Geophysical Survey Report

Metro North Dardistown Depot
Archaeological Geophysical Survey MN_7120_12
Ballystruan & Ballymun Townlands
Co. Dublin

License No. 11R0017
TAG Project No. 11003

Client:

Irish Archaeological Consultancy Ltd

On behalf of

Railway Procurement Agency

TARGET Geophysics

Specialists In Geophysical Prospection For Archaeological Assessment

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NON-TECHNICAL SUMMARY

Project Area

Archaeological geophysical survey was undertaken at the site of the proposed Metro North Dardistown Depot, in Ballymun & Ballystruan townlands, in North County Dublin. A total of 17.3 hectares (ha) of agricultural land and playing fields divided into 8 survey areas (SA) were examined during this work by gradiometer scanning and detailed survey.

Summary

No concentrations of archaeological activity have been recorded from survey at the site of the proposed Metro North Dardistown Depot. A number of linear anomalies, isolated positives and weak trends have been detected. However, none of these display characteristic patterns of response to suggest they are of archaeological origin. The majority of these anomalies are expected to derive from recent landuse, natural soil/geological variation and modern ferrous.

No archaeological features were recorded within the broad sections of ferrous disturbance noted from survey in SA C1, SA C2 & SA D. This is due to the extensive modern ferrous interference encountered in these locations.

1.0 INTRODUCTION

Geophysical survey was conducted at the site of the proposed Metro North Dardistown Depot, to the south of Dublin Airport, in Ballymun and Ballystruan townlands, in North County Dublin. A total 8 survey areas (SAs A1.1, A1.2, A1.3, B1, B2, C1, C2 & D) were investigated by gradiometer scanning and detailed gradiometry. This survey was undertaken in connection with the archaeological assessment for the proposed depot, for which archaeological testing will be carried out in SAs A1-B2 by Irish Archaeologial Consultancy Ltd (IAC Ltd.).

This survey was commissioned by IAC Ltd. on behalf of Railway Procurement Agency. The aim of the survey was to identify potential sub-surface archaeological remains within the proposed Metro North Dardistown Depot site. The geophysical survey was carried out in advance of a programme of intensive archaeological test excavations to be undertaken by IAC Ltd (License Ref. 11R0017).

2.0 SURVEY LOCATION

The site of the proposed Metro North Dardistown Depot extends over 17.3ha of agricultural land and adjoining playing fields, which are situated at NGR 315878 242020 (central coordinate). The proposed Metro North Dardistown Depot lies immediately south of Dublin Airport and a minor road to Collinstown Cross in the east and the R108 to Naul in the west. The south-western site limit is defined by a minor road leading to an industrial site.

For the purposes of the archaeological assessment the site of the proposed Metro North Dardistown Depot has been divided into 8 survey areas (SAs A1.1, A1.2, A1.3, B1, B2, C1, C2 & D). Location details of SAs A1.1, A1.2, A1.3, B1, B2, C1, C2 & D are provided below in Table 2.1 with the relevant drawing numbers indicated.

Table 2.1 Survey location

Drawing No.	Drawing Title
ZMN71204302Z02	Cover sheet: Dardistown Depot location, Areas SAs A1 - D
ZMN71204303Z02	Survey location: gradiometer scanning SAs A1–B3, detailed gradiometry GAA1.1 - GAD.1

2.1 Landscape, soils & geology

The site of the proposed depot lies within a low-lying landscape to the south of Dublin Airport, which is under mixed agricultural and light industry use. SAs A1 – A3 extend

through agricultural land, SA B1 represents the site of a former orchard, and SAs B2 – D are currently used as playing fields. The soils within SAs A1 – D are listed as Soil Association 38, and described as dry and mineral in character, consisting mainly of grey brown podzolics, with gley soils occurring locally. Bedrock geology for this region of North County Dublin comprises till of Irish Sea origin with limestone and shale (National Soil Survey of Ireland 1980).

2.2 Archaeological Background

An EIS, which will form a component of the Railway Order Application for the proposed Metro North Dardistown Depot is currently being prepared by RPA. The results of this archaeological geophysical survey and of the testing to be completed by IAC Ltd. will be incorporated into the Material Assets; Archaeological, Architectural and Cultural Heritage Environmental Impact Statement (EIS).

2.2.1 Previous archaeological investigations

Previous archaeological fieldwork comprising geophysical survey and archaeological testing was carried out within the immediate east and south boundaries of the proposed Metro North Dardistown Depot in 2008 and 2009 (Thébaudeau and Harrison 2009; Frazer 2009; Frazer and Hession 2010).

An extensive programme of geophysical survey was carried out at a total 50 greenfield sites along the entire route of the Metro North scheme between June 2008 and April 2009 by Margaret Gowen Ltd. under license 08R0117. To the east and south of the proposed Metro North Dardistown Depot positive anomalies were identified, which were interpreted as potential ploughed out archaeological remains and former field boundaries. Subsequent archaeological testing by Headland Archaeology (Ireland) Ltd between 2008 and 2009 in testing Areas 10 & 11 within the east and south of the proposed Metro North Dardistown Depot identified 7 archaeological sites (Licence Refs. 09E478 and 09E479).

Five archaeological sites were identified within Area 10 (Ballystruan 1-5, License Ref. 09E478; Frazer 2009). These included a pit containing burnt mound material at Ballystruan 1; a cluster of probable cremation burial pits at Ballystruan 2; a 56m by 45m sub-rectangular enclosure at Ballystruan 3; a curvilinear ditch and associated pit features at Ballystruan 4, and an isolated fire-pit at Ballystruan 5. The closest of these to the current geophysical survey was area Ballystruan 4, which was located c. 50m to the east. Ballystruan 3 was located c. 120m to the east, as was Ballystruan 1. The remaining sites were located over 150m to the east of the current geophysical survey area.

Two archaeological sites were identified within Area 11 (Ballymun 1-2, License Ref. 09E479; Frazer & Hession 2010). These included a burnt spread containing heat-affected stones and charcoal-stained silt at Ballymun 1 (c. 100m south of the proposed scheme) and a series of pits containing heat-affected stone and charcoal stained silt at Ballymun 2 (c. 50m south of the proposed scheme).

2.2.2 Recorded Monuments and Places (RMPs) Drawings ZMN7120EN4302Z02 and ZMN7120EN4303Z02

No RMPs are located within the boundary of the proposed Metro North Dardistown Depot, nor within its immediate perimeter. Two RMPs are present within a 2 kilometre (km) radius of the proposed Metro North Dardistown Depot, notably enclosure site DU014-022 c.1.3km to the south-west in Balcurris townland and Santry House (DU014-030) c.1.6km to the south-east. Further details relating to these monuments are provided below in Table 2.2.

Table 2.2 Recorded Monuments and Places

RMP	NGR	Townland	Classification
DU014-022	314644 240948	Balcurris	Enclosure
DU014-030	316475 240362	Santry (Coolock By)	House 18/19th Century

3.0 METHODOLOGY

The methodology for geophysical survey at the site of the proposed Metro North Dardistown Depot was twofold: gradiometer scanning and subsequent 40% detailed gradiometer survey was conducted in SAs A1 - B2, and 100% detailed gradiometry was undertaken through SAs C1 – D.

3.1 Gradiometer scanning and 40% detailed gradiometry at SAs A1 - B2

Gradiometer scanning totalling 17.3ha was undertaken throughout SAs A1 – B2. The scan objective was to identify areas of potential archaeological response where present within SAs A1 – B2, and these responses would subsequently be targeted for further examination by 40% detailed gradiometer survey.

The scan was undertaken employing a Bartington Grad601 gradiometer examining SAs A1 – B2 along traverses spaced at 10m intervals, whilst monitoring instrumentation for significant fluctuations in response. Where these occurred the responses were examined in closer detail, and their locations referenced to the

National Grid using a differential global positioning system (DGPS). Anomalies deemed to be of potential archaeological interest were highlighted further analysis by detailed gradiometer survey.

On the basis of the results from scanning in SAs A1 – B2 a total 7.2ha of detailed gradiometer survey was conducted as gradiometry areas (GA) GAA1.1 - GAB2.1. Detailed survey blocks focused initially on anomalies noted during scanning, with survey grids extended to ensure 40% coverage through SAs A1 - B2. Gradiometer data was recorded at 0.25m intervals along 1m traverses collecting a total 3600 measurements per 30m^2 grid.

3.2 100% Detailed Gradiometry at SAs C1-D

A total 2.84 ha of detailed gradiometry was completed in SAs C1 – D, GAC1.1 – GAD.1. Consistent with SAs A1–B2 gradiometer data at GAC1.1 – GAD.1 was recorded at 0.25m intervals along 1m traverses collecting a total 3600 measurements per 30m^2 grid.

4.0 GROUND CONDITIONS AND GENERAL CONSIDERATIONS

The majority of lands at the site of the proposed Metro North Dardistown Depot in SAs A1 – D comprise accessible level ground: SAs A1 – A3 extend over arable and pasture land; SA B1, formerly an orchard, contains numerous trees, the locations of which at times hindered the progress of fieldwork. SAs B2 – D currently traverse existing sports grounds. Sports grounds typically produce widespread magnetic disturbance due to landscaping, and the presence of goal posts, routes of access, fencing and outbuildings. Any subtle variations in response caused by buried archaeological features in SAs B2 – D may remain beyond detection due to the presence of these sources of interference.

Locations of small-scale ferrous are also indicated throughout the results from GAA1.1 – GAD.1. These responses are commonly the result of modern metallic debris contained within the topsoil, and are not discussed in the text unless deemed relevant.

5.0 GRADIOMETER SCANNING RESULTS, DRAWING ZMN71204303Z02

Few anomalies of potential archaeological interest were recorded during gradiometer scanning through SAs A1 – B2. Background variation through SAs A1 – B2 was found to be generally within the +/-1.5 nT range. Increases above background

response were observed during the scan through SAs A1 – B2, and these were generally suspected as deriving from remains of disused boundaries, former cultivation, natural soil/geological variation and modern ferrous.

The scan did identify a number of responses worthy of further investigation within SAs A1, A2, B1 & B2. No significant responses were noted during scanning through SA A3. Details of scan anomalies detected in SAs A1, A2, B1 & B2 are provided below in Table 5.1 with a brief description of observations made in the field.

Table 5.1 Responses noted from scanning in SAs A1 – B2

SA	Summary Of Observations
A1	Isolated and poorly defined responses, including possible interference from disused boundaries and former cultivation.
A2	Possible linear response detected to the south beyond ferrous concentration. Remaining anomalies expected to reflect combined interference from disused boundaries, former cultivation and modern ferrous.
A3	No significant anomalies noted.
B1	Strong magnetic and well-defined linear response to the south-east.
B2	Erratic, poorly defined responses, including possible interference from former cultivation and modern landuse.

No further responses of interest were noted during the scan within SAs A1 – B2.

6.0 DETAILED GRADIOMETRY RESULTS

A total of 14 detailed gradiometry areas (GA) were conducted at the site of the proposed Metro North Dardistown Depot through SAs A1 – D, as GAA1.1 – GAD.1. GAA1.1 – GAB2.1 were undertaken as 40% detailed gradiometry of SAs A1 – B2, and GAC1.1 – GAD.1 as 100% detailed gradiometry through SAs C1 - D.

The results from detailed gradiometry are presented as a series of greyscale plots at -1.5/+2nT, with subsequent interpretations, all presented at a scale of 1/1500. Table 6.1 below details the relevant greyscale and interpretation diagrams provided for each section of detailed survey for this project:

Table 6.1 GAA1.1–GAD.1 Detailed gradiometry greyscales & interpretations

SA	Drawing Numbers	Type	Detailed Gradiometry Area(s)
A1 & A2	ZMN7120EN4304Z02	Greyscale	GAA1.1 – GAA1.3, GAA2.1 & GAA2.2
A1 & A2	ZMN7120EN4305Z02	Greyscale	GAA1.4 & GAA1.5 & GAA2.3
A3, C1 & C2	ZMN7120EN4306Z02	Greyscale	GAA3.1, GAC1.1 & GAC2.1

SA	Drawing Numbers	Type	Detailed Gradiometry Area(s)
B1 & B2	ZMN7120EN4307Z02	Greyscale	GAB1.1 & GAB2.1
D	ZMN7120EN4308Z02	Greyscale	GAD.1
A1 & A2	ZMN7120EN4309Z02	Interpretation	GAA1.1 – GAA1.3, GAA2.1 & GAA2.2
A1 & A2	ZMN7120EN4310Z02	Interpretation	GAA1.4 & GAA1.5 & GAA2.3
A3, C1 & C2	ZMN7120EN4311Z02	Interpretation	GAA3.1, GAC1.1 & GAC2.1
B1 & B2	ZMN7120EN4312Z02	Interpretation	GAB1.1 & GAB2.1
D	ZMN7120EN4313Z02	Interpretation	GAD.1

6.1 SA A1

6.1.1 GAA1.1 – GAA1.5

The results from detailed gradiometry through SA A1, GAA1.1 – GAA1.5, demonstrate a low background response throughout. No characteristic archaeological responses are apparent in the data. Weak trends are present in GAA1.1, GAA1.2, GAA1.4, & GAA1.5. These show no significant arrangement to warrant an archaeological interpretation, and are therefore expected to derive from natural soil/geological variations or former landuse.

A single isolated positive anomaly (1), which may be of possible interest, has been recorded in the south-eastern portion of GAA1.2. The lack of any distinctive archaeological features within this location suggests that this anomaly is actually the result of probable modern ferrous contained within the topsoil.

The remains of 2 former boundaries extend north-east to south-west and east to west through GAA1.3 & GAA1.4 respectively. These are former boundaries are visible on the 1st Edition Ordnance Survey Map of 1829-1841.

Remains of former cultivation extend north-east to south-west through GAA1.1 – GAA1.5.

6.2 SA A2

6.2.1 GAA2.1 – GAA2.3

One positive linear anomaly (2), which is expected to represent remains of a former boundary, has been recorded extending north-west to south-east through GAA2.1. Numerous weak trends also extend through GAA2.1 and the majority of these are suggestive of natural variations in the underlying soils/geology. A rectangular trend (3) in GAA2.1 to the south-east may be of potential interest, potentially representing

ploughed out archaeological features. However, a natural soil/geological derivation for this anomaly should not be discounted.

GAA2.2 shows evidence of drainage features traversing the survey block north-east to south-west. Two positive anomalies (3) to the south in GAA2.2 may be of archaeological interest. However, these anomalies are situated along the alignment of a former boundary shown in this approximate location on the 1st Edition Ordnance Survey Map of 1829-1841. Archaeological interpretation of these two anomalies therefore remains tentative.

GAA2.3 displays the alignment of a former boundary shown on the 1st Edition Ordnance Survey Map of 1829-1841. Two small-scale positives (5 & 6) recorded to the north-east and south-west in GAA2.3 are expected to derive from interference caused by deeply buried modern ferrous.

Further weak trends are visible in the data from GAA2.2 – GAA2.3. These are expected to derive from natural sources of interference and former landuse. Remains of former cultivation also extend through GAA2.2 and GAA2.3.

6.3 SA A3

6.3.1 GAA3.1

No significant anomalies have been recorded from survey in GAA3.1. A single weak trend in the data passes north-west to south-east. This is expected to derive from natural sources of interference or former landuse.

6.4 SA B1

6.4.1 GAB1.1

Two linear anomalies (7 & 8) are present in GAB1.1. Anomaly 7 extends roughly east to west across the survey block and is expected to represent a former boundary. Anomaly 8 to the south-east corresponds to a response located during scanning. This response may be significant.

Further weak trends in the data extend to the north and south-east. These are expected to derive from former cultivation landuse and possible natural soil/geological variations.

Remains of former cultivation aligned north to south are also present in the results from GAB1.1

No significant anomalies have been recorded from survey in GAA3.1. 1 weak trend in the data passes north-west to south-east. This is expected to derive from natural source of interference or former landuse.

6.5 SA B2

6.5.1 GAB2.1

One isolated positive anomaly (9) has been recorded to the south-east in GAB2.1. Whilst an archaeological source for this anomaly cannot be entirely discounted it is expected to derive from modern ferrous contained within the topsoil.

Remains of former cultivation aligned roughly north to south are also present in the results from GAB2.1

Weak trends in the data pass through the survey block, mainly to the south. These are expected to derive from natural sources of interference and former landuse.

6.6 SA C1

6.6.1 GAC1.1

No significant anomalies have been recorded from survey in GAC1.1. Large-scale interference occurs throughout this section of survey due to the current use of this location as a sports ground. Where archaeological features may be present in this location they are likely to remain undetected by gradiometer survey.

6.7 SA C2

6.7.1 GAC2.1

No significant anomalies have been recorded from survey in GAC2.1. Large-scale interference occurs throughout this section of survey due to the current use of this location as a sports ground. Where archaeological features may be present in this location they are likely to remain undetected by gradiometer survey.

6.8 SA D

6.8.1 GAD.1

One isolated linear anomaly (10) occurs in the eastern portion of survey in GAD.1. This feature may be significant. However it borders large-scale ferrous disturbance, and the potential that it derives from modern ferrous interference should not be dismissed.

No further anomalies of interest have been recorded from survey in GAD.1.

7.0 CONCLUSIONS

No concentrations of definite archaeological remains have been recorded from archaeological geophysical survey at the site of the proposed Metro North Dardistown Depot.

A number of isolated positive anomalies, poorly defined linears, and weak trends are present in the survey results from detailed gradiometry at SA A1 – SA D, GAA1.1 – GAB2.1 & GAD.1. These are mostly expected to derive from former land use, including drainage improvement, landscaping, past cultivation, and modern ferrous, as well as possible natural soil/geological variation. Whilst these anomalies demonstrate no clear archaeological patterns, the possibility that they may represent isolated or plough damaged remains should not be ignored. Where feasible, archaeological test excavation of these anomalies may be required.

Extensive modern ferrous interference has been encountered through SA C1 – SA D, GAC1.1 – GAD.1. The geophysical survey in these areas has proved highly uninformative with regard to archaeological features that may be present in these locations. No archaeological features will have been recorded from survey within these sections of the site of the proposed Metro North Dardistown Depot.

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Personnel John Nicholls MSc MIAI and Peadar Quine

8.0 BIBLIOGRAPHY

Frazer, W.O. (2009) *Assessment Report on the results of Metro North Advance Archaeological Test Trenching, Testing Area 10, Ballystruan Townland, Co. Dublin.* Unpublished Report by Margaret Gowen & Company Ltd. for Railway Procurement Agency.

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IFA (2008), *Institute For Archaeologists, Standard and Guidance For Archaeological Field Evaluation.*

National Soil Survey of Ireland (1980), *General Soil Map 2nd Edition (1:575,000*). (An Foras Taluntais).

Thébaudeau, B. And Harrison, D. (2009) Metro North Dublin City Centre to Lissenhall, County Dublin: Geophysical Survey Report: License No. 08R0117. Unpublished Report by Margaret Gowen & Company Ltd. for Railway Procurement Agency.

9.0 DIGITAL ARCHIVE

A complete digital archive for this project is provided on CD with this report. The archive includes the report text with digital versions of all drawings and displays relating to this work.

All report figures are included in AutoCad format (.DWG, Version 2004), and can be re-referenced to the raw and processed data included as part of this archive. Gradiometry greyscale and XY Trace displays forming part of this archive are provided at –1/1.5nT and 15nT/cm respectively unless otherwise stated. Display parameters used are as indicated.

A complete PDF version of this report is also included.

Table 9.1 below details the various file types provided.

Table 9.1 Digital archive files

Description	File Type
Survey Location	.DWG
Greyscale (Interpolated Data)	.DWG
Interpretation	.DWG
Greyscale (Raw Data)	.BMP
XY Trace (Raw Data)	.TIF
Area Interpretation	.DWG
Report Text	.DOC
Entire report as PDF	.PDF

Gradiometer Survey

This information is provided as a summary of the gradiometer technique employed in Target projects, the display formats used for presentation of the results from these surveys, and the interpretation terms included for each report. If you have any queries in relation to this documentation or geophysical survey in general please contact Target by email at survey@targetgeophysics.ie.

Background

Gradiometry is a soil magnetic technique used to define the location and determine the extent of buried archaeological sites. Such remains may include leveled enclosure systems, house platforms, pits, hearths, kilns, furnaces and metal working sites. These remains typically exhibit magnetic contrasts above background soil / geological variation due to burning and depositional activities deriving from site occupation. These contrasts are measured by gradiometers as variations in the local magnetic field in units of nanoTesla (nT).

Instrumentation

Target uses Bartington Grad-601 dual sensor fluxgate gradiometers. Each instrument comprises two highly stable 1m vertical separation sensors connected to a data logger, and mounted on a lightweight frame. These instruments are designed specifically for archaeological prospection purposes providing enhanced depth response and exceptional stability. Target uses the Grad601 for reconnaissance archaeological survey in *scanning* mode, and for archaeological site mapping through *detailed* survey.

Field Methodology

Target undertakes gradiometry in *scanning* mode as a means of locating buried archaeological sites, and conducts survey in *detailed* mode for recorded mapping of these sites over an OS referenced grid. The majority of Target projects commence with gradiometer scanning followed by percentage detailed survey based on the initial scanning results.

Scanned responses in red.

Gradiometer *scanning* allows for initial geophysical inspection of a site through reconnaissance survey. Two gradiometers are used to traverse the entire survey area along traverses spaced at 10m intervals. Instrument display panels are continuously monitored for significant responses during each traverse, with interference from modern ferrous and natural sources discounted where possible. Responses of definite archaeological character noted during the scan and any additional anomalies which may require further clarification are marked with canes and tied-in to the OS by DGPS. These responses are then selected for further examination by *detailed* gradiometer survey.

Detailed gradiometry is conducted over a rigid OS referenced grid to investigate significant responses observed during scanning and to carry out full mapping of known areas of archaeological activity. Survey data is normally collected at 0.25m x 1.0m intervals to map underlying features both accurately and in detail. Sampling intervals may be increased depending on the archaeological or soil / geological context specific to each project.

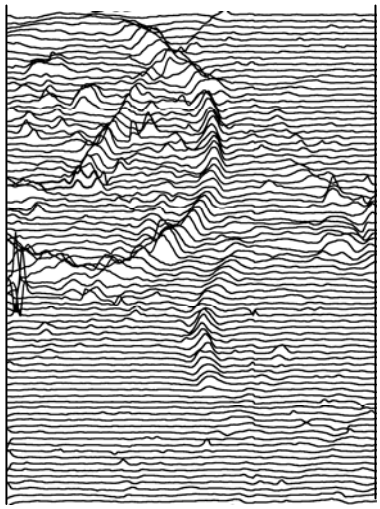
On completion of the *detailed* phase data is downloaded on site and compiled to produce greyscale maps of survey results. These greyscale maps and their subsequent interpretations are used by clients to form a basis for archaeological testing or excavation where appropriate.

** All Target services comply with English Heritage guidelines for geophysical survey in archaeological evaluation (2008).*

Data Display

XY Trace

XY Trace formats comprise a series of linear traces, enabling a semi-profile display of the respective anomalies along the X and Y-axes. This format 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. Target normally displays XY traces at 15nT/cm unless otherwise specified.

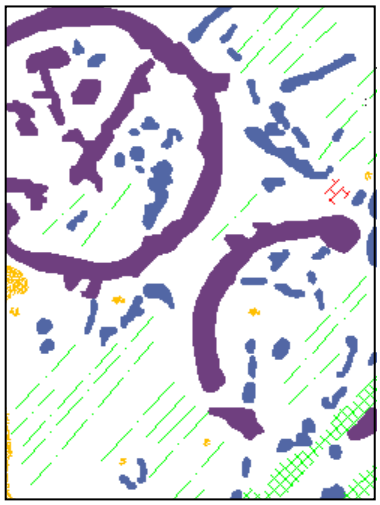


Greyscale

Greyscale formats assign 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. Target normally displays greyscales at -1 to 1.5nT unless otherwise specified.

Interpretation

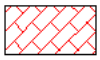
The interpretations provided in all Target reports follow in depth analysis of survey data, and are designed to assist in highlighting the immediate archaeological concerns relating to each project. A concise legend describing all responses present is provided, and a glossary of terms used accompanies the technical information section provided with each report. It is highly recommended that Target reports are read in their entirety, including all text and figures.



Glossary Of Interpretation Terms

Archaeology

This category refers to responses usually supported by comparative archaeological evidence (i.e. photographic transcriptions, excavation, etc), or for anomalies which display clearly recognisable archaeological patterns. The term is generally associated with significant concentrations of former settlement, such as ditched enclosures, storage pits and associated features.

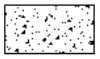


?Burnt / Fired

Such anomalies are mostly recorded in association with concentrations of settlement activity, possess a strong magnetic response and may equate with archaeological features such as kilns, furnaces, concentrations of fired debris and industrial material.

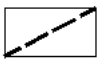
?Archaeology

This term refers to anomalies considered to be of potential archaeological interest, but for which a possible more recent landuse, modern ferrous or natural origin cannot be discounted.



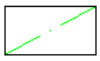
Increased Response

This category applies to poorly defined responses of potential archaeological origin. This poor definition may be caused by disturbance from more recent cultivation or equate with deposits which have a low capacity for magnetic enhancement. Natural or modern sources of interference causing these anomalies should not be discounted.



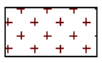
Trend

This category refers to low-level magnetic responses which are at the limits of instrument detection. In the absence of any clear archaeological context these anomalies are more commonly associated with natural variations in the underlying soils and geology.



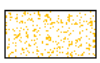
Cultivation

Visible as a series of closely spaced parallel linear responses, these anomalies equate with patterns of former cultivation.



?Natural

These responses are typically broad positive / negative variations caused by local changes in the underlying soils and geology. This can vary from slight mottled texturing across the data set within the 1 to 2nT range, to extensive ‘noise’ greater than +/-100nT. The latter may mask anomalies of interest.



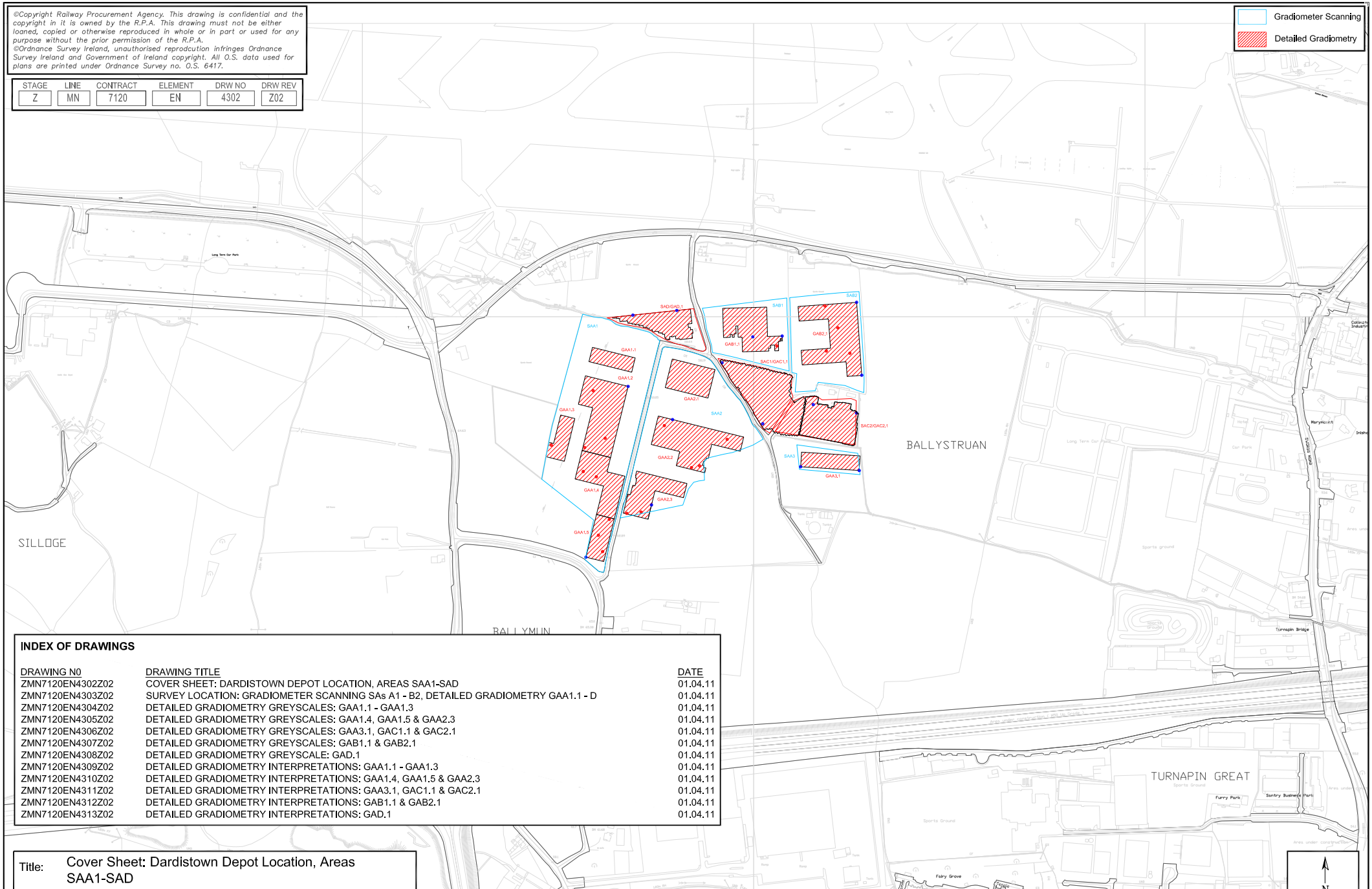
Ferrous

These anomalies exhibit typically strong magnetic positive /negative responses often referred to as ‘iron spikes,’ and are the result of modern metal debris contained within the topsoil.

Strong Magnetic Disturbance

This term refers to regions of magnetic interference to which no immediate modern ferrous or natural source can be assigned. A possible archaeological origin for these responses may be given depending on the individual project.

STAGE	LINE	CONTRACT	ELEMENT	DRW NO	DRW REV
Z	MN	7120	EN	4302	Z02



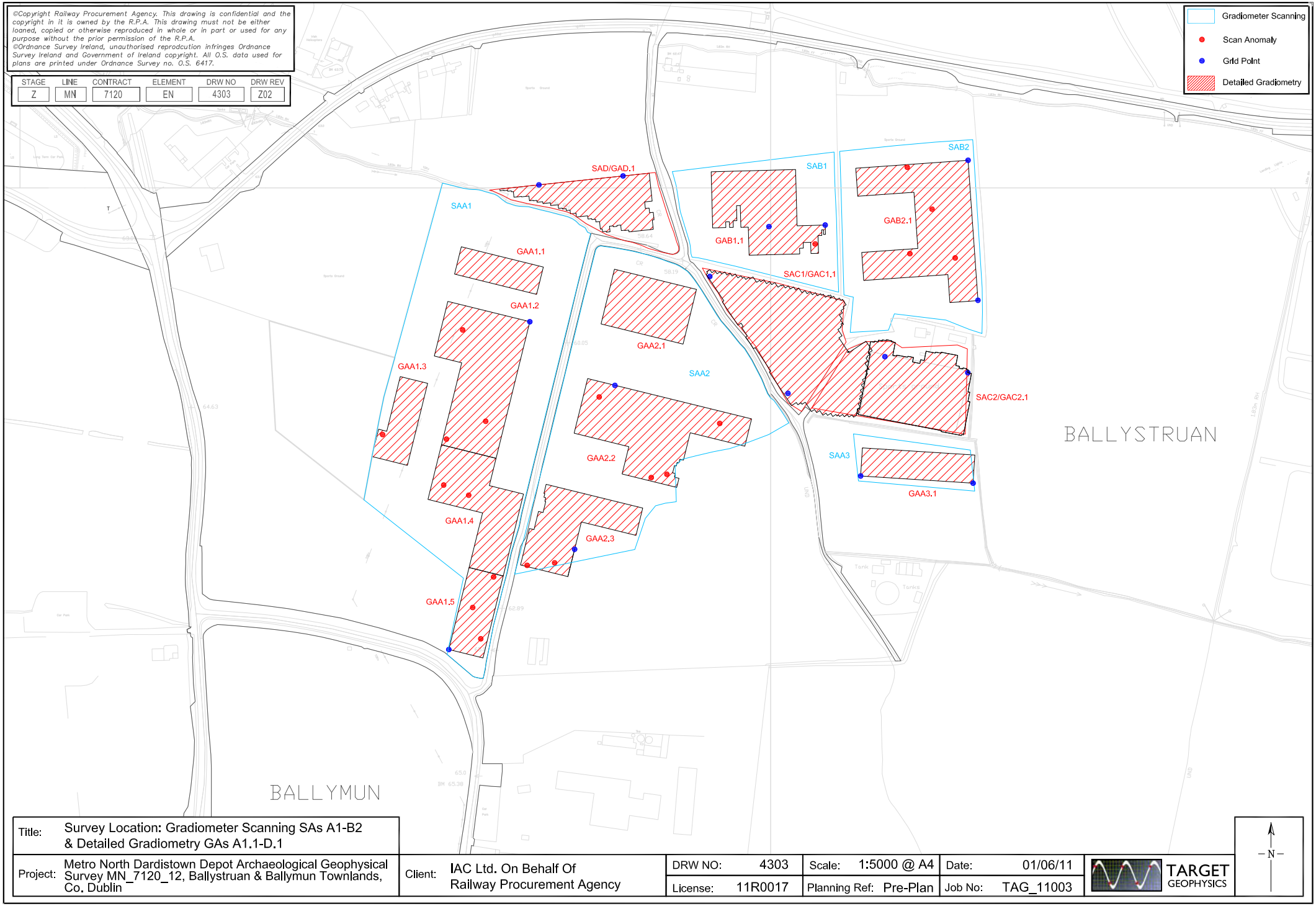
INDEX OF DRAWINGS

DRAWING N0	DRAWING TITLE	DATE
ZMN7120EN4302Z02	COVER SHEET: DARDISTOWN DEPOT LOCATION, AREAS SAA1-SAD	01.04.11
ZMN7120EN4303Z02	SURVEY LOCATION: GRADIOMETER SCANNING SAs A1 - B2, DETAILED GRADIOMETRY GAA1.1 - D	01.04.11
ZMN7120EN4304Z02	DETAILED GRADIOMETRY GREYSCALES: GAA1.1 - GAA1.3	01.04.11
ZMN7120EN4305Z02	DETAILED GRADIOMETRY GREYSCALES: GAA1.4, GAA1.5 & GAA2.3	01.04.11
ZMN7120EN4306Z02	DETAILED GRADIOMETRY GREYSCALES: GAA3.1, GAC1.1 & GAC2.1	01.04.11
ZMN7120EN4307Z02	DETAILED GRADIOMETRY GREYSCALES: GAB1.1 & GAB2.1	01.04.11
ZMN7120EN4308Z02	DETAILED GRADIOMETRY GREYSCALE: GAD.1	01.04.11
ZMN7120EN4309Z02	DETAILED GRADIOMETRY INTERPRETATIONS: GAA1.1 - GAA1.3	01.04.11
ZMN7120EN4310Z02	DETAILED GRADIOMETRY INTERPRETATIONS: GAA1.4, GAA1.5 & GAA2.3	01.04.11
ZMN7120EN4311Z02	DETAILED GRADIOMETRY INTERPRETATIONS: GAA3.1, GAC1.1 & GAC2.1	01.04.11
ZMN7120EN4312Z02	DETAILED GRADIOMETRY INTERPRETATIONS: GAB1.1 & GAB2.1	01.04.11
ZMN7120EN4313Z02	DETAILED GRADIOMETRY INTERPRETATIONS: GAD.1	01.04.11

Title:	Cover Sheet: Dardistown Depot Location, Areas SAA1-SAD				
Project:	Metro North Dardistown Depot Archaeological Geophysical Survey MN_7120_12, Ballystruan & Ballymun Townlands, Co. Dublin	Client:	IAC Ltd. On Behalf Of Railway Procurement Agency	DRW NO: 4302	Scale: 1:10,000 @ A4
				License: 11R0017	Planning Ref: Pre-Plan
				Date: 01/06/11	Job No: TAG_11003

TARGET GEOPHYSICS

STAGE	LINE	CONTRACT	ELEMENT	DRW NO	DRW REV
Z	MN	7120	EN	4303	Z02



Title:	Survey Location: Gradiometer Scanning SAs A1-B2 & Detailed Gradiometry GAs A1.1-D.1						
Project:	Metro North Dardistown Depot Archaeological Geophysical Survey MN_7120_12, Ballystruan & Ballymun Townlands, Co. Dublin	Client:	IAC Ltd. On Behalf Of Railway Procurement Agency	DRW NO: 4303	Scale: 1:5000 @ A4	Date: 01/06/11	TARGET GEOPHYSICS
				License: 11R0017	Planning Ref: Pre-Plan	Job No: TAG_11003	

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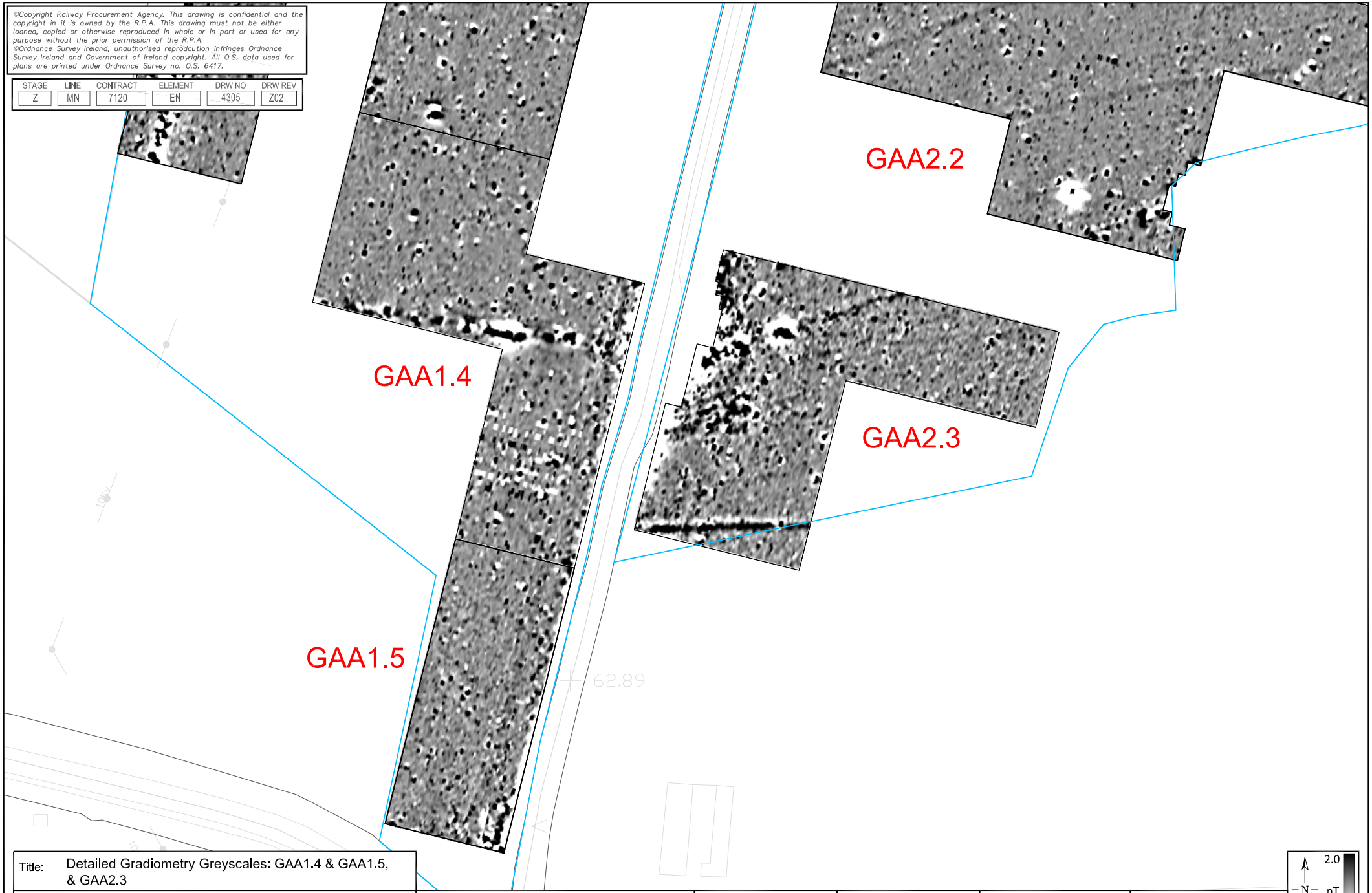
STAGE	LINE	CONTRACT	ELEMENT	DRW NO	DRW REV
Z	MN	7120	EN	4305	Z02



Title: Detailed Gradiometry Greyscales: GAA1.4 & GAA1.5, & GAA2.3

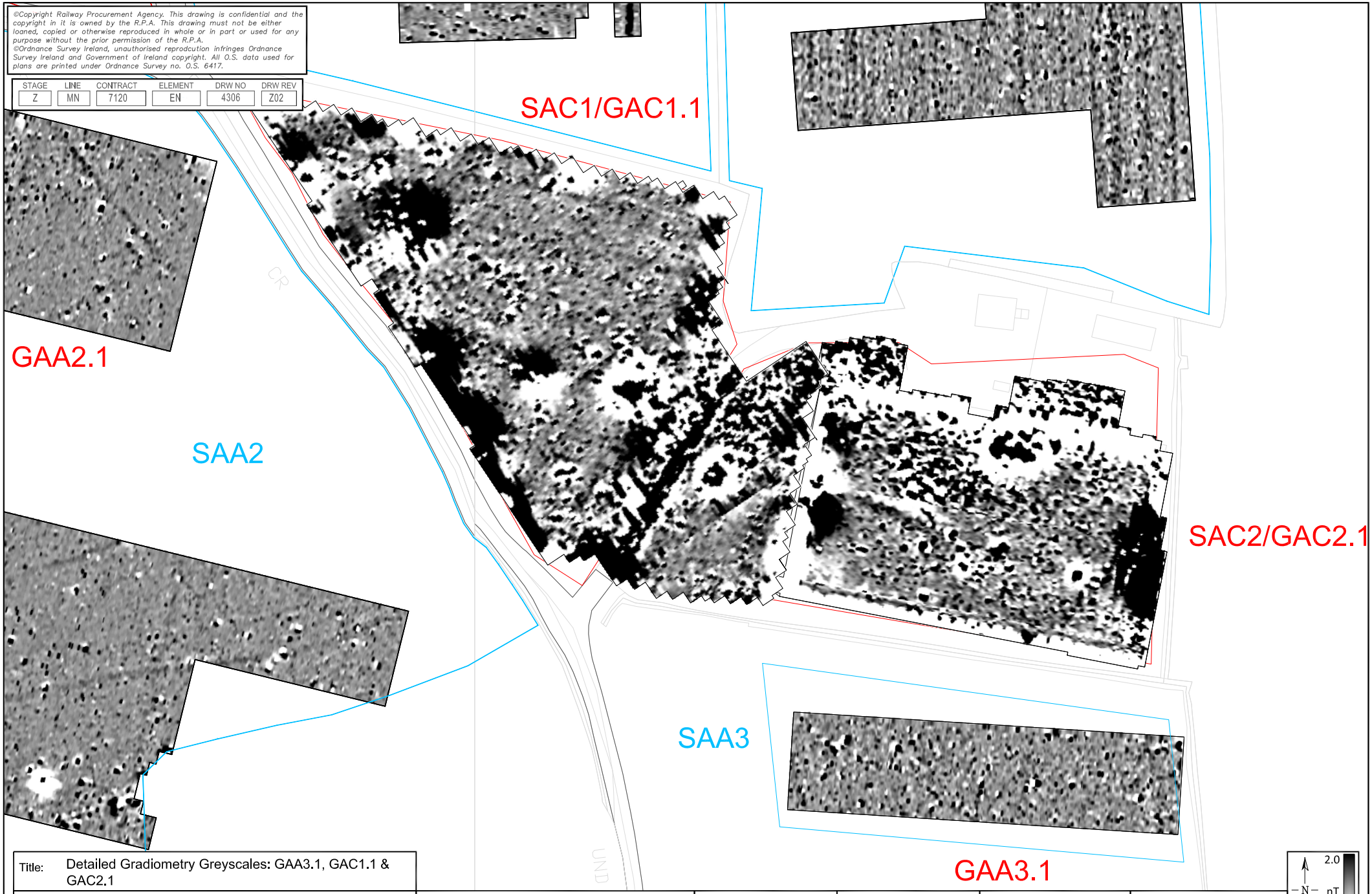
Project: Metro North Dardistown Depot Archaeological Geophysical Survey MN_7120_12, Ballystruan & Ballymun Townlands, Co. Dublin

Client: IAC Ltd. On Behalf Of Railway Procurement Agency

DRW NO:	4305	Scale:	1:1500 @ A4	Date:	01/06/11
License:	11R0017	Planning Ref:	Pre-Plan	Job No:	TAG_11003

TARGET GEOPHYSICS

STAGE	LINE	CONTRACT	ELEMENT	DRW NO	DRW REV
Z	MN	7120	EN	4306	Z02



Title:	Detailed Gradiometry Greyscales: GAA3.1, GAC1.1 & GAC2.1						
Project:	Metro North Dardistown Depot Archaeological Geophysical Survey MN_7120_12, Ballystruan & Ballymun Townlands, Co. Dublin	Client:	IAC Ltd. On Behalf Of Railway Procurement Agency	DRW NO: 4306	Scale: 1:1500 @ A4	Date: 01/06/11	TARGET GEOPHYSICS
				License: 11R0017	Planning Ref: Pre-Plan	Job No: TAG_11003	

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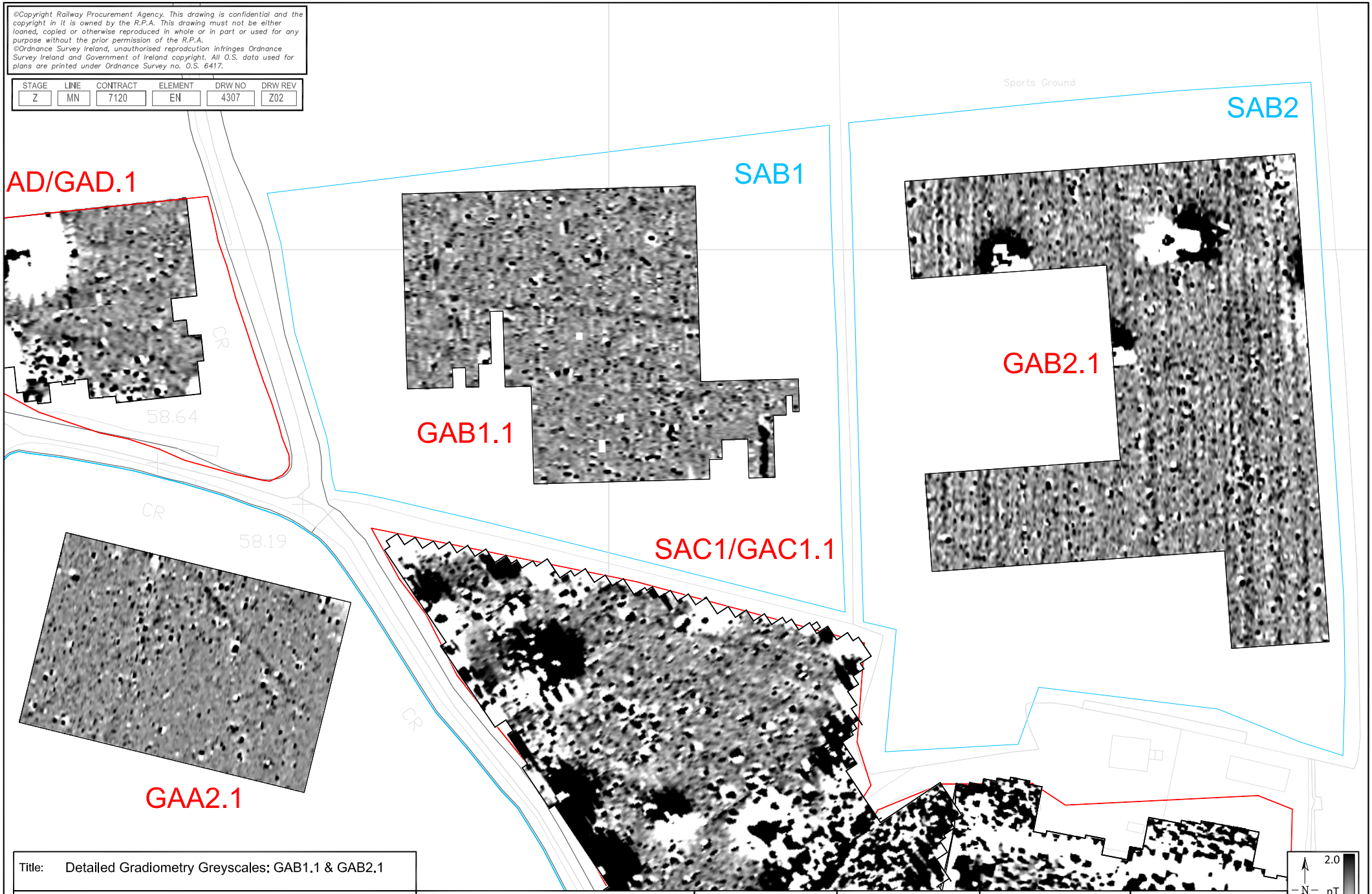
STAGE	LINE	CONTRACT	ELEMENT	DRW NO	DRW REV
Z	MN	7120	EN	4307	Z02



Title:	Detailed Gradiometry Greyscales: GAB1.1 & GAB2.1				
Project:	Metro North Dardistown Depot Archaeological Geophysical Survey MN_7120_12, Ballystruan & Ballymun Townlands, Co. Dublin	Client:	IAC Ltd. On Behalf Of Railway Procurement Agency	DRW NO: 4307	Scale: 1:1500 @ A4
				License: 11R0017	Planning Ref: Pre-Plan

Date: 01/06/11
Job No: TAG_11003

TARGET GEOPHYSICS

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