GEOPHYSICAL SURVEY

Land at Dinting Vale, Glossop, Derbyshire

ARS Report N°: 2023/107

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Land at Dinting Vale, Glossop, Derbyshire, Report on a Geophysical Survey

ARS LTD REPORT 2023/22

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Prepared on behalf of:	Wain Homes (North West) Ltd
Date of compilation:	August 2023
Compiled by:	Richard Durkin AciFA Davor Čakanić
Checked by:	Joel Goodchild
Approved for issue by:	Lucie McCarthy
Planning Reference:	HPK/2022/0456
Local Authority:	High Peak Borough Council
Geophysical Survey Area:	SK 01901 94150

EXECUTIVE SUMMARY

Project Name:	Geophysical Survey Report: Land at Dinting Vale, Glossop, Derbyshire
Planning Authority:	High Peak Borough Council
Planning Reference:	N/A
Location:	Dinting Vale, Glossop, Derbyshire
Parish:	Brassington
Hard Geology:	Mudstone/ Siltstone
Superficial Geology:	Till
Soil Type:	Slowly permeable loam and clay
NGR:	SK 01901 94150
Date of Fieldwork:	16th February to 17th February 2023 27th July, 4th August 2023
Date of Report:	August 2023

This report presents the results of a geophysical (magnetometry) survey and ground penetrating radar survey (GPR) undertaken on land at Dinting Vale, Glossop Derbyshire. The survey was commissioned to support a planning application for residential development. The Proposed Development Area (PDA) comprises a parcel of land crossed by a private track in the north. During the first phase of the survey carried out in February 2023, two- thirds of the PDA were unsuitable for magnetometry due to the presence of trees, scrub and dense vegetation. The survey of the remaining areas was carried out in July and August 2023 using a Bartington Grad 601 dual sensor fluxgate gradiometer. Due to the presence of ecologically sensitive vegetation, it was not possible to clear all areas to allow the magnetometry survey to cover 100% of the PDA.

It has been suggested that the possible alignment of the Ardotalia to Navio Roman road may run through the northern part of the PDA and that there is the potential for other remains of Romano-British date to survive within the PDA boundary. The main part of the PDA, south of the track, was agglomerated in the 20th Century from 4 smaller fields.

The results of this survey suggest that the presence of any significant archaeological remains in the areas of the PDA that were successfully surveyed is low. The results have revealed evidence of probable medieval/post-medieval agriculture in the south of the PDA but have otherwise only found evidence of probable modern tipping and general disturbance, ordinary natural responses and ferrous contamination.

CONTENTS

LIST OF FIGURES

1 Introduction

1.1 Project and Planning Background

1.1.1 Archaeological Research Services Ltd was commissioned by Wain Homes (North West) Ltd to conduct a Geophysical Survey on land at Dinting Vale, Glossop in Derbyshire. This was undertaken in advance of a planning application being determined for the construction of a residential development on a site which is allocated for housing in the Council's adopted Local Plan.

1.2 Site Description

1.2.1 The 'red line boundary' of the proposed development area (hereafter 'PDA') is depicted by a red polygon on Figure 1 and comprises a total of c. 3.2 hectares, bounded by woodland. A private track servicing a number of dwellings crosses the PDA in the north and separates the main area of the PDA from a small parcel of land to the north-east. The PDA comprises a mix of trees, pasture grassland and dense vegetation and scrub and consequently only *c*.1 ha. of the land contained within the PDA was suitable for magnetometry. The land within the PDA slopes gently from south to north and occupies and elevation of *c*. 150m above Ordnance Datum (aOD).

1.3 Geology and Soils

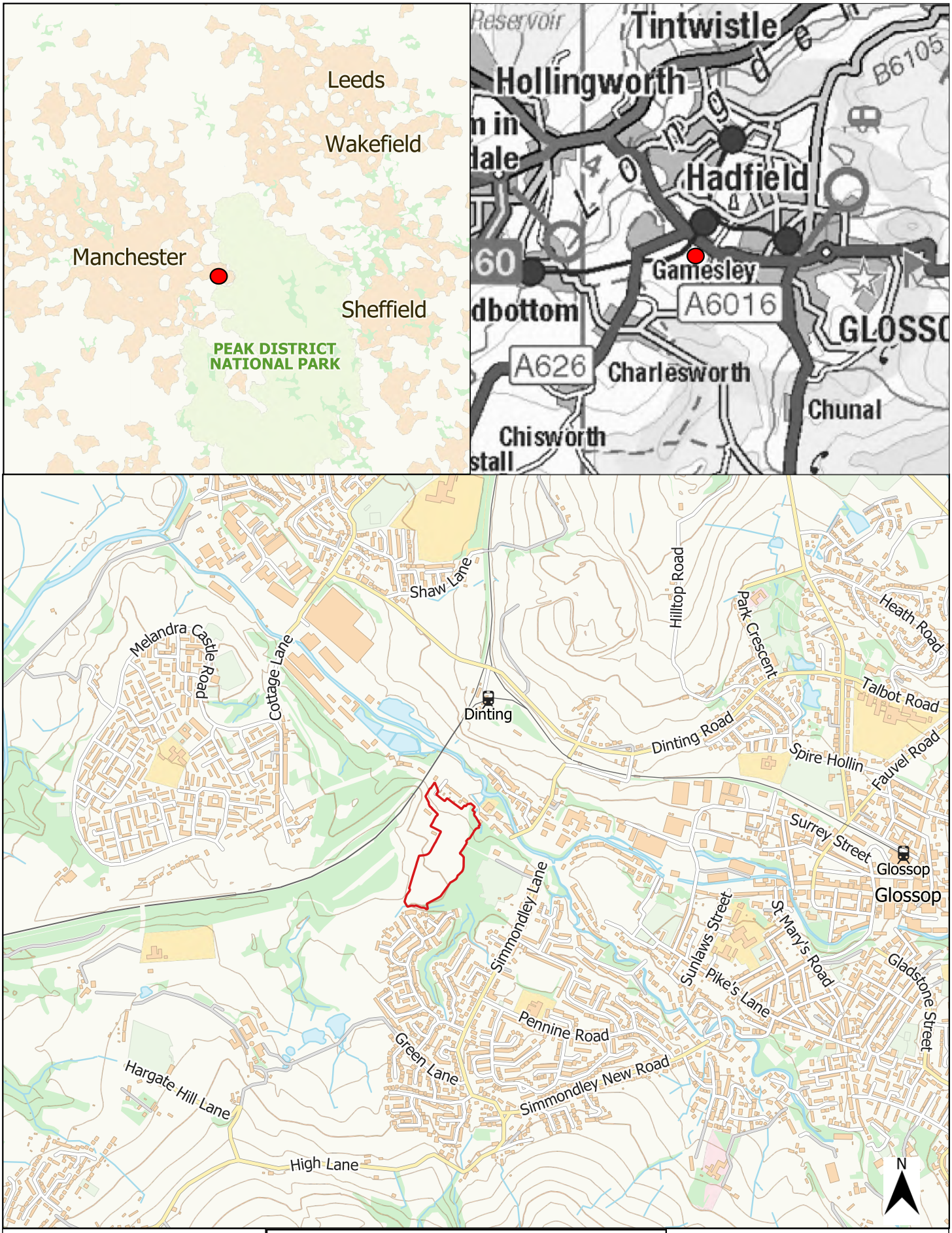
1.3.1 The underlying solid geology of the PDA comprises mudstone and siltstone of the Marsden Formation which is overlain by superficial deposits of Till (BGS 2023).

1.3.2 The soils of the PDA are classified by the Soilscapes free interactive online viewer as belonging to the Soilscapes 17 soils unit. These soils are described as '*Slowly permeable seasonally wet acid loamy and clayey soils'* (Cranfield University 2023).

1.4 Archaeological and Historical Background

1.4.1 A detailed Archaeological and Historical background, including an HER search of the immediate area, a literature check with particular reference to Peter Wroe's work, a basic map regression, a site visit to check out surface evidence particularly for the road line, and a review of aerials photographs, was compiled for the Written Scheme of Investigation (Appendix 2). The assessment concluded the following:

- There is no substantial evidence of later Prehistoric activity within the environs of the site boundary
- The Romano-British period provides the most substantial evidence of prehistoric remains within the Glossop and Dinting areas and the Derbyshire HER shows the possible alignment of the *Ardotalia* to *Navio* road running through the northern part of the PDA on a southeast-northwest trajectory. The exact route of this Roman Road has not been confirmed through ground investigations, but it may potentially be present within the northern half of the PDA,
- There is the potential that remains of Romano-British date may survive within the PDA boundary. The prominent position of the natural landscape to the northwest at Melandra Castle suggests that the wider landscape, including the PDA, would have been favoured during this period,
- A map regression of the PDA has revealed that the area was previously subdivided into four fields. The field system layout remained the same until 1971, when the former field boundaries are no longer depicted.



Site name:	Dinting Vale
Date:	Feb / Jul / Aug 2023
Drawn by:	Davor Čakanić
Scale:	Varies

Land at Dinting Vale, Site Boundary

Figure 1: Site location

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2 METHOD STATEMENT

2.1 Introduction

2.1.1 Magnetometry is a non-intrusive scientific prospecting technique that is the preferred geophysical technique used to determine the presence or absence of buried archaeological features when site and geological conditions are favourable. It is an efficient and effective method for locating anomalies corresponding with archaeological features. The instrument chosen for this survey was a Bartington Grad 601 dual sensor fluxgate gradiometer which can detect weak changes in the Earth's magnetic field caused by buried features.

2.1.2 All fieldwork and reporting were undertaken following Historic England's (2008) Geophysical Survey in Archaeological Field Evaluation and The Chartered Institute for Archaeologists (CIfA) Code of Conduct (CifA 2014a) and Standards and Guidance for Archaeological Geophysical Survey (CIfA 2014b).

2.1.3 The 30m by 30m survey grids were located to cover the entire PDA and aligned as shown in Figure 2. In total 33 survey grids (predominantly partial grids) were set out and accurately positioned using a Leica Zeno 20 GNSS which was connected to Leica Smartnet to receive corrections resulting in an accuracy of typically better than 0.5m. Each grid was then surveyed at 1m traverse intervals with the sampling at 0.25m (4 readings per metre) intervals. The survey was carried out in 'zig-zag' mode with each alternate traverse walked in opposite directions. The range of the instrument was set at 100nT (0.01nT resolution).

2.1.4 The survey was carried out by ARS Ltd in February, July and August 2023. The weather during the survey was dry and mild in February and with intermittent rain in July and August. The ground conditions in the areas that could be accessed were suitable for magnetometry survey.

2.1.5 Prior to commencing the survey the gradiometer was balanced and calibrated to the local conditions and this was repeated regularly throughout each day. At the end of each day, the data were downloaded into a computer, checked and archived on the ARS Ltd server. The data were downloaded using Bartington Instruments' Grad 601 communication software.

3 GEOPHYSICAL SURVEY RESULTS

3.1 Gradiometer

3.1.1 The data were minimally processed using Geoplot software. The data were "clipped" (clipping parameters selected on the mean and standard deviation data values), and the striping that can often appear in gradiometer data was removed by utilising the "zero mean traverse" function with thresholds applied. Finally, the data were interpolated. To enhance the visibility of subtle features the data were viewed under a number of different clip plotting parameters.

3.1.2 Occasionally processing the data to compensate for directional sensitivity can inadvertently disguise anomalies that may be of archaeological origin, particularly long linear features in the direction of the traverses. The data has therefore been analysed in a number of different formats and at each stage of processing.

3.1.3 Anomalies have been included in the results and discussion as much as possible and sensible. Dipolar anomalies, many notable by their size yet showing no clustering or pattern to their distribution, are most likely to relate to miscellaneous ferrous litter or discarded ferrous objects on the surface or buried in the field or natural variations in the magnetic properties of the superficial deposits.

3.1.4 The data analysis is presented graphically in Figures 3 to 7. A greyscale shade plot of the processed gradiometer data is presented in Figures 3, 4 and 5 and an interpretative plan in Figures 6 and 7. A trace plot of the processed gradiometer data is presented in Figures 8 and 9.

Anomalies

3.1.5 **Feature 1** is a weak linear (c. 25 m in length, c. 1.3 m in width, SE-NW orientation) negative anomaly located in the middle of the survey area and c. 70 m south of the current gravel road (overlaying the supposed Roman road). Its shape and proximity to **Feature 2** suggests interpretation as a possible field boundary.

3.1.6 **Feature 2**, located in the middle of the survey area, consists of two positive converging linear anomalies, longer one c. 20 m in length (SW-NE orientation) and the shorter c. 11 m in length (N-S orientation). **Feature 3** is a positive linear feature c. 8 m in length and c. 2.5 m in width, SW-NE orientation, located c. 33 m SE of the current track on the NW boundary of the survey area. Due to possible parallel relationship of features X and Y, it is possible they present former field boundaries or drainage ditches.

3.1.7 **Features 4, 5 and 6** represent parallel linear positive anomalies, oriented SW-NE and located in the southern half of the PDA. Their dimensions vary from c. 4 m to c. 25 m in length and c. 0.8 m to 1.3 m in width. They represent probable medieval/post-medieval ridge and furrow, being congruent to the former field boundary bisecting the PDA.

3.1.8 **Feature 7** represents strong dipolar anomalies adjacent to the current gravel and metaled road and is probably associated with its construction. The anomaly likely relates to modern tipping (some still visible on the surface), a possible drain and the current standing fence.

3.1.9 Strong dipolar anomalies evident throughout the surveyed area and marked as **Feature 8** likely relate to ferrous objects associated with modern agricultural activity.

3.1.10 **Feature 9** represents smaller anomalies scattered throughout the survey area with possible natural origin or related to field use or tipping.

3.1.11 Strong magnetic disturbances marked as **Feature 10** are most likely traces of modern tipping and land use.

3.2 Ground Penetrating Radar

3.2.1 The GPR survey generated results for Areas 1 and 2 and single traverse Profiles 1-4. For near-surface anthropogenically modified deposits where the sediments are complex, GPR results can be difficult to interpret with high confidence. This is confidence decreases where individual profiles are being considered. All interpretations should be considered preliminary prior to any confirmation by ground truthing in advance of any strategic decisions.

Area 1

3.2.2 The amplitude time-slices created using GPR-Slice are shown in Figure 10. The time-slice data clearly reveal the trackway and bank deposits to the north survey area. The remainder of the area is noted as being devoid of any major anomalies of obvious archaeological interest.

Area 2

3.2.3 The amplitude time-slices created using GPR-Slice are shown in Figure 11. An anomaly was noted in time-slice A2 (see Figure 12) towards the northern extent of the survey. This anomaly correlated with a change in level and was tentatively interpreted as a stone revetment feature. The radargram of the traverse 2 in Area 2 showed the presence of an anomaly that is likely related to made ground. This varied in thickness from 0.4 to 0.7m (see Figure 13).

Profile 1

3.2.4 The radargram from Profile 1 is shown in Figure 14. The former land surface is shown as not level with either a stone-filled depression around the middle of the profile or that the made ground material was inhomogeneous. The made ground appears to thicken towards the northern extent of the survey.

3.2.5 The width of the central deposits is most likely too wide for a Roman road foundation and is less visible in an adjacent traverse radargram indicating that the anomaly is more likely the result of complex inhomogeneous deposits.

Profile 2

3.2.6 The radargram from Profile 2 is shown in Figure 15. The complex reflections of the first 5 m of this plot correspond to the embankment and entrance way to the northern land parcel.

3.2.7 No structural anomaly was noted with the deposit best identified as made ground with stony deposits estimated to extend to a depth of at least 0.6 m. No archaeologically significant anomalies can be identified.

Profile 3

3.2.8 The radargram from Profile 3 is shown in Figure 13. The profile compares well with profile 2 (Figure 16) indicating identical deposits to the initial 10m of profile 2 and revealing the embankment and gateway entrance deposits. Beyond 10m it is again indicated that the deposits most like relate to made ground of ~0.6m depth.

Profile 4

3.2.9 The radargram from Profile 4 is shown in Figure 17. This profile utilised a 250 MHz antenna to improve penetration albeit at a reduced resolution. There is good agreement with the results from the 500 MHz antenna suggesting the 500 MHz antenna achieved viable results.

3.2.10 Below ~0.6m neither the 250 MHz or the 500 MHZ antennas are observing any archaeological anomalies. This suggests that the made ground sits above a mostly stone-free subsoil or that the nature of that sub-soil strongly absorbs the radar pulse energy below depths of ~0.9 m. Such absorption might be expected for undisturbed saturated clays.

4 Discussion and Conclusions

4.1.1 Due to ecological constraints, it has not been possible to survey the PDA in its entirety. Approximately 35% of the PDA was suitable for magnetometry survey and the results of this have revealed evidence of probable medieval or post-medieval ridge and furrow and probable tipping, modern disturbance and discarded ferrous materials. Otherwise the areas that were successfully surveyed appear to be largely devoid of anomalies of significant archaeological interest. GPR survey and transects have also been undertaken to specifically target the conjectured route of the Roman Road.

4.1.2 Even though some of the planned survey area was inaccessible due to the presence of ecologically important and sensitive vegetation, presently collected gradiometer data suggest no anomalies of probable archaeological provenance. It is not considered that extending the survey further would reveal significant archaeological features.

4.1.3 The GPR survey was successfully undertaken across a number of areas that were considered to be the proposed route of the Roman road. No clear archaeological remains of significance were noted.

4.1.4 While no definitive evidence for a Roman road has been obtained, the examination of the individual profiles, of which traverse 7 in Area 1 (See Figure 18) does reveal within a stony layer extending to a depth of around 0.4 m. This layer is not visible in the timeslices shown in Figure 10. This area coincides with an area of intense magnetic anomalies observed in the magnetometry results suggesting made-ground or modern dumping. Currently there is a field entrance at this point and the land is boggy pointing to the deposit being made for hardstanding at this access point. The overall size and orientation of this deposit as seen by GPR is not consistent with what is expected of a buried Roman road although this can be only established with certainty by evaluation excavation.

4.1.5 In conclusion, the survey detected no significant archaeological deposits. The GPR survey specifically targeted the proposed line of a Roman road and despite the use of various antennas no evidence could be found to support its presence.

5 Publicity, Confidentiality and Copyright

5.1.1 Any publicity will be handled by the client.

5.1.2 ARS Ltd will retain the copyright of all documentary and photographic material under the Copyright, Designs and Patent Act (1988).

6 Statement of Indemnity

6.1.1 All statements and opinions contained within this report arising from the works undertaken are offered in good faith and compiled according to professional standards. No responsibility can be accepted by the author/s of the report for any errors of fact or opinion resulting from data supplied by any third party, or for loss or other consequence arising from decisions or actions made upon the basis of facts or opinions expressed in any such report(s), howsoever such facts and opinions may have been derived.

7 Archive

7.1.1 One bound copy of the final report with an attached digital PDF/A copy on disc will be deposited with Derbyshire HER. The disc will also include a digital archive, consisting of relevant ESRI shapefiles or CAD files, for use of updating the HER database.

8 Acknowledgements

8.1.1 ARS Ltd would like to thank the Wain Homes (North-west) Ltd for commissioning this survey.

9 REFERENCES

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APPENDIX I FIGURES

Figure 2: Site Extent

Site name: Dinting Vale, Glossop

Date Surveyed: February / July / August 2023

Date Drawn: August 2023

Client: **Wain Homes (North West) Ltd**

PDA

0 25 50 75 m

N

Map Scale at A4: 1:2400

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Figure 3: Gradiometer Data: February 2023 survey

Site name: Dinting Vale, Glossop

Date Surveyed: February 2023

Date Drawn: March 2023

Client: **Wain Homes (North West) Ltd**

PDA

3.00
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
nT

0 25 50 75 m

N

Map Scale at A4: 1:2400

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Figure 4: Gradiometer Data: July / August 2023 survey

Site name: Dinting Vale, Glossop

Date Surveyed: July / August 2023

Date Drawn: August 2023

Client: **Wain Homes (North West) Ltd**

PDA

0 25 50 75 m

N

Map Scale at A4: 1:2400

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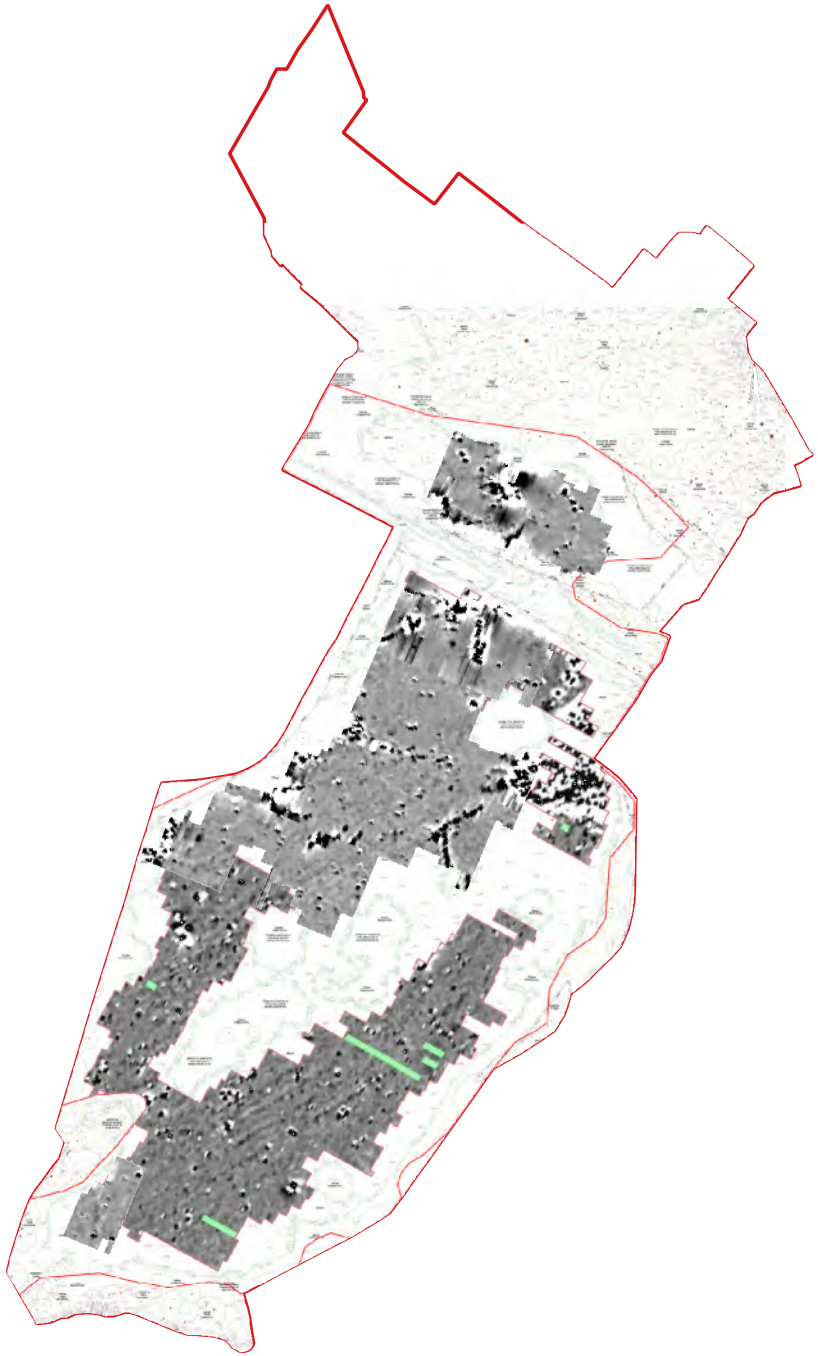

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Figure 5: Combined Gradiometer Data

Site name: Dinting Vale, Glossop

Date Surveyed: February / July / August 2023

Date Drawn: August 2023

Client: **Wain Homes (North West) Ltd**

PDA

0 25 50 75 m

N

Map Scale at A4: 1:2400

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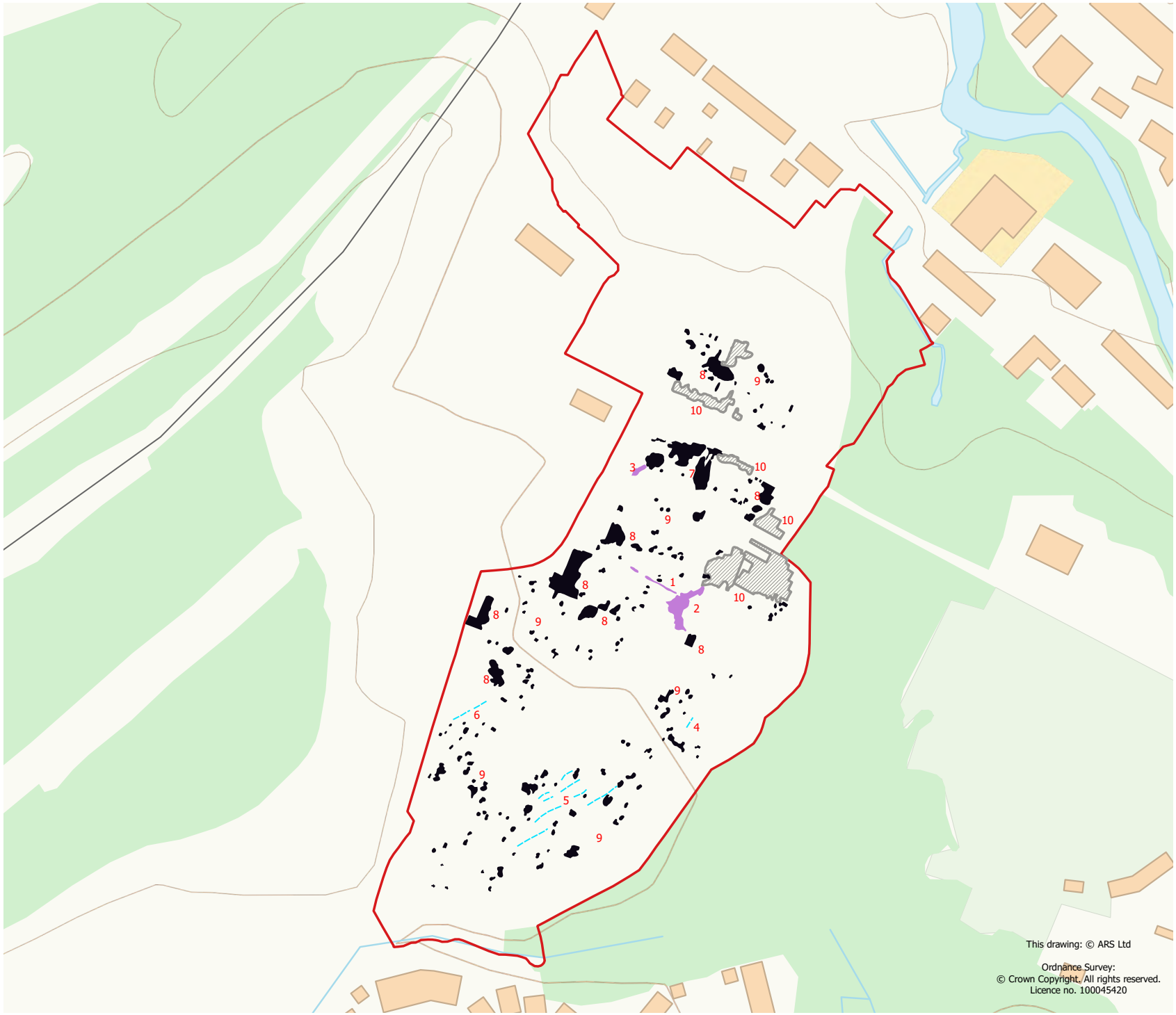

Figure 6: Interpretation of Gradiometer Data

Site name: Dinting Vale, Glossop

Date Surveyed: Feb / Jul / Aug 2023

Date Drawn: Aug 2023

Client: **Wain Homes (North West) Ltd**

Legend

- Ferrous Object
- Magnetic Disturbance
- Possible Archaeology
- Ridge_and_Furrow

0 20 40 60 80 m

N

Map Scale at A4: 1:1120

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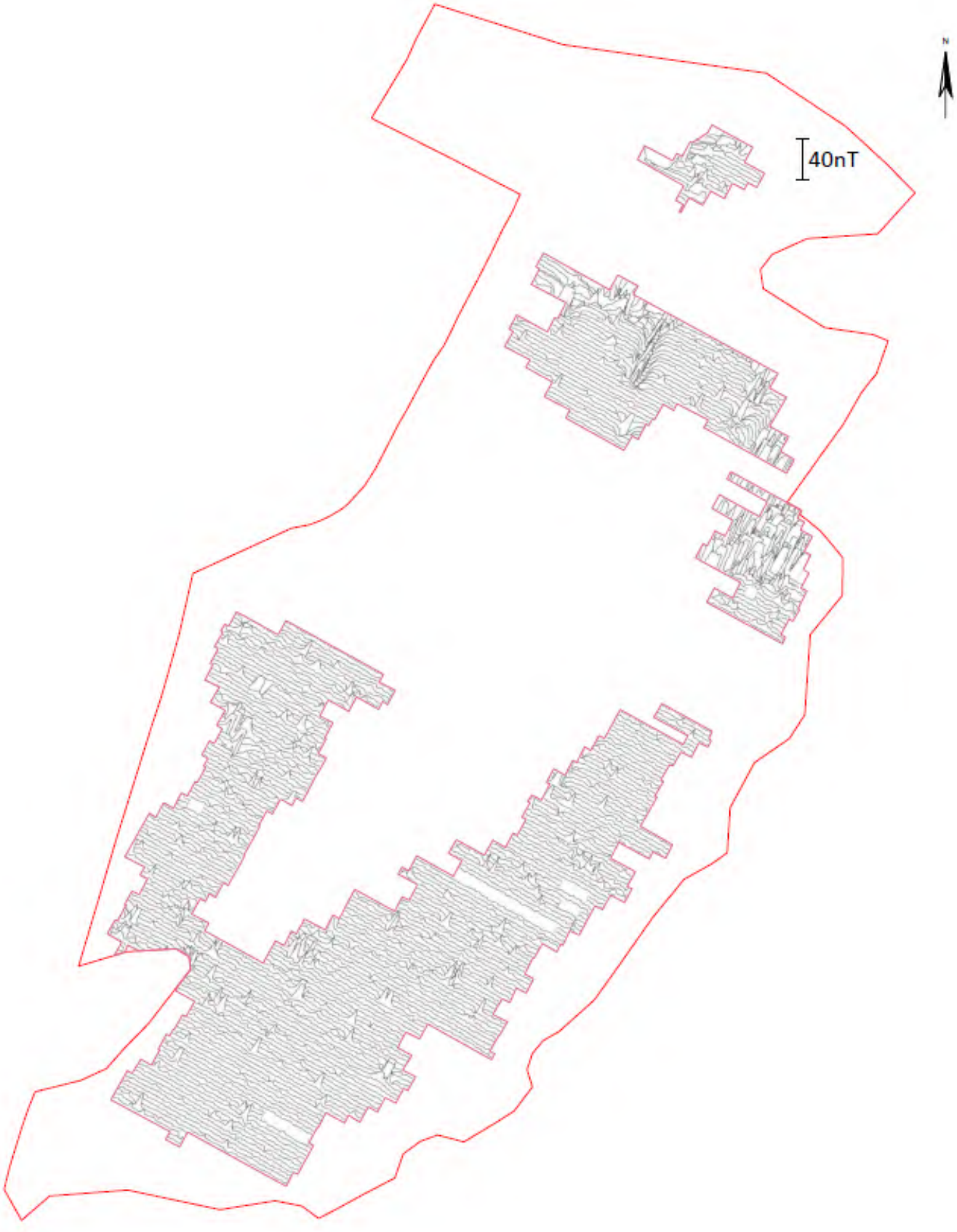

N

Site name: Dinting Vale
Date: Feb 2023
Drawn by: Richard Durkin

Land at Dinting Vale, Site Boundary

Figure 7: Trace Plot of February Gradiometer Data

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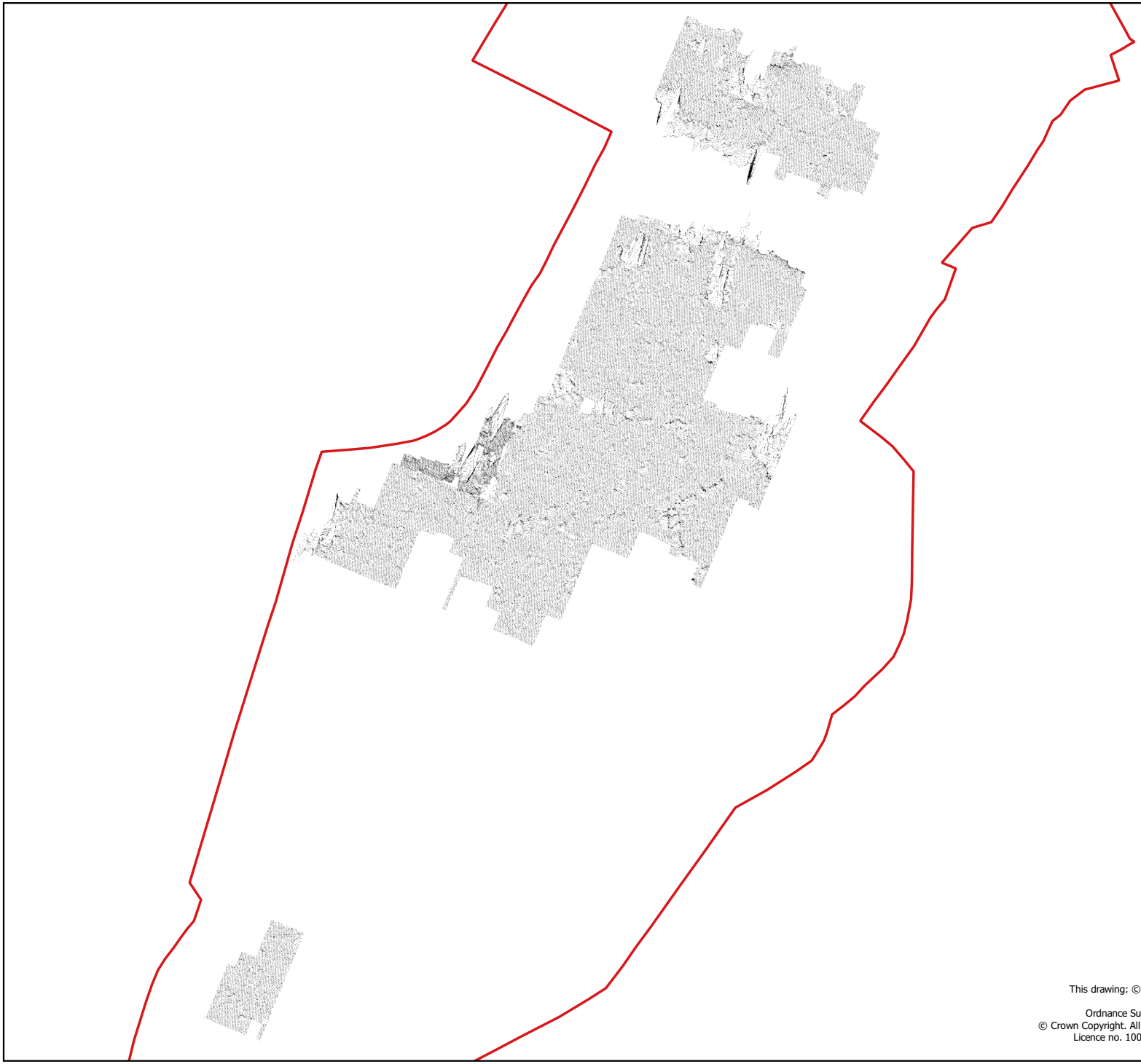

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Figure 8: July / August Gradiometer Trace Plot

Site name: Dinting Vale, Glossop

Date Surveyed: Jul / Aug 2023

Date Drawn: Aug 2023

Client: **Wain Homes (North West) Ltd**

60 nT

0 25 50 m

N

Map Scale at A4: 1:1400

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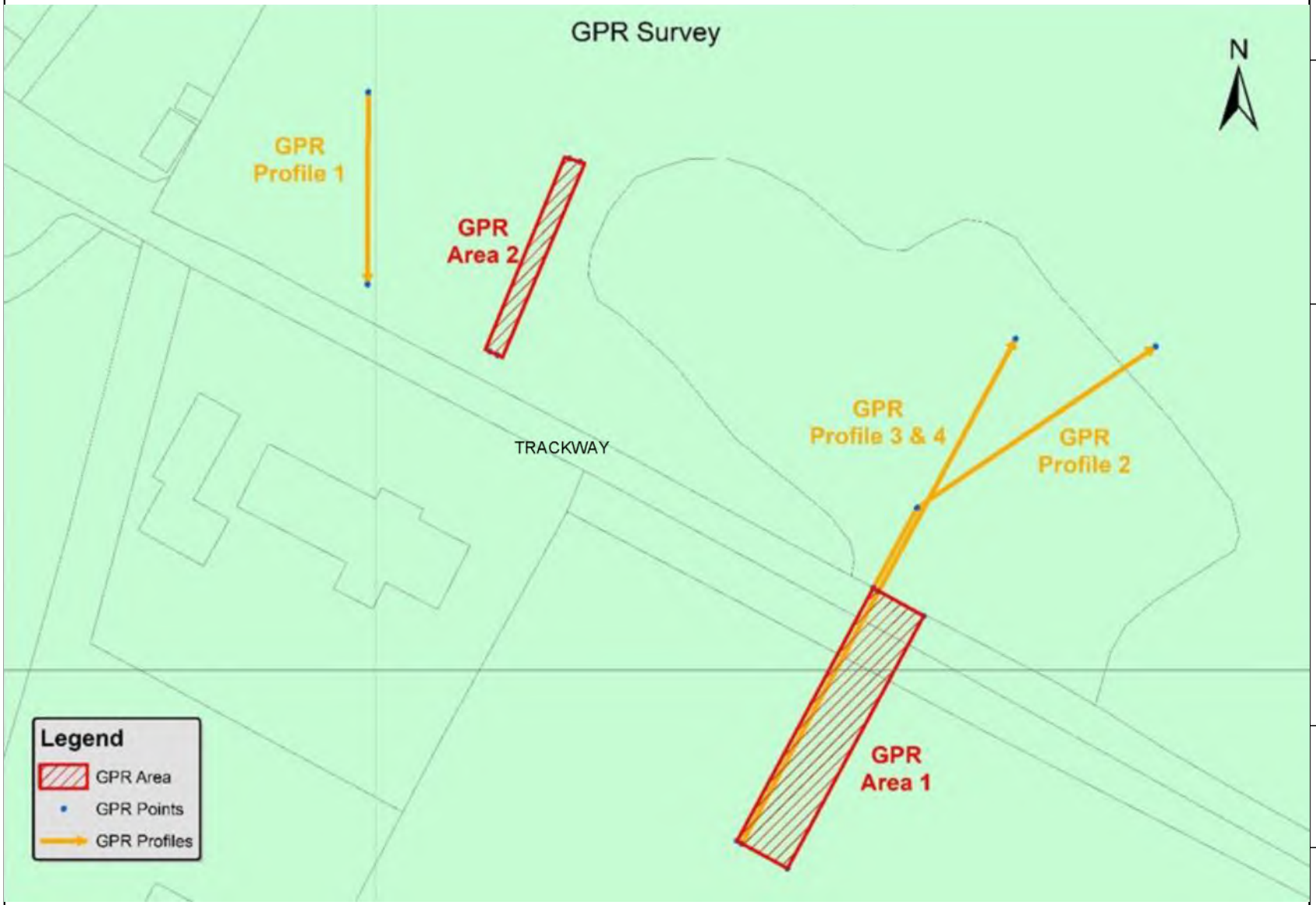
Figure 8: GPR Survey Areas and Profiles



Site name: Dinting Vale, Glossop

Date Surveyed: February 2023

Date Drawn: February 2023

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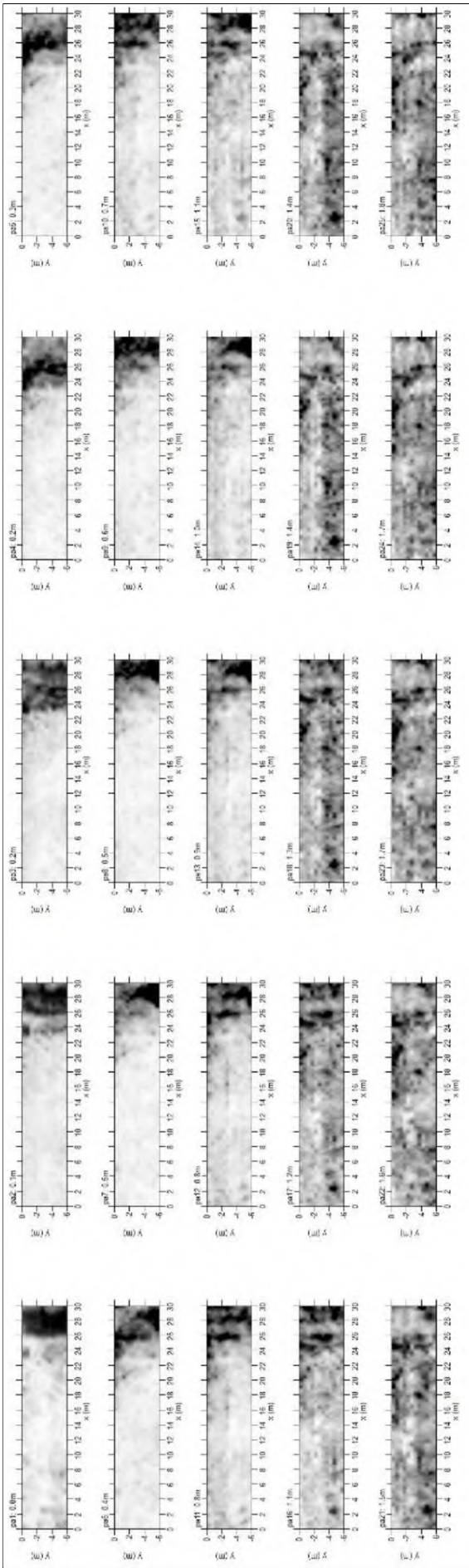

Figure10Area 1 amplitude time slices. Minimally processed with each slice plotted as relative intensities. The track surface and make-up layers can be clearly seen to the north with the area to the south devoid of any major anomalies.

(Darker plot area = higher intensity reflections)

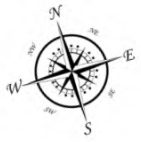

Figure 10:

Area 1 Amplitude Time Slices

Site name: Dinting Vale, Glossop

Date Surveyed: February 2023

Date Drawn: February 2023

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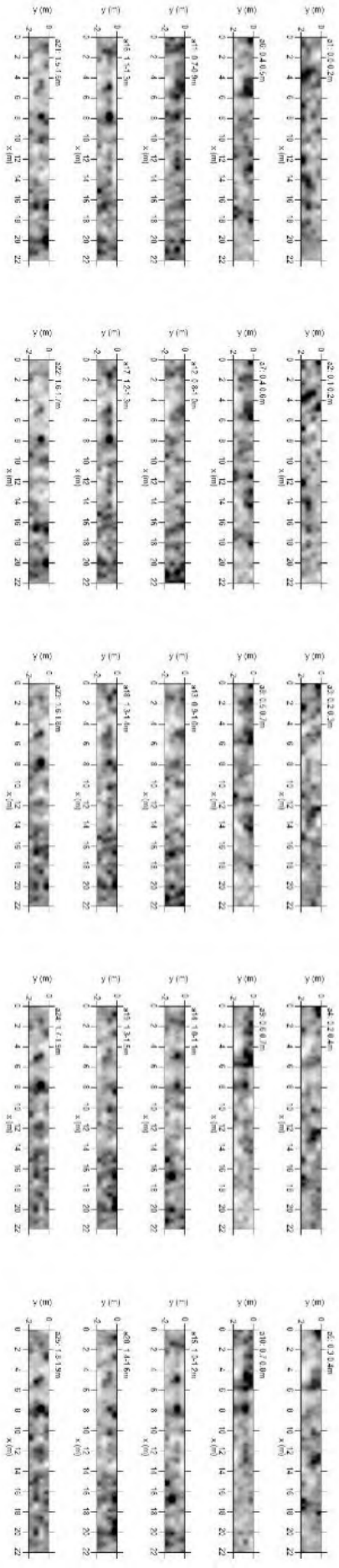

Figure 11 Area 2 amplitude time slices. Minimally processed with each slice plotted as relative intensities. A single convincing shallow linear structure is seen in slice 'a2' crossing E-W (see Figure 9).

(Darker plot area = higher intensity reflections)

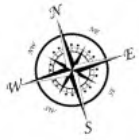

Figure 11:

Area 2 Amplitude Time Slices

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Date Drawn: February 2023

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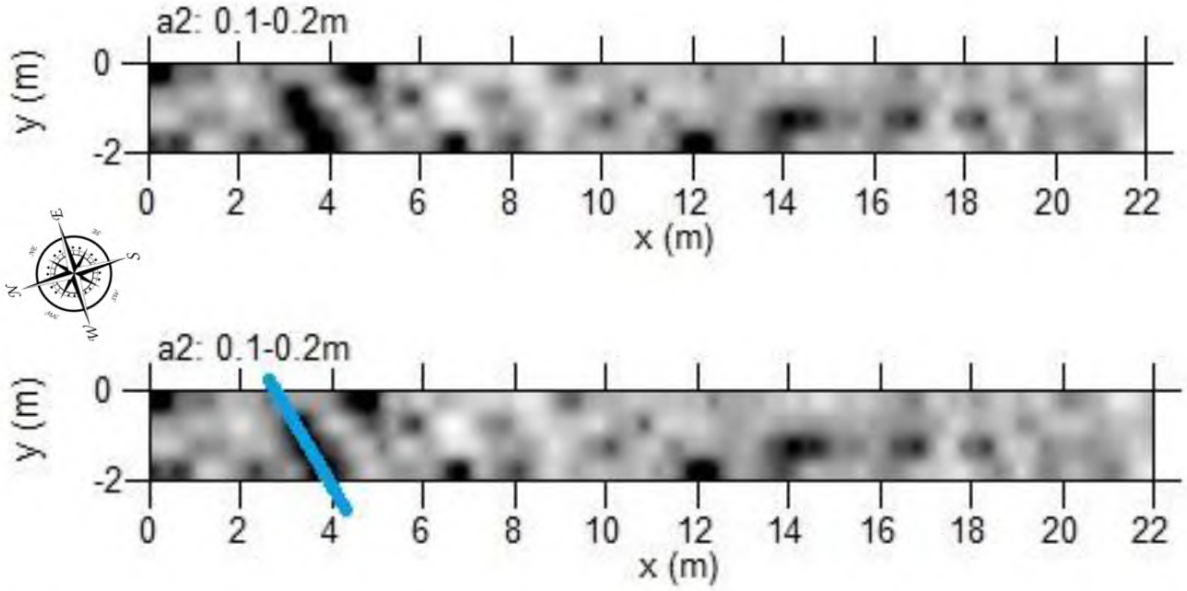

Figure 12 Area 2 amplitude time-slice 'a2' with the linear anomaly annotated on the lower plot.

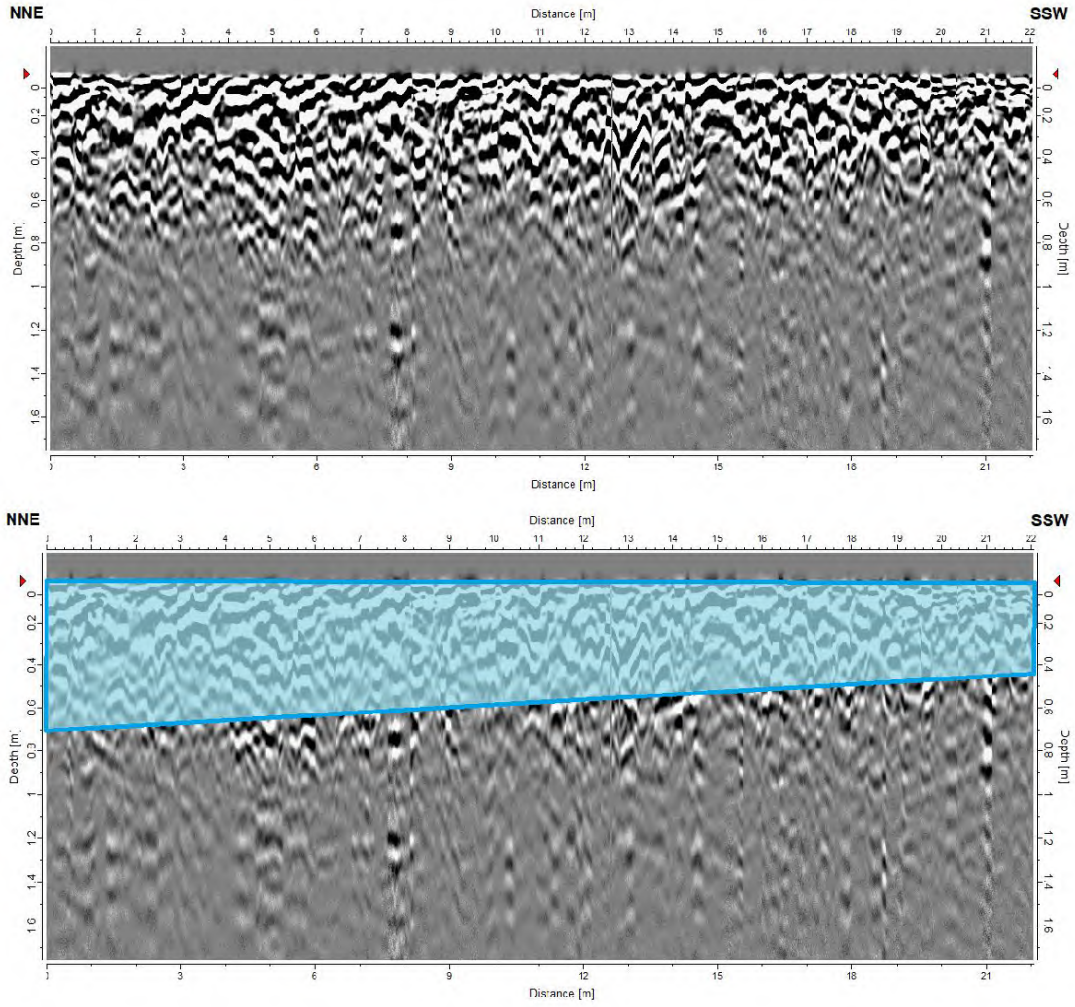

Figure 13 Area 2 traverse 2 radargram. The blue annotation on the lower plot indicates made ground that is ~0.4 m deep by the trackway (to the south) but thickening to around 0.7 m at the northern end of the traverse. This layer seals and likely masks any ephemeral archaeological remains.

Figures 12:
Area 2 Amplitude Time Slice

Figures 13:
Area 2 Traverse 2 radargram

Site name: Dinting Vale, Glossop

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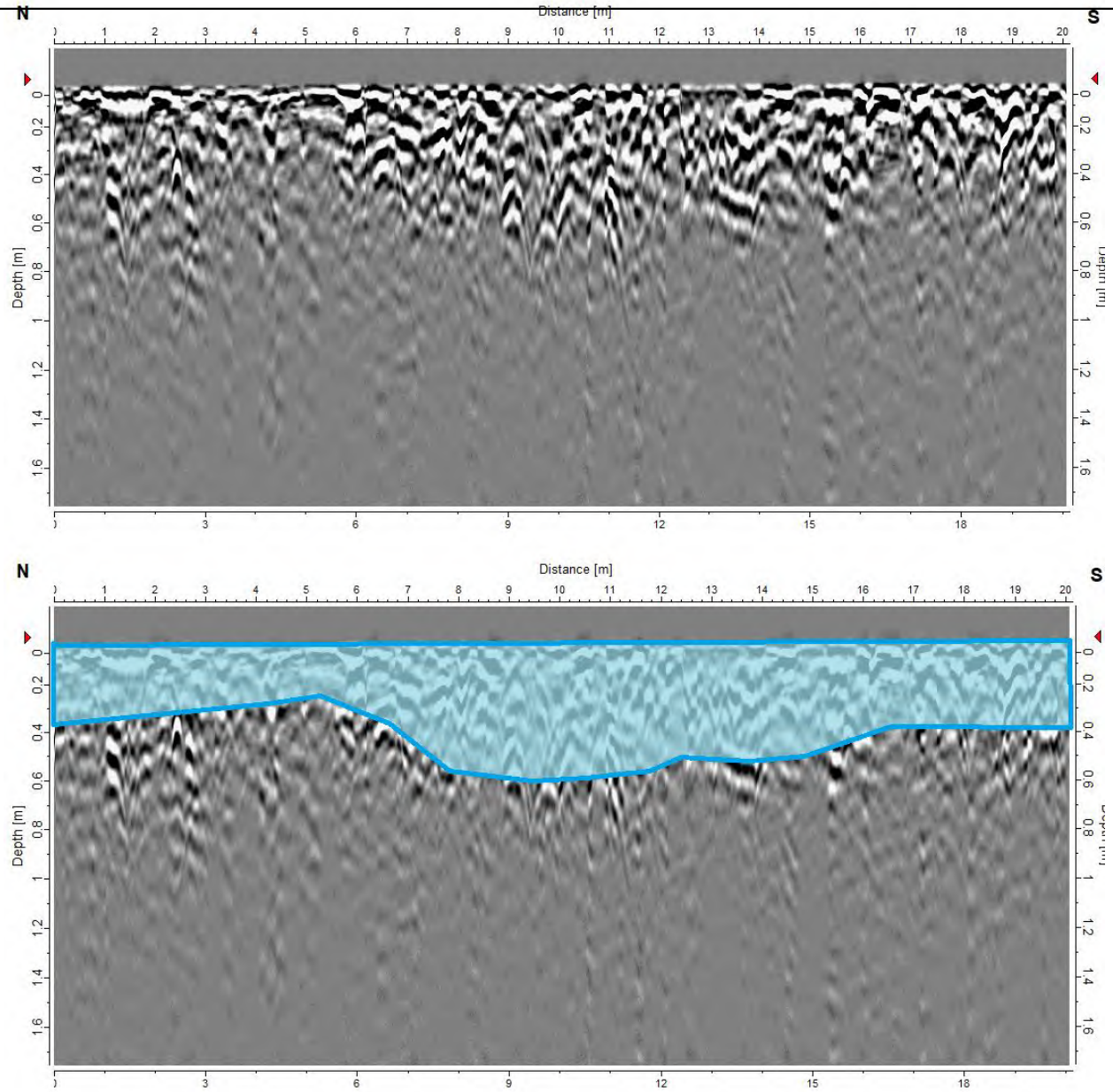

Figure 14 Profile 1 traverse 1 radargram showing a complex made ground deposit that is either mixed or following an undulating underlying surface. The approximate extent of the stony deposit is indicated in blue on the lower plot although possibly deeper towards the northern end.

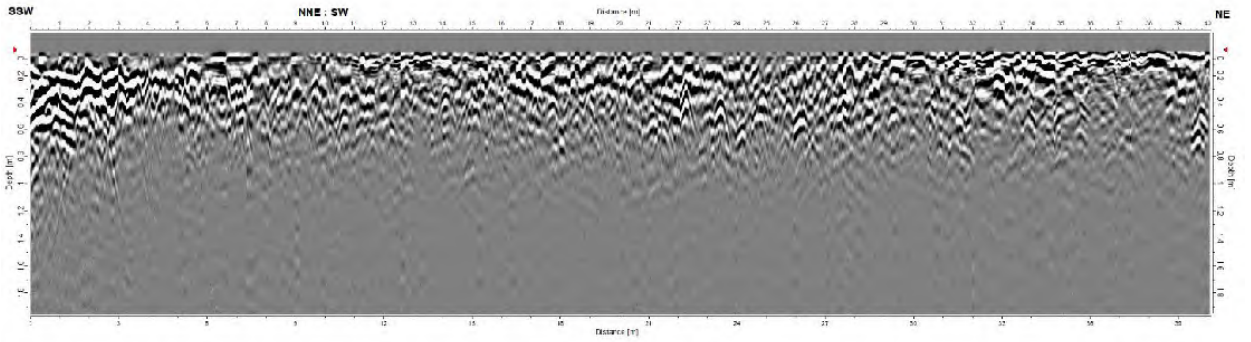

Figure 15 Profile 2 traverse 1 radargram. The complex reflections of the first 5 m of this plot correspond to the embankment and entrance way. Beyond this the largely level area would appear to be made ground estimated to extend to a depth of at least 0.6 m. In this radargram no archaeologically significant anomalies can be suggested.

Figure 14:
Profile 1 traverse radargram

Figure 15:
Profile 2 traverse radargram

Site name: Dinting Vale, Glossop

Date Surveyed: February 2023

Date Drawn: February 2023

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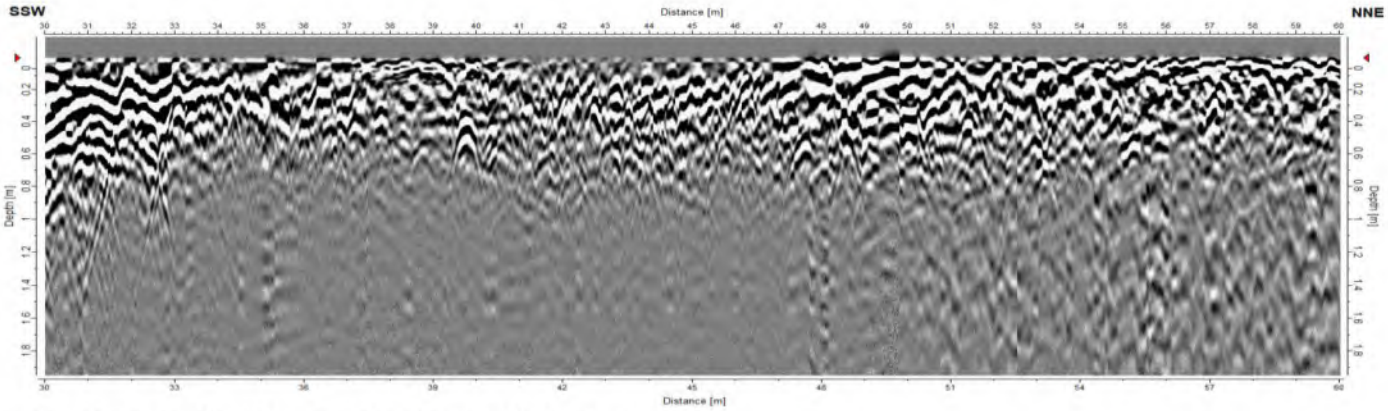

Figure 16. Profile 3 Traverse 1 radargram (last 30 m).

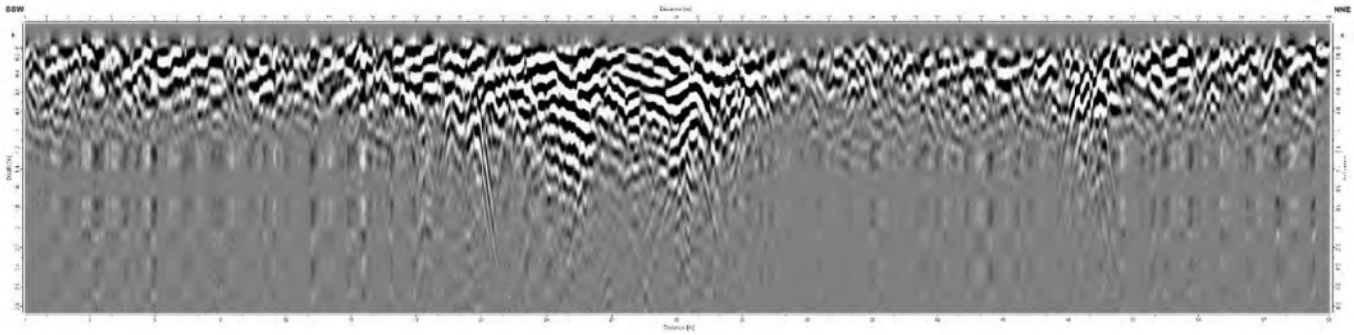

Figure 17. Profile 4 Traverse 2 radargram. Central anomaly showing the strong reflection from the track and embankment. Between 48 and 50 m there is a strong stony anomaly ~ 2 m wide.

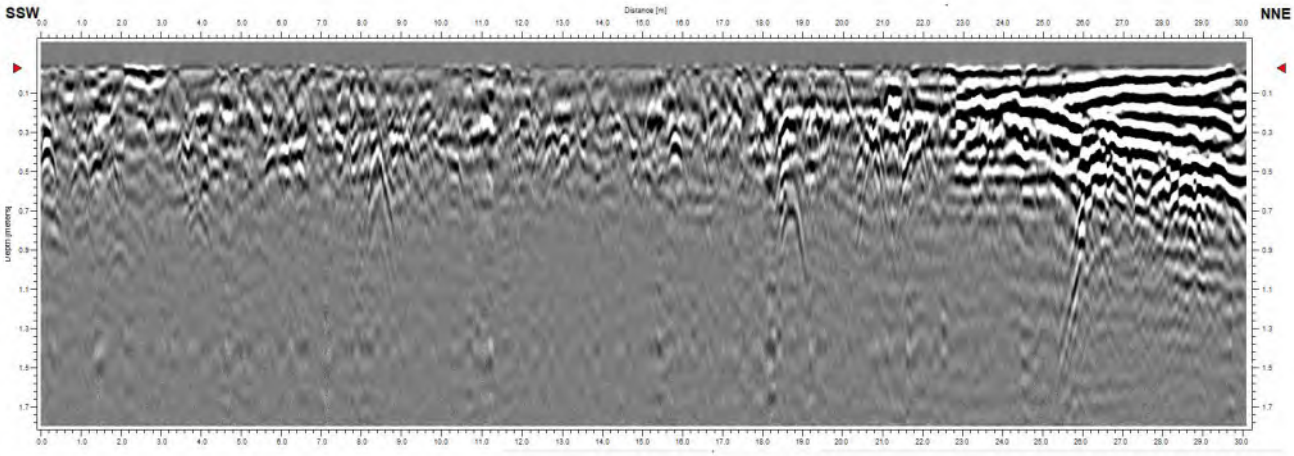

Figure 18 . Area 1 traverse 7 radargram showing a a stony topsoil and subsoil running along to around 19m. A more compact layer at a depth of around 20 cm running to 23 m is highlighted in lower imager. The strong reflections of the layers that make up the embankment and track surface are seen to the NNE. The original ground surface can be seen below the road surface as appears as the inclined deposit layer.

Figures 16, 17, 18	**Site name: Dinting Vale, Glossop** **Date Surveyed: February 2023** **Date Drawn: February 2023** **Client: Wain Homes (North West) Ltd**	Archaeological Research Services Ltd. Angel House Portland Square Bakewell Derbyshire DE45 1HB www.archaeologicalresearchservices.com