# Appendix A20.3 Geophysical Survey Report

# **GEOPHYSICAL SURVEY**

# REPORT

# Dart Coastal,

Counties Dublin and Meath

Date: 18/12/2023

J. M. Leigh Surveys Ltd. 124 Oaklawn West Leixlip County Kildare <u>www.jmlsurveys.com</u> 01 615 4647



J. M. Leigh Surveys Ltd. 124 Oaklawn West, Leixlip, Co. Kildare Tel: 01 615 4647 Mobile: 0879062729 www.jmlsurveys.com

### GEOPHYSICAL SURVEY SUMMARY SHEET DART COASTAL, COUNTIES DUBLIN & MEATH

Site Name	Dart Coastal	JML Ref No.	23043	
Townland	Various	Licence No.	Various	
County	Dublin & Meath	Licence Holder	Joanna Leigh	
ITM (centre)	Various	Purpose	Pre-planning investigation	
Client	Courtney Deery Heritage Consultancy Ltd.	Reference No.	NA	
Ground Conditions	Overall, ground conditions were difficult with saturated ground. Some areas were deemed unsuitable to survey due to the excessive wet conditions. As much survey as possible was undertaken.			
Survey Type	Detailed gradiometer survey in 12 areas totalling c.16 hectare.			

#### Summary of Results

The majority of survey areas are dominated by modern magnetic disturbance from the adjacent rail line. Responses of interest were recorded in Gormanston1, where a circular response (6m in diameter) may represent a circular ditch feature, such as a barrow site. Further responses in Gormanston1 may represent an associated former field system, although this is speculative.

In Gormanston 2 broad amorphous responses were recorded. Although these may represent modern ground disturbance, it is noted that they are adjacent to the recorded megalithic tomb (ME028-021). The tomb was previously excavated, and the responses recorded may represent a spread of excavated material. Interpretation is unclear.

Fieldwork Date	24 <sup>th</sup> October – 22 <sup>nd</sup> November 2023		
Report Date	18/12/2023	Report Author	Joanna Leigh

## <u>Contents</u>

1. Introduction	1
2. Survey ground conditions and further information	2
3. Survey Methodology	3
4. Data Display	3
5. Survey Results	4
6. Conclusion	6
6. Technical Information	7

### Geophysical Survey Report Dart Coastal, Counties Dublin & Meath

#### 1 Introduction

1.1 A geophysical survey has been conducted by J. M. Leigh Surveys Ltd. at multiple locations along the proposed route of the dart coastal extension scheme. 17 areas were highlighted for investigation, of which 12 were suitable for geophysical survey. The areas of detailed survey are listed below and presented in Figures 1-3.

Site Name	County	ITM Centre	Licence #
Newtown	Meath	710416,774786	23R0489
Colp East (N)	Meath	712346,774197	23R0488
Colp East (S)	Meath	712730,774012	23R0488
Sevitsland	Meath	714821,772999	23R0487 &
Sevitsianu	weath	/14021,//2555	19R0166
Ninch (east)	Meath	716027,771453	23R0486
Ninch (west)	Meath	716027,771453	23R0486
Irishtown	Meath	717339,768160	23R0485
Gormanston 1	Meath	717777,767022	23R0483
Gormanston 2	Meath	718102,766528	23R0484
Gormanston 3	Meath	717980,766650	23R0536
Bremore	Dublin	719426,765169	23R0481
Hampton Demesne	Dublin	721467,762752	23R0482
Barnageeragh	Dublin	722807,760870	23R0480
Milverton	Dublin	724946,759039	23R0479
Hacketstown	Dublin	724943,759037	23R0478
Tyrrelstown	Dublin	724085,755754	23R0478
Effelstown	Dublin	723200,753929	23R0477
Corbalis	Dublin	722573,749185	23R0476

- 1.2 The survey areas were recommended by Courtney Deery Consultancy Ltd. and form part of wider archaeological study.
- 1.3 The main aim of the geophysical survey was to identify any magnetic responses that may represent the remains of unknown archaeological features in the highlighted areas of investigation.
- 1.4 A detailed gradiometer survey was conducted under licence numbers listed above, issued by the Department of Housing, Local Government and Heritage.

#### 2 Survey ground conditions and further information

- 2.1 On the whole, survey ground conditions were difficult due to the wet weather at the time of survey. Waterlogged ground was noted throughout all the areas and some ground conditions were deemed unsuitable for survey. The Sevitsland site was largely under construction upon site inspection. However, a previous survey was conducted here in 2019 under licence 19R0166. The results of the previous survey have been presented in this report.
- 2.2 The table below lists the ground conditions for each site, and the dates fieldwork was completed.

Site Name	County	ITM Centre	Licence #	Survey Date	Ground Conditions
Newtown	Meath	710416,774786	23R0489	NA	Not suitable for survey. Overgrown
Colp East (N)	Meath	712346,774197	23R0488	14/11/2023	Recently sown crop - Very wet ground restricted survey.
Colp East (S)	Meath	712730,774012	23R0488	11/11/2023	Recently sown crop. Very wet in places.
Sevitsland	Meath	714821,772999	23R0487 & 19R0166	Previous Survey 2019	NA
Ninch (east)	Meath	716027,771453	23R0486	15/11/2023	Landscaped grass
Ninch (west)	Meath	716027,771453	23R0486	16/11/2023	Pasture
Irishtown	Meath	717339,768160	23R0485	NA	Not suitable for survey. Magnetically disturbed
Gormanston 1	Meath	717777,767022	23R0483	16/11/2023	Grazing pasture
Gormanston 2	Meath	718102,766528	23R0484	17/11/2023	Pasture
Gormanston 3	Meath	717980,766650	23R0536	17/11/2023	Pasture
Bremore	Dublin	719426,765169	23R0481	Access Denied	NA
Hampton Demesne	Dublin	721467,762752	23R0482	31/10/2023	Harvested potato field and stubble.
Barnageeragh	Dublin	722807,760870	23R0480	21/11/2023	Waterlogged pasture.
Milverton	Dublin	724946,759039	23R0479	22/11/2023	Eastern section was largely overgrown. The western section comprised of stubble.
Hacketstown	Dublin	724943,759037	23R0478	NA	Not suitable for survey. Heavy plough
Tyrrelstown	Dublin	724085,755754	23R0478	NA	Not suitable for survey. Heavy plough
Effelstown	Dublin	723200,753929	23R0477	24/10/2023	Harrowed ground. Very wet at the time of survey
Corbalis	Dublin	722573,749185	23R0476	NA	Not suitable for survey. Overgrown

#### 3 Survey Methodology

- 3.1 A detailed gradiometer survey detects subtle variations in the local magnetic field and measurements are recorded in nano-Tesla (nT). Some archaeological features such as ditches, large pits and fired features have an enhanced magnetic signal and can be detected through recorded survey.
- 3.2 Data was collected with a Bartington Grad 601-2 instrument. This is a specifically designed gradiometer for use in archaeological prospection. The gradiometer operates with a dual sensor capacity making survey fast and effective.
- 3.3 The instrument is calibrated in the field to ensure a constant high quality of data. Extremely sensitive, these instruments can detect variations in soil magnetism to 0.01nT, affording diverse application throughout a variety of archaeological, soil morphological and geological conditions.
- 3.4 All data was collected in 'zigzag' traverses. Grid orientation was positioned to facilitate data collection within the pre-defined application areas. Data was collected with a sample interval of 0.25m and a traverse interval of 1m. The survey grid was set out using a GPS VRS unit. Survey tie-in information is available upon request.

#### 4 Data display

- 4.1 Summary greyscale images of the survey results with accompanying interpretation diagrams are presented in Figures 4-18. The survey results and interpretation are displayed at a scale of 1:2,000.
- 4.2 The raw gradiometer data is used to aid interpretation and is available as a series of archive PDF images. The raw data is displayed as a greyscale image and xy-trace plot and used for reference only. The PDF archive plots are available upon request.
- 4.3 The display formats referred to above and the interpretation categories are discussed in the summary technical information section at the end of this report.

#### 5 Survey Results

- 5.1 Most of the data sets are affected by modern magnetic disturbance from the rail line. Few responses of interest were recorded. However, responses of clear archaeological potential were recorded in Gormanston 1. Responses of potential interest were also noted in Gormanston 2, although an archaeological pattern is difficult to discern.
- 5.2 The survey results for each area and their respective figure numbers are listed below.

Site Name	Figure #	Results
Newtown	NA	NA
Colp East (N)	FIG04	Very wet ground restricted some survey. The data comprised of numerous ferrous responses and magnetic disturbance. No responses of interest were recorded.
Colp East (S)	FIG05	The data is dominated by broad amorphous responses, indicative of natural variations in the underlying geology. A curvilinear trend and some isolated responses were recorded in the north of the data. It is possible that these represent further natural variations. However, it is equally possible that plough damaged archaeology is represented here. Interpretation is tentative as there is no clear archaeological pattern.
Sevitsland	FIG06 & 07	This site is under construction. A previous survey was completed in 2019. No clear responses of interest are within the application area. Faint linear trends are most likely the results of agricultural activity.
Ninch (east)	NA	This area is magnetically disturbed.
Ninch (west)	FIG 08	Magnetic disturbance from the adjacent train station dominates the data. No responses of archaeological interest were recorded. A linear trend in the south of the data most likely represents a former field division.
Irishtown	NA	NA
Gormanston 1	FIG 09	A circular response (diam.6m) is located in the north-west of the data. This is indicative of a circular ditched feature and is considered to be of clear archaeological potential. Surrounding the probable circular ditch are a series of irregular sub-linear responses which are indicative of ditched features. These may represent a former field system, possible associated with the circular ditched feature. Elsewhere, isolated responses have no clear pattern. However, they may represent isolated pit-type features and are considered to be of archaeological potential.
Gormanston 2	FIG 10 & 11	In the south of the data there are numerous amorphous responses. Although it is possible that these responses represent more recent ground disturbance, an archaeological interpretation must be considered. They may represent fragmented remains of archaeological pits and ditches. This interpretation is cautious.

Site Name	Figure #	Results
Gormanston 3	FIG 10 & 11	No responses of archaeological potential were recorded.
Bremore	NA	NA
Hampton Demesne	FIG 12, 13, & 14	The eastern half of the data (Fig 12 & 13) comprises of magnetic disturbance and numerous ferrous responses. Linear trends are likely the result of agricultural activity. The western half (Fig 14) comprises of numerous ferrous responses. Some isolated responses have been recorded. Although it is possible that these are of archaeological interest, they may equally represent more deeply buried ferrous. No clear archaeological pattern is evident.
Barnageeragh	FIG 15 & 16	Isolated responses may be of interest. However, there is no clear pattern, and these are more likely to result from natural variations in the topsoil. A possible pipe and cable appear to run through the dataset.
Milverton	Figure 17	In the eastern half of the data, there are isolated responses with a linear trend. This most likely represents a former field division. Further isolated responses have no clear pattern and may equally represent more deeply buried ferrous debris. In the western half, parallel linear trends result from agricultural activity. Magnetic disturbance is dominant and results from the adjacent trainline.
Hacketstown	NA	NA
Tyrrelstown	NA	NA
Effelstown	Figure 18	The data is dominated by modern magnetic disturbance. No responses of interest were recorded.
Corbalis	NA	NA

#### 6 Conclusion

- 6.1 Survey was deemed unsuitable in areas Newtown, Ninch (east), Irishtown, Bremore, Hacketstown, Tyrrelstown and Corbalis. Most of these areas were either overgrown or severely waterlogged.
- 6.2 The majority of survey areas which were suitable for survey have no responses of potential archaeological interest and are dominated by modern magnetic disturbance from the adjacent rail line. However, some responses of interest were recorded in Gormanston 1, Gormanston 2 and Colp East (S).
- 6.3 In Gormanston 1 there are clear responses of potential interest. These are characterised by a circular response, measuring c.6m in diameter, and a series of irregular sub-linear responses. The circular response is typical of a ditched feature, and it is speculated that this may represent a barrow feature. The irregular sub-linear responses are indicative of former boundary ditches, and it is possible that these are contemporary with the probable barrow feature. These responses are considered to be of clear archaeological potential.
- 6.4 In Gormanston 2 a series of irregular amorphous responses were recorded. Although an archaeological pattern is difficult to discern, they are of potential archaeological interest. Although they may represent more recent ground disturbance, the magnetic signature of the responses is indicative of spreads of archaeological material. It is noted that they are in close proximity to the recorded megalithic tomb (ME028-021). This was previously excavated, and it is possible that the amorphous responses represent the remains of excavated material.
- 6.5 In Colp East (S), a faint curvilinear trend and isolated responses were recorded. Although it is possible that these represent natural variations within the sub-soil, it is equally possible that plough damaged archaeology is represented here. No clear archaeological pattern is evident, and interpretation is tentative.
- 6.6 Consultation with a licensed archaeologist and with the Department of Housing, Local Government and Heritage is recommended to establish if any additional archaeological works are required.

#### 7 Technical Information Section

#### Instrumentation & Methodology

#### Detailed Gradiometer Survey

Detailed gradiometer survey can either be targeted across a specific area of interest or conducted as a blanket survey across an entire application area, often as a standalone methodology.

Sampling methodologies can vary but a typical survey is conducted with a sample interval of 0.25m and a traverse interval of 1m. This allows detection of potential archaeological responses. Data is collected in grids measuring 40m x 40m, with the data displayed

accordingly. A more detailed survey methodology may be applied where archaeological remains are thought likely. This can sometimes produce results with a more detailed resolution. A survey with a grid size of 20m x 20m and a traverse interval of 0.5m will provide a data set with high resolution.

#### Bartington GRAD 601-2

The Bartington Grad 601-2 instrument is a specifically designed gradiometer for use in archaeological prospection. The gradiometer operates with a dual sensor capacity making survey very fast and effective. The sensors have a separation of 1m allowing greater sensitivity.



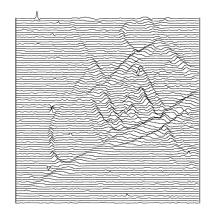
Frequent realignment of the instruments and zero drift correction ensure a constant high quality of data. Extremely sensitive, these instruments can detect variations in soil magnetism to 0.1nT, affording diverse application throughout a variety of archaeological, soil morphological and geological conditions.



#### **Gradiometer Data Display & Presentation**

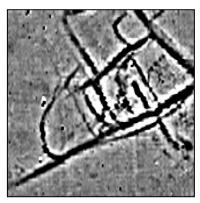
#### XY Trace

The data are presented as a series of linear traces, enabling a semi-profile display of the respective anomalies along the X and Y-axes. This display option is essential for distinguishing between modern ferrous materials (buried metal debris) and potential archaeological responses. The XY trace plot provides a linear display of the magnitude of the response within a given data set.



#### Greyscale\*

As with dot density plots, the greyscale 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 the given data set. This display method also enables the identification of discrete responses that may be at the limits of instrument detection. In the summary diagrams processed, interpolated data is presented. Raw un-interpolated data is presented in the archive drawings along with the xy-trace plots.



#### Interpretation

An interpretation of the data is made using many of the plots presented in the final report, in addition to examination of the raw and processed data. The project managers' knowledge and experience allow a detailed interpretation of the survey results with respect to archaeological potential.



\*XY Trace and raw greyscale plots are presented in archive form for display of the raw survey data. Summary greyscale images of the interpolated data are included for presentation purposes and to assist interpretation. The archive plots are provided as PDF images upon request.

#### **Glossary of Interpretation Terms**

Categories of responses may vary for different data sets. The list below are the most used categories for describing geophysical responses, as presented in the summary interpretation diagrams.

#### Archaeology

This category refers to responses which are interpreted as of clear archaeological potential and are supported by further archaeological evidence such as aerial photography or excavation. The term is generally associated with significant concentrations of former settlement, such as ditched enclosures, pits, and associated features.

#### ? Archaeology

This term corresponds to anomalies that display typical archaeological patterns where no record of comparative archaeological evidence is available. In some cases, it may prove difficult to distinguish between these and evidence of more recent activity also visible in the data.

#### Area of Increased Magnetic Response

These responses often lack any distinctive archaeological form, and it is therefore difficult to assign any specific interpretation. The resulting responses are site specific, possibly associated with concentrations of archaeological debris or more recent disturbance to underlying archaeological features.

#### Trend

This category refers to low-level magnetic responses barely visible above the magnetic background of the soil. Interpretation is tentative, as these anomalies are often at the limits of instrument detection.

#### Ploughing/Ridge & Furrow

Visible as a series of linear responses, these anomalies equate with recent or archaeological cultivation activity.

#### ? Natural

A broad response resulting from localised natural variations in the magnetic background of the subsoil; presenting as broad amorphous responses most likely resulting from geological features.

#### Ferrous Response

These anomalies exhibit a typically strong magnetic response, often referred to as 'iron spikes,' and are the result of modern metal debris located within the topsoil.

#### Area of Magnetic Disturbance

This term refers to large-scale magnetic interference from existing services or structures. The extent of this interference may in some cases obscure anomalies of potential archaeological interest.

#### Bibliography

European Archaeological Council (EAC) (2016) '*Guidelines for the use of Geophysics in Archaeology*' by Armin Schmidt, Paul Linford, Neil Linford, Andrew David, Chris Gaffney, Apostolos Sarris, and Jörg Fassbinder.

English Heritage (2008) '*Geophysical guidelines: Geophysical Survey in Archaeological Field Evaluation.*' Second Edition.

Gaffney, C. Gater, J. & Ovenden, S. (2006) 'The use of Geophysical Techniques in Archaeological Evaluations.' IFA Paper No. 6.

Gaffney, C & Gater, J (2003). '*Revealing the buried past: Geophysics for Archaeologists*.' Tempus Publishing Limited.

National Soil Survey of Ireland (1980) *General soil map second edition (1:575,000)*. An Foras Taluntais.

## List of Figures

Figure	Description	Scale
Figure 1	Site Location Diagram	1:50,000
Figure 2	Site Location Diagram	1:50,000
Figure 3	Site Location Diagram	1:50,000
Figure 4	Colp East (N): Summary Greyscale Image & Interpretation	1:2,000
Figure 5	Colp East (S): Summary Greyscale Image & Interpretation	1:2,000
Figure 6	Sevitsland: Summary Greyscale Image	1:2,000
Figure 7	Sevitsland: Summary Interpretation	1:2,000
Figure 8	Ninch: Summary Greyscale Image & Interpretation	1:2,000
Figure 9	Gormanston 1: Summary Greyscale Image & Interpretation	1:2,000
Figure 10	Gormanston 2&3: Summary Greyscale Image	1:2,000
Figure 11	Gormanston 2&3: Summary Interpretation	1:2,000
Figure 12	Hampton Demesne: Summary Greyscale Image	1:2,000
Figure 13	Hampton Demesne: Interpretation	1:2,000
Figure 14	Hampton Demesne: Summary Greyscale & Interpretation	1:2,000
Figure 15	Barnageeragh: Greyscale Image	1:2,000
Figure 16	Barnageeragh: Interpretation	1:2,000
Figure 17	Milverton: Summary Greyscale & Interpretation	1:2,000
Figure 18	Effelstown: Summary Greyscale & Interpretation	1:2,000



