklow.

The survey, comprising high resolution magnetic gradiometry, was undertaken by Ger Dowling in mid-February 2022. The target area, encompassing some 14ha. in total size, comprises two fields of tillage**.**

The site has not previously been subjected to geophysical survey and the investigation was designed to identify and map any unrecorded sub-surface archaeological sites or features that may be present.

2 Site Location

The geophysical survey area encompasses two, large irregular fields of tillage in the townlands of Tinakelly and Newrath, Co. Wicklow (Figure 1). The site, which lies directly east of Rathnew town, is in the Civil Parish of Rathnew and the Barony of Newcastle.[1]

3 Survey Background

The survey was being conducted on behalf of Irish Archaeological Consultancy Ltd in respect of a pre-planning study (archaeological reconnaissance).

4 Archaeological Background

4.1 Recorded/Known Archaeology

There are no recorded archaeological monuments within the lands of the survey area. The nearest recorded monument is a church and graveyard (SMR WI025-010001- & WI025-010003-), and associated font (SMR WI025-010002-), in the town of Rathnew (Figure 2).[2] A number of other sites and features of varying date are recorded in the surrounding area and include an enclosure (SMR WI025-009001-) and a field system (SMR WI025-009----) in Newrath townland, about 600m northwest, and an enclosure (SMR WI025-089----) in Knockrobin townland, about 800m to the southeast.[3] Tinakelly House, a detached four-bay two-storey with attic country house, built between 1876 and 1883 and recorded in the National Inventory of Architectural Heritage (Reg. No. 16402508), is situated immediately adjacent to the site, on the east.

[1] https://www.logainm.ie/en/55775?s=tinakelly & https://www.logainm.ie/en/55485: accessed on 15 January 2022.
[2] Historic Environment Viewer (archaeology.ie): accessed on 15 January 2022.
[3] *Ibid*.

The only recorded archaeological investigation in the Tinakelly—Newrath area comprised monitoring of topsoil stripping of fourteen discrete areas in Tinakelly townland in 2021.[4] This resulted in the discovery of a large and varied array of features that included pits, troughs, hearths, cremation pits, kilns and furnaces. Many of the features identified appear to relate to Bronze Age activity, though a figure-of-eight/shaped kiln of possible early medieval origin was also encountered. Taken together, the recorded remains are suggestive of prolonged, multi-phase activity, involving settlement, burial, agricultural and small-scale industry.

4.2 Previous Investigations

No recorded archaeological investigations have previously been conducted at the survey area. Nearby investigations have been described above.

5 Survey Location and Aims

The investigation, comprising high resolution magnetic gradiometry, encompassed an area of approximately 14ha. in total size. This consists of two adjacent fields ('Field 1' and 'Field 2') separated by a tree-lined earthen bank and post-and-wire fence that have been used for tillage in recent times (Figure 3). Field 1, on the south, is relatively flat (Plate 1), apart from on the west where the land slopes gently to a water-logged area of rough, overgrown pasture (Plate 2). The northern Field 2 is more undulating and steeply sloped in places and rises to a low, rounded height of approximately 27m ASL. An overgrown former quarry pit (Plate 3) is located in the eastern half of the field, while its far western corner is occupied by a small tract of rough pasture. Both fields are flanked by pastureland on the north and west, and by Tinakelly House on the east, with a residential estate currently under construction in the field directly to the south.

The underlying bedrock of the locality comprises dark blue-grey slate, phyllite & schist (Maulin Colleen Formation).[5] The soils are dominated by fine loamy drift with siIlceous stones (Clonroache series).[6]

The geophysical investigation sought to:

- identify any geophysical anomalies of possible archaeological origin within the specified survey areas
- accurately locate these anomalies and present the findings in map form

[4] https://excavations.ie/report/2021/Wicklow/0030675/: accessed on 15 January 2022.
[5] Geological Survey of Ireland Spatial Resources, Public Data Viewer Series: https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228 [Accessed 15 January 2022].
[6] Irish National Soils Map, 1:250,000k, V1b (2014): http://gis.teagasc.ie/soils/map.php [Accessed 15 January 2022].

- describe the anomalies and discuss their likely provenance in a written report
- incorporate all of the above in a report to the Client

6 Survey Methodology and Instrumentation

The survey employed high resolution magnetic gradiometry (Table 1). This technique measures variations in the magnetic properties of the soils and is widely used in archaeological geophysical prospection due to its ability to detect and map a broad range of sub-surface archaeological remains, including ditches and pits as well as burnt or fired features associated with metalworking and pottery production.

The magnetic survey was conducted using a five-channel fluxgate gradiometer system combined with cm-precision GPS (georeferenced to Irish Transverse Mercator and Ordnance Datum). Mounted on a cart, and pulled by a quad bike, the system records magnetometer and GPS data simultaneously into a single data file. The data capture strategy involved logging readings every 0.05m intervals along transects spaced 0.5m apart, with a maximum traverse width of 2.5m. The sampling strategy produces a high-resolution dataset, giving clarity to any archaeological features detected. The highly accurate positioning of the survey data provides strong confidence when integrating the geophysical results with other datasets such as aerial imagery in GIS, and also ensures repeatability should further investigation of anomalies (e.g. test excavation) be required.

Table 1. Tinakelly—Newrath geophysical survey details

Technique	Instrumentation	Sensor spacing	Sample rate	Survey Area	Number of recorded data
Magnetic Gradiometry	Five-channel fluxgate gradiometer array	0.5m	40 Hz	*c*.26ha	780,260[7]

7 Data Management, Processing and Interpretation

Survey data was logged to a laptop computer and archived daily to an external hard drive. The collated data was processed using the following methodology:

- Real-time positioning of magnetometer data based on GPS measurements;
- Processing (Zero Mean Transect) of collated magnetometer data;
- Gridding (nearest neighbour interpolation);
- Interpolation of the dataset to improve the visual quality; and

[7] Field 1 (south): 399,390 readings; and Field 2 (north): 308,870 readings.

- Export of georeferenced greyscale images at optimum visual range

The processed data was imported into QGIS for final image production (see Figure 8—Figure 11). Final geophysical datasets have been formatted as raster data models/GeoTiffs (projected to ITM, EPSG:2157) to enable subsequent geospatial analysis. Fieldwork, data processing and reporting adhered to the most up-to-date guidelines for conducting archaeo-geophysical surveys.[8] All geophysical raster datasets will be digitally archived to best practice.[9]

8 General Considerations and Complicating Factors

8.1 Access and Ground Conditions

The survey area comprises two, large fields of tillage, with the northern Field 2 being more undulating and steeply sloped than Field 1. Most of the target lands proved suitable for investigation, apart from two, small tracts of rough pasture at the western end of each field. A large pit, corresponding to a former quarry, in the eastern sector of Field 2 also had to be avoided by the survey.

8.2 Modern Interference

Numerous small-scale ferrous (dipolar) responses are evident in the results from the gradiometry survey. These are a common occurrence in magnetic data and in most cases represent modern metal debris contained within the topsoil; some of the ferrous responses may reflect objects of archaeological interest.

Areas of ferrous disturbance deriving from survey in proximity to post-and-wire fences were recorded in places around the edges of the survey area. Modern metallic debris in the quarry pit in Field 2 also represented a source of magnetic disturbance.

8.3 Former land use

Traces of former cultivation are evident in the survey results from portions of both fields, appearing as multiple, closely-spaced, parallel, positive linear anomalies, oriented northeast–southwest. A

[8] 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*: *Questions to Ask and Points to Consider*. EAC Guidelines 2. [Online] Available from: https://f64366e3-8f7d-4b63-9edf5000e2bef85b.filesusr.com/ugd/881a59_fdb1636e95f64813a65178895aea87cf.pdf

[9] Niven, K. 2012. *Raster Images: A Guide to Good Practice*. Archaeology Data Service/Digital Antiquity, Guides to Good Practice. [Online] Available from: http://guides.archaeologydataservice.ac.uk/g2gp/RasterImg_Toc; & Schmidt, A. and Ernenwein, E. 2012. *Guide to Good Practice: Geophysical Data in Archaeology*. Oxford: Oxbow.

former field boundary depicted in Field 1 on both the first-edition six-inch Ordnance Survey Map (1840) and the 25-inch Ordnance Survey Map (1910; surveyed 1908) was also identified by the survey (labelled '5' on Figure 9; for historical mapping, see Figure 4 and Figure 5). The quarry in Field 2 corresponds to a small, ovaloid area indicated as marshy terrain on the 1910 map; it is not recorded on the 1840 map.

8.4 Geology and soils

The dominant magnetic variations recorded across the survey area appear as an incoherent and 'mottled' array of amorphous and sinuous responses. In general, fluctuations of this sort are likely attributed to natural variations in the depth and composition of the underlying (near-surface) geology and soils. However, the possibility that some of the discrete anomalies within this group are anthropogenic (archaeological or modern) in origin cannot be excluded. It is also conceivable, moreover, that these responses could have the effect of masking more subtle anomalies of archaeological interest.

8.5 Cropmarks

Several cropmarks are visible in both fields on available satellite imagery. The former field boundary mapped by the survey in Field 1 is clearly apparent as a linear cropmark on Aerial Premium imagery (Figure 6),[10] though two other possible arcuate cropmarks (labelled 'Cropmark 1' an 'Cropmark 2') discernible nearby on the same imagery were not detected by the magnetic survey and their precise nature and significance is unknown.

Of perhaps greater potential interest is the possible cropmark of what may be a small circular enclosure on Google Satellite imagery[11] in the southwest quadrant of Field 2 (Figure 7). This tentative feature, which corresponds to a very faint, positive, semi-circular trend in the geomagnetic data (labelled '1' on Figure 9), could be of archaeological interest, though a natural or geological origin for this potential anomaly is equally possible. Many of the sinuous cropmark features recorded in Field 2 on Google Satellite imagery were mapped by the gradiometry survey and likely reflect the underlying geology and soils.

[10] See National Townland and Historical Map Viewer (arcgis.com)
[11] Google Earth.

9 Survey Results

Table 2. survey results

Townlands	Tinakelly & Newrath			
ITM (centroid)	729373, 695688			
Area surveyed	*c*.14ha.			
Figure Numbers	Figure 8—Figure 11			
Anomaly Number	***Field Number***	***Form/nature of anomaly***	***Possible sources(s) of anomaly***	***Interpretative discussion***
1	2	Weak, semi-circular positive trend	Possible archaeology/natural/ geology	Possible circular feature, approx. 22m E–W. Appears to correspond to cropmark visible on Google Satellite imagery. Tentative feature. A natural/geological origin also possible ***Detailed view of cropmark on Figure 7***
2	2	Strong 'pit-type' response	Possible archaeology/ modern	Possible elongated pit/kiln, approx. 2.5m in length (roughly N—S). Defined by strong magnetic response, up to 50nT, possibly indicating presence of burnt or fired material. A modern ferrous origin also possible ***Detailed view of anomaly on Figure 10***
3	2	Multiple, strong 'pit-type' responses	Possible archaeology/ modern	Possible burnt spreads or modern ferrous debris. Defined by strong magnetic response, averaging 20—60nT.
4	1	Multiple 'pit-type' responses	Possible archaeology/ agricultural/natural	Possible pits/deposits; may also reflect natural soil variation and/or disturbance from agriculture and/or ferrous debris
5	1	Negative linear	Agricultural/modern	Relict field boundary, *c*.135m in length (NW–SE). Marked on both first-edition six-inch Ordnance Survey Map (1840) and the 25-inch Ordnance Survey Map (1910; surveyed 1910). Appears to underlie, and therefore pre-date,

				plough trends
6	1, 2	Multiple negative linears	?Agricultural	Possible ditches of varying width, suggestive of former field boundaries and/or field drains. Not depicted on historical mapping
	1, 2	Multiple, closely spaced, parallel, positive linears	Agricultural	Former cultivation. Extends NE–SW across the approximate centre of Field 1 and southern part of Field 2. Appears to overlie, and therefore postdate, [3]
	1, 2	Multiple ferrous responses	Modern	Ferrous debris
	1, 2	Areas of ferrous disturbance	Modern	Disturbance from adjacent field boundaries and metallic debris in former quarry pit
	1, 2	Multiple, sinuous positive—negative anomalies and weak, amorphous areas of magnetic variation	Natural/geological	Likely reflects localised natural variations in geology and soils ***Principal geological/pedological responses marked on Figure 9; mottled areas not indicated***

10 Conclusion

The geophysical survey did not reveal any anomalies of certain archaeological significance, though a number of responses of potential interest were identified. A faint, semi-circular positive anomaly [1] mapped in Field 2 appears to correspond to the northern half of a possible small cropmark enclosure measuring approximately 22m in east—west diameter. This anomaly would be consistent with a narrow 'ditch-type' feature, but it is only very weakly expressed against the background magnetic variation and is not sufficiently distinct to allow for any further interpretation. Elsewhere in Field 2, a possible pit (or kiln?) with burnt material [2] and several areas of potential burning [3] were recorded by the survey, though in the absence of supporting evidence, an archaeological interpretation for these is tentative; some may have a modern (e.g. agricultural/ferrous) origin and/or reflect natural variations in the underlying geology/soils. While an archaeological origin is also possible for the 'pit-type' anomalies [4] identified in Field 1, they may equally be the result of natural soil variation and/or relate to ground disturbance associated with agriculture.

Evidence for modern agricultural activity is also represented in the dataset. A linear response [5] recorded in the eastern half of Field 1 corresponds to a levelled field boundary marked on both the first-edition six-inch Ordnance Survey Map (1840) and the 25-inch Ordnance Survey Map (1910; surveyed 1908). A number of linear negative anomalies [6] identified in both fields also hint at the existence of other buried features possibly relating to former field division and land-use (e.g. drainage).

The dominate responses registered by the survey in both fields appear as sinuous, positive—negative anomalies and less coherent ('mottled') spreads or deposits of magnetically enhanced soils. Likely reflecting natural variations in the underlying geology and soils, these responses are more pronounced in Field 2, where the terrain reaches its highest point. This suggests that the bedrock lies to close to the surface in Field 2 and may account for the presence of the quarry in this area.

Given the nature of the survey results overall, it is important to note that weaker responses of potential archaeological significance may be 'masked' or 'hidden' by the natural/geological responses mapped by the survey. Further work (e.g. test excavation) is required to assess the nature and significance of the anomalies identified by the present investigation.

11 Figures

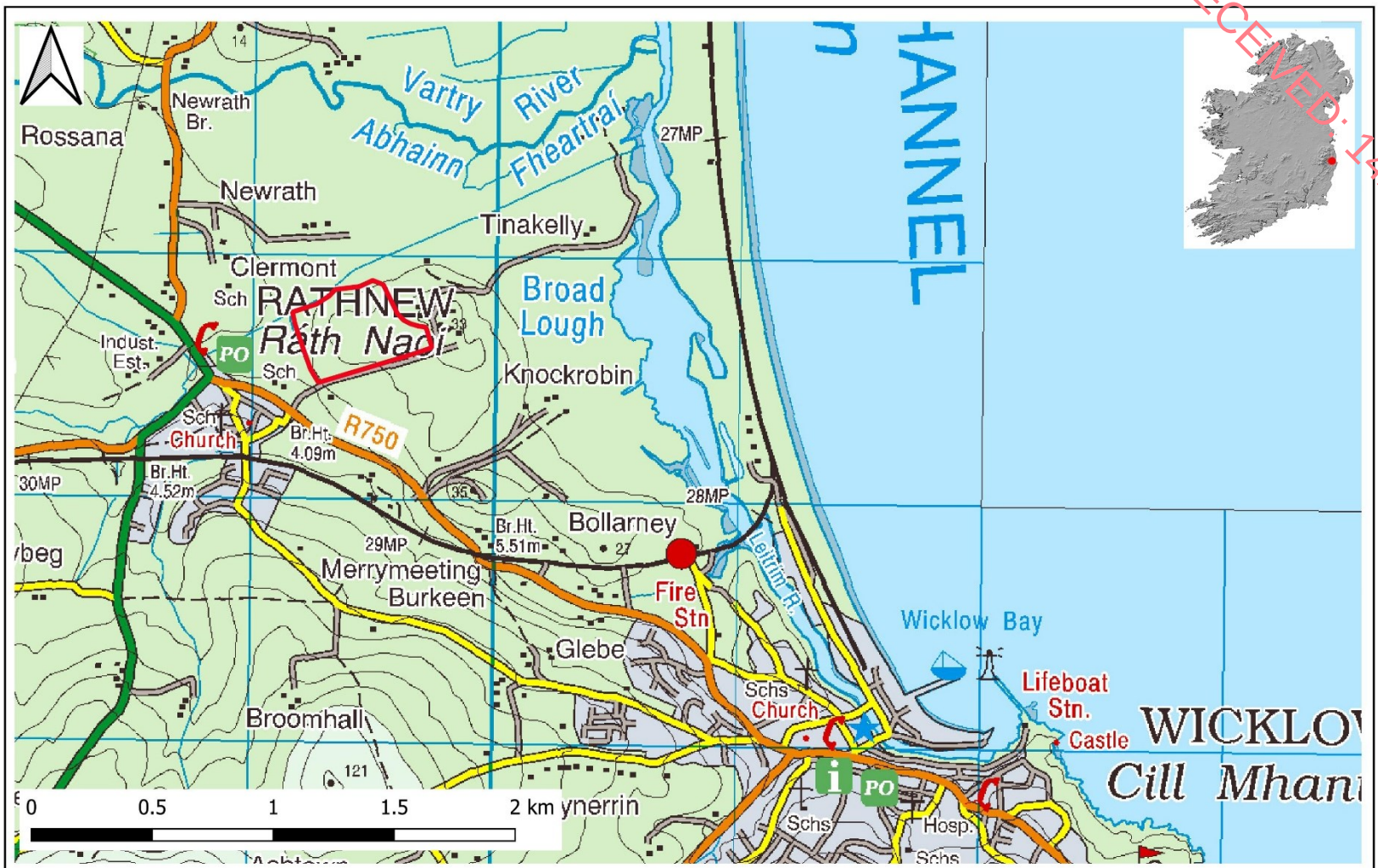

Figure 1	Tinakelly & Newrath, Co. Wicklow Geophysical survey Site Location Map	Scale 1:20,000@A4 Date 21.02.2022	Legend Survey Area	Source of background mapping: Discovery Series Maps, sheet 56

Figure 1. Map of the Wicklow—Rathnew area, showing location of the survey area outlined in red.

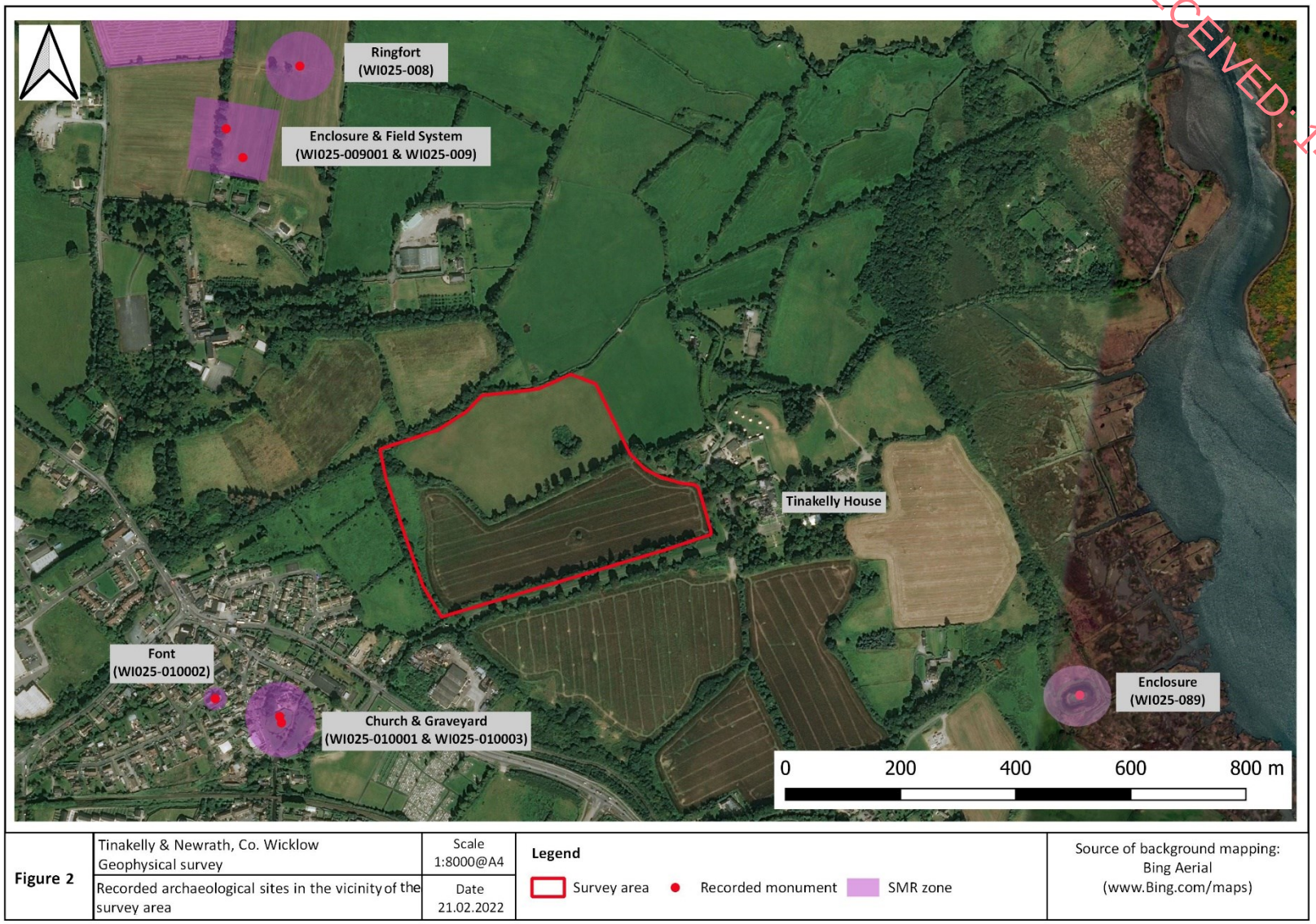

Figure 2. Aerial view of the Tinakelly—Newrath area, showing recorded monuments in the vicinity of the survey area.

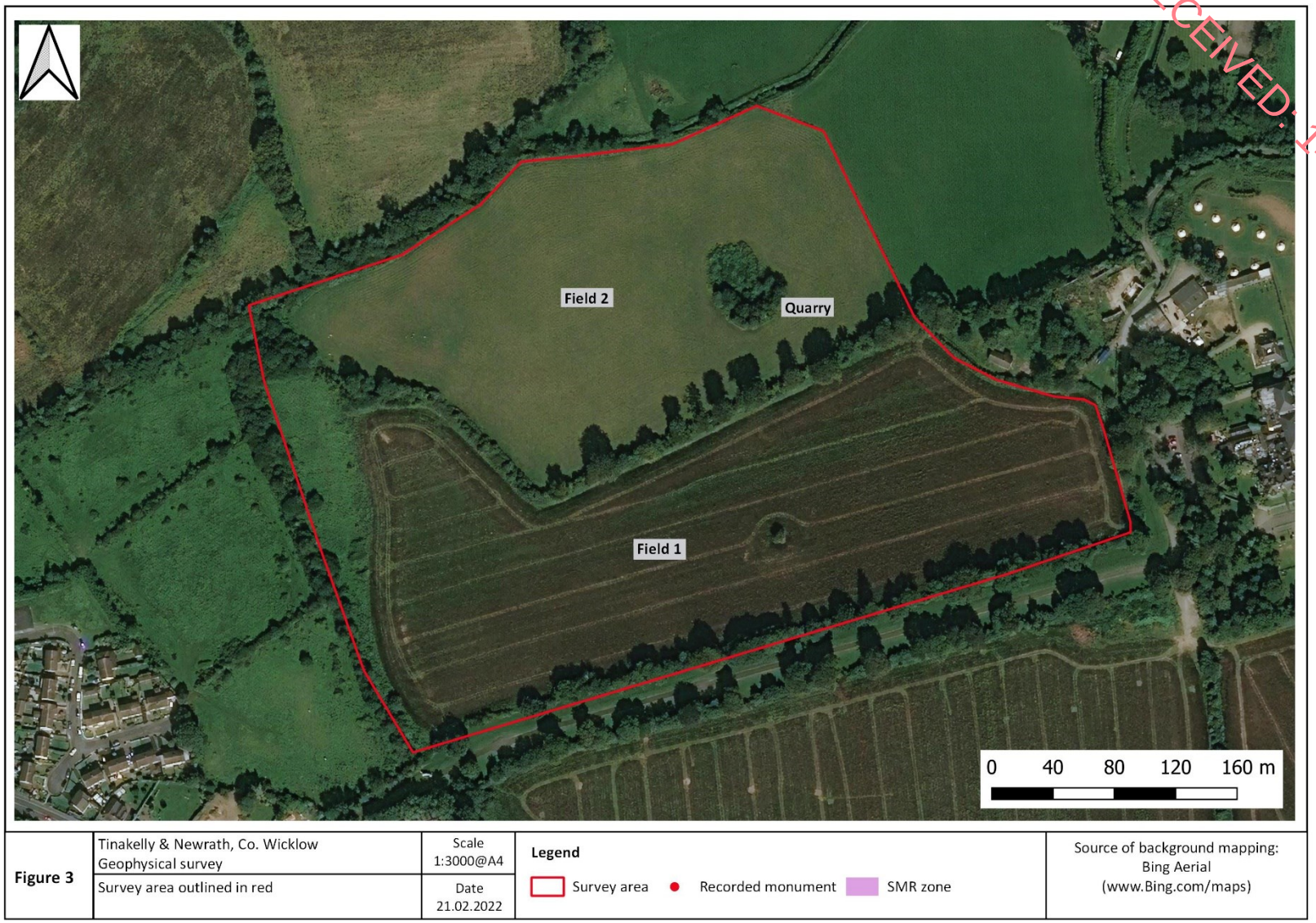

Figure 3. Location of the survey area outlined in red, with fields numbered.

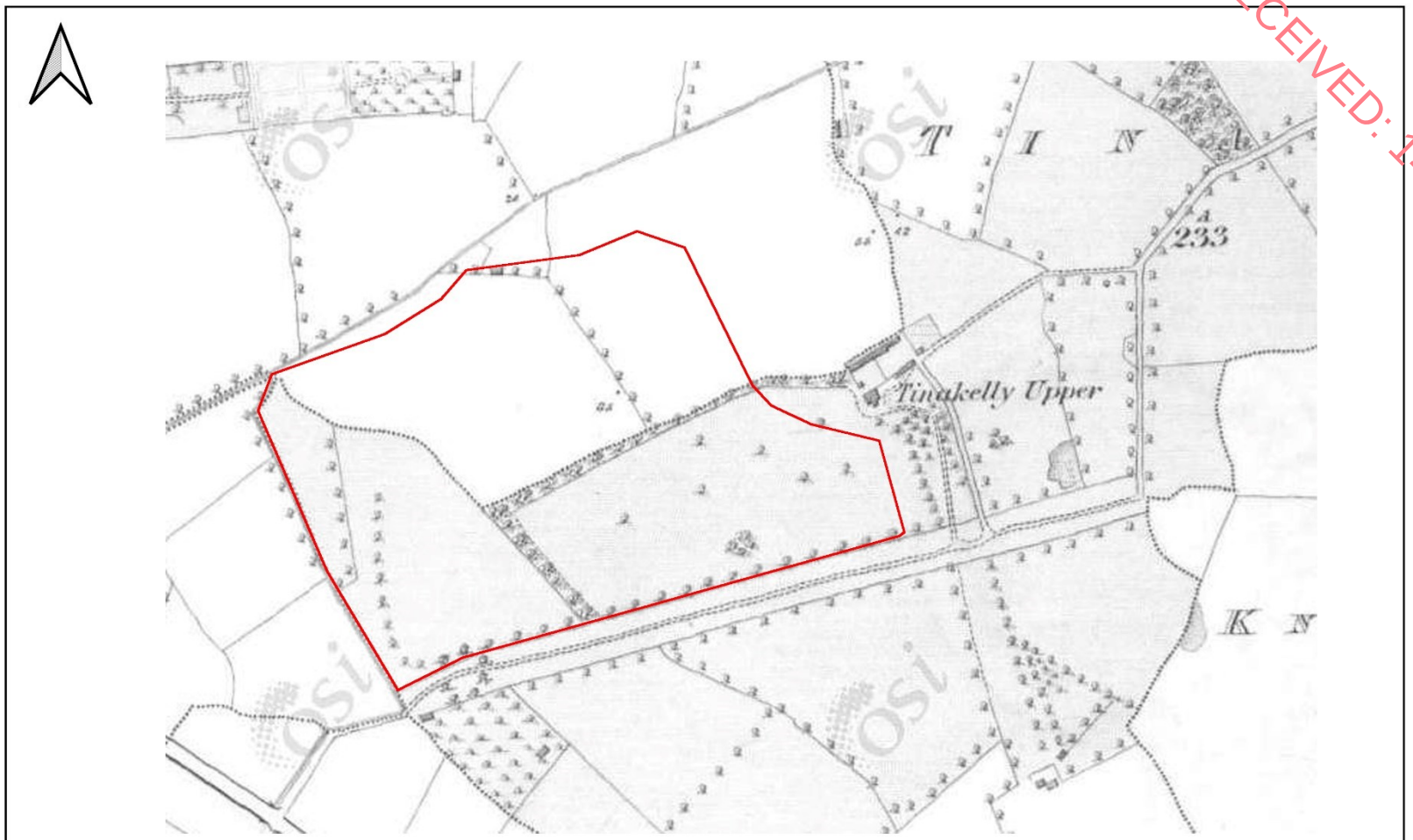

Figure 4	Tinakelly & Newrath, Co. Wicklow Geophysical survey	Scale N/A	**Legend** Survey area ● Recorded monument SMR zone	Source of background mapping: https://geohive.maps.arcgis.com/
	Survey area overlaid on first-edition six-inch Ordnance Survey Map (1840)	Date 21.02.2022		

Figure 4. Survey Area overlaid on first-edition six-inch OS map (1840).

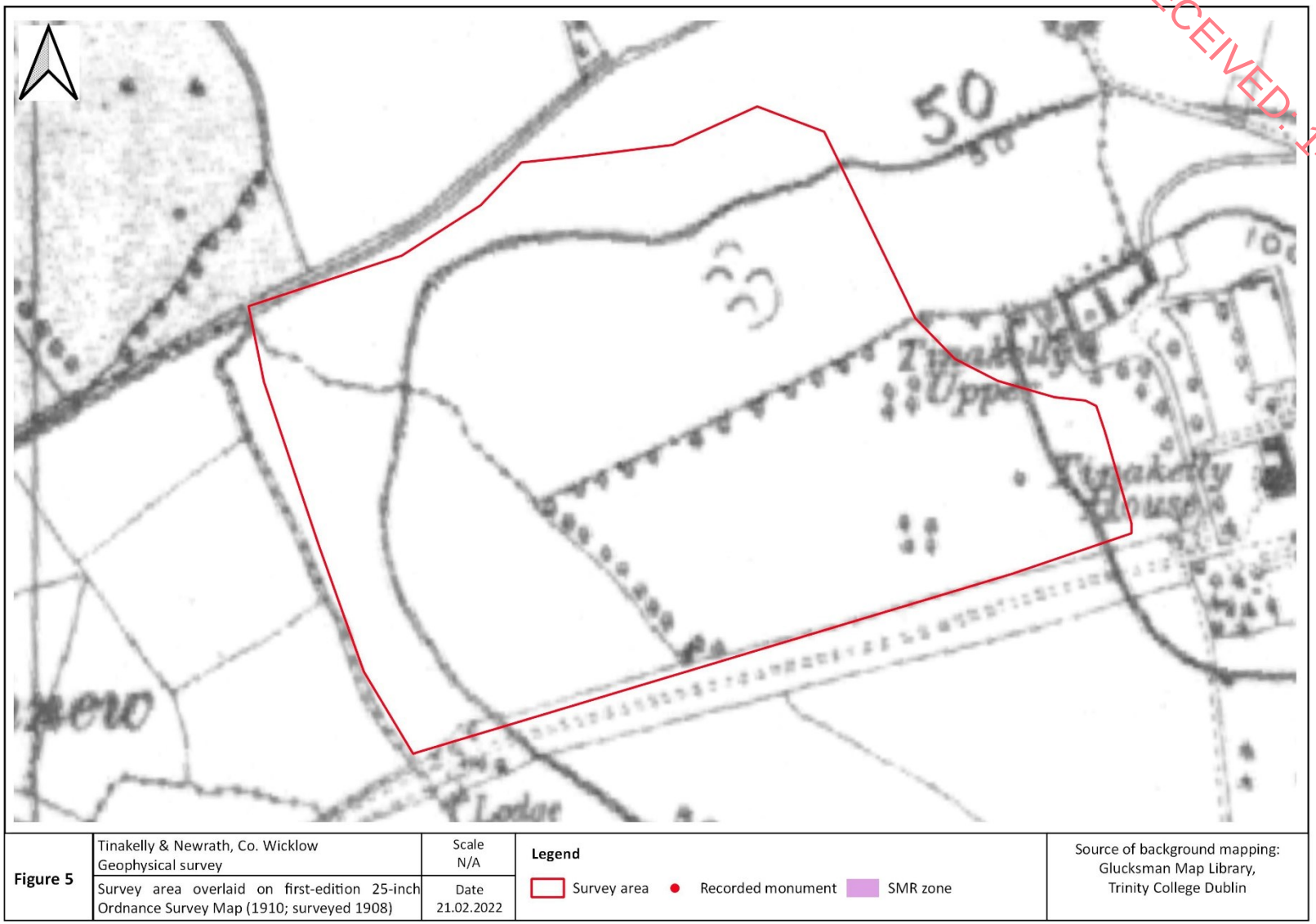

Figure 5. Survey Area overlaid on first-edition 25-inch OS map (1910; surveyed 1908).

Figure 6	Tinakelly & Newrath, Co. Wicklow Geophysical survey	Scale N/A	Source of background mapping: Aerial Premium Imagery (https://geohive.maps.arcgis.com/)
	Aerial view of survey area, showing relict field boundary and other cropmark features	Date 21.02.2022	

Figure 6. Aerial view of survey area, showing relict field boundary cropmark and other possible cropmark features.

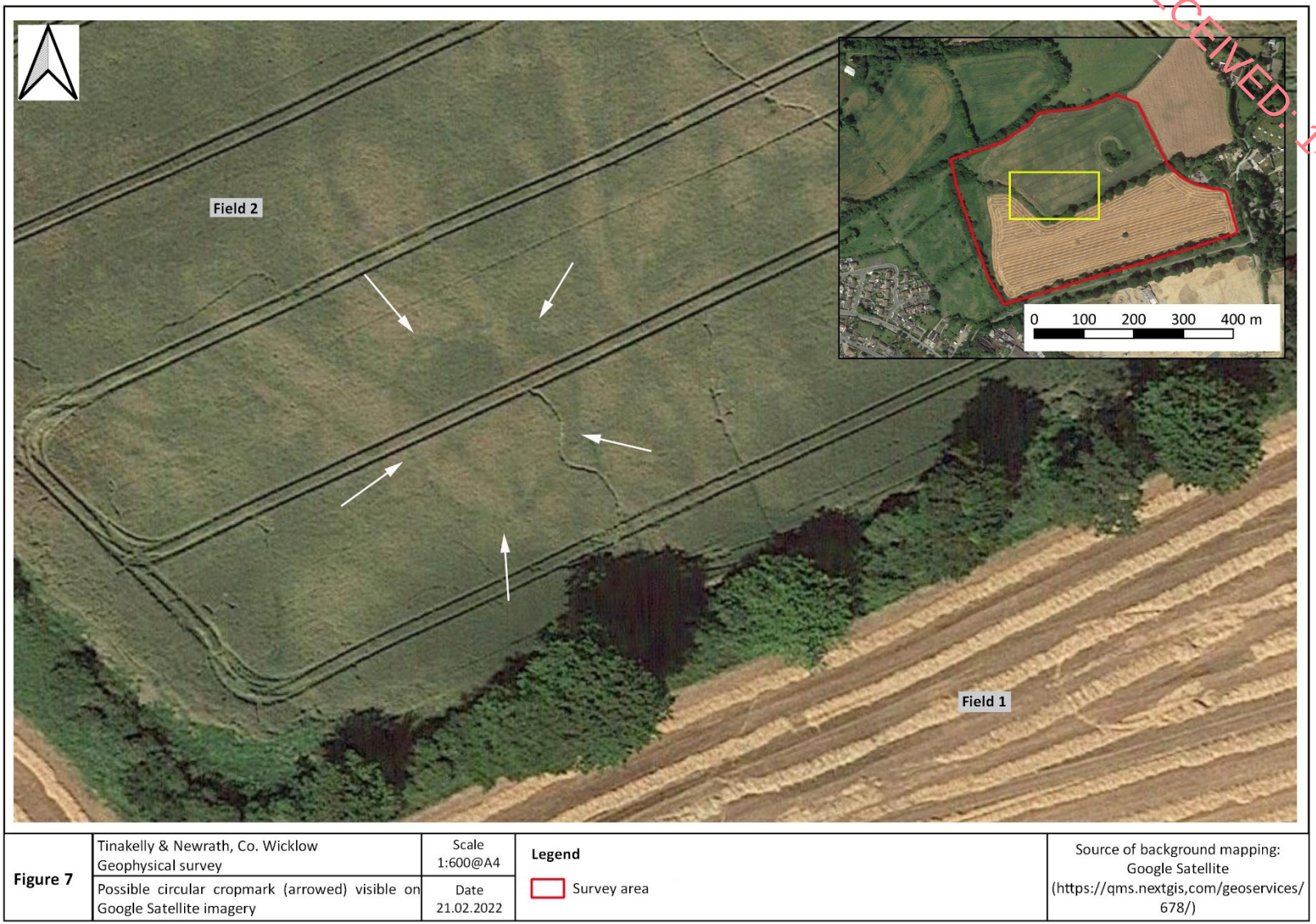

Figure 7. Possible circular enclosure cropmark (arrowed) visible on Google Satellite imagery in Field 2.

Figure 8. Greyscale image of gradiometry results.

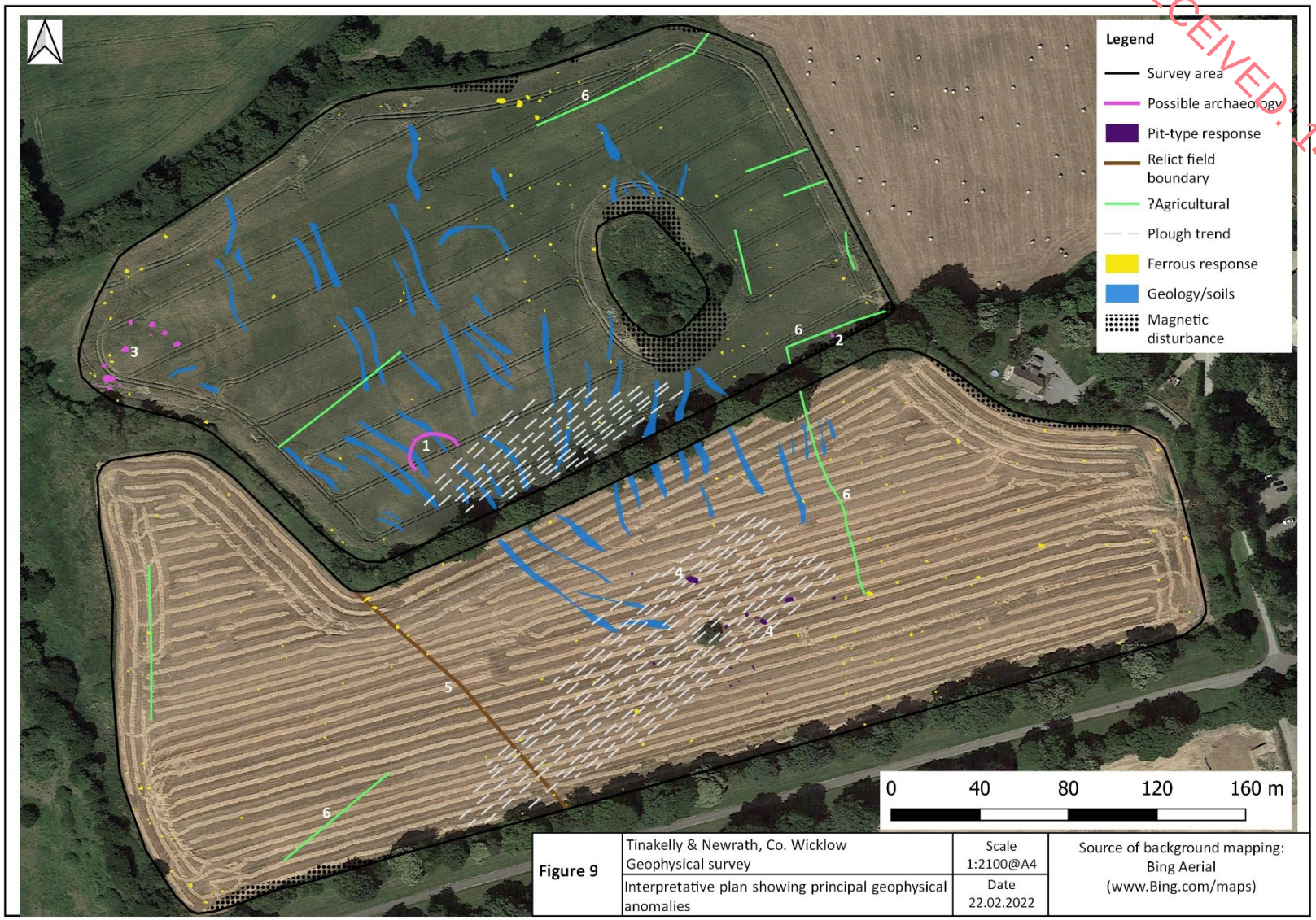

Figure 9. Interpretative plan showing principal geophysical anomalies.

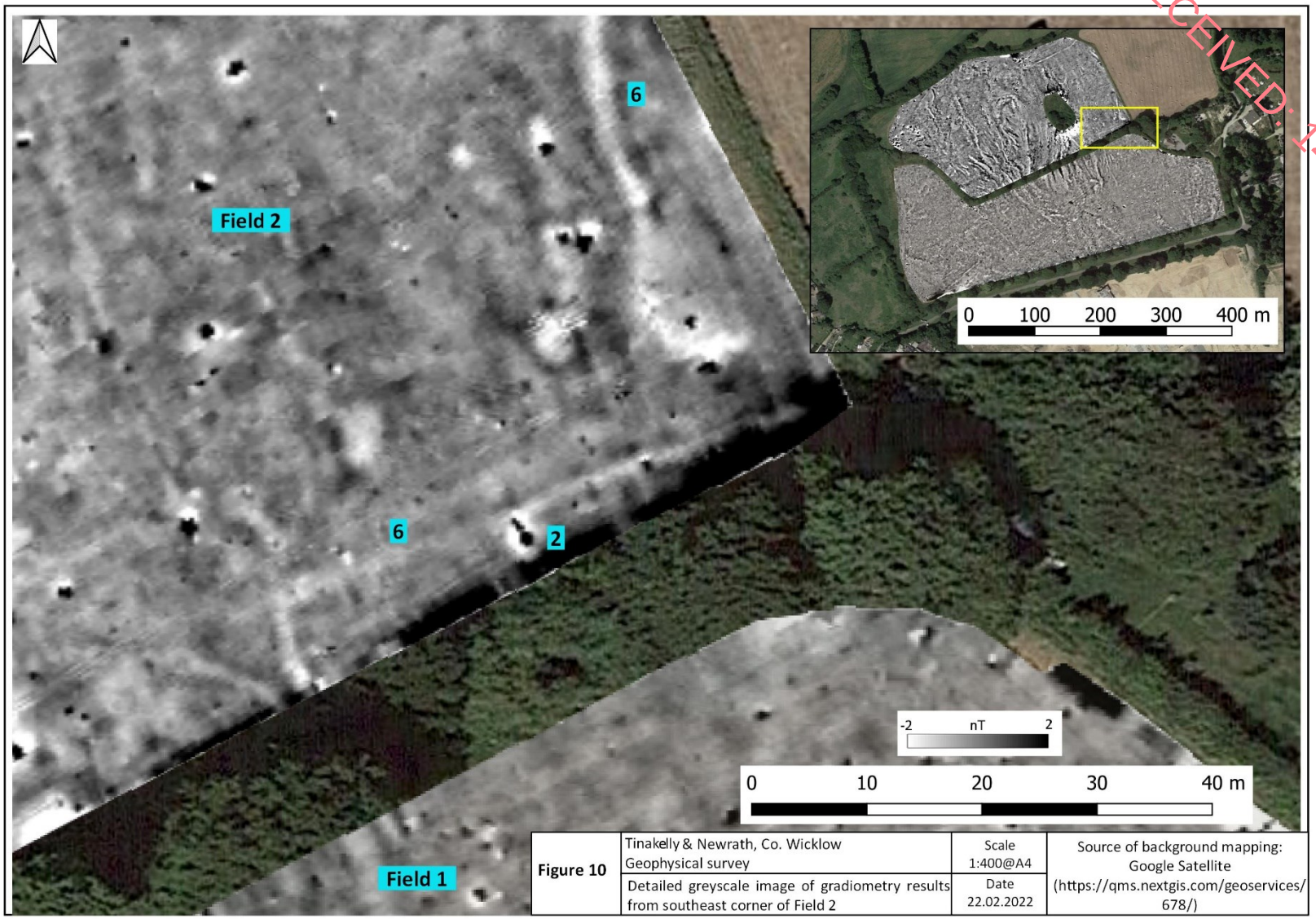

Figure 10. Detailed greyscale image of southeast corner of Field 2, with possible features [2:?pit/kiln] and [6:?ditch/drain] labelled.

Figure 11. Interpretative plan overlaid on greyscale image of the gradiometry results.

12 Plates

Plate 1. Looking west across Field 1.

Plate 2. Area of rough pasture at western end of Field 1, looking northwest.

Plate 3. Former quarry pit in Field 2, looking south.