BELMONT SCHOOL,
DURHAM, COUNTY DURHAM

~ ARCHAEOLOGICAL EVALUATION ~

JUNE 2023

The Archaeological Practice Ltd.

BELMONT SCHOOL,
DURHAM, COUNTY DURHAM

REPORT ON AN ARCHAEOLOGICAL EVALUATION

Frontispiece: *North view, working shot, Trench 22.*

Report title:	*Belmont School, Durham, County Durham*
Stage:	***FINAL***
Project code:	*AP 23/15*
Compiled by:	*Adam Leigh, Kennis Yip, Richard Carlton*
Control:	*Marc Johnstone*
OASIS ID:	*thearcha2-516515*
Date of fieldwork:	*May-June 2023*
Date Issued:	*13/06/2023*
DCC Ref:	*n/a*
Grid reference (NGR):	*NZ 30523 43358*
Client:	*Kier Construction Limited - North & Scotland*

CONTENTS

ILLUSTRATIONS

Front Cover: *South view of Trench 12, showing a NW-SE aligned field drain.*

Frontispiece*: North view, working shot, Trench 22.*

Location Maps and Plans:

Illus. 01: *City view, showing the approximate location of the study area (circled in red), within the wider region and within Durham.*

Illus. 02: *Street view, showing the location of the study area (outlined in red) within the campus area.*

Illus. 03: *Trench location plan, transposed over Geophysical survey interpretation plan.*

Illus. 04: *Amalgamated extracts from the 1st edition Ordnance Survey 25 inch (lower) and 6 inch (upper) series 1857-1859.*

Illus. 05: *Extract from the 2nd edition Ordnance Survey 25 inch series 1896.*

Illus. 06: *Extract from the 3rd edition Ordnance Survey 25 inch series 1919.*

Illus. 07: *Extract from the 4th edition Ordnance Survey 25 inch series 1939.*

Illus. 08: *Extract from the 1960 edition Ordnance Survey 25 inch series.*

Illus. 09: *Extract from the 1971 edition Ordnance Survey 25 inch series.*

Illus. 10: *Aerial views of the study area, captured in December 1945 and July 2006.*

Illus. 11: *Enhanced LiDAR image of the study area (DTM 0.5-1m).*

Illus. 12: *Geophysical survey, magnetic gradient data ('standard' range).*

Illus. 13: *Geophysical survey, interpretation of magnetic gradient data.*

Illus. 14: *Trench 1; Plan, section, sample section and selected photos.*

Illus. 15: *Trench 2; Plan, section, sample section and selected photos.*

Illus. 16: *Trench 3; Plan, section, sample section and selected photos.*

Illus. 17: *Trench 4; Plan, section, sample section and selected photos.*

Illus. 18: *Trench 5; Plan, section, sample section and selected photos.*

Illus. 19: *Trench 6; Plan, section, sample section and selected photos.*

Illus. 20: *Trench 7; Plan, section, sample section and selected photos.*

Illus. 21: *Trench 8; Plan, section, sample section and selected photos.*

SUMMARY

This document reports on a scheme of archaeological evaluation conducted in May and June 2023, prior to the determination of planning consent for the proposed redevelopment and expansion of the Belmont Schools campus, Durham. The development entails demolition of existing structures on the site and expansion of new buildings onto the current playing fields area.

Durham County Council Conservation Team stipulated that geophysical survey followed by archaeological evaluation should be undertaken on the site in order to determine the location, character and state of survival of any remains found to exist on the site and aid the determination of an appropriate mitigation strategy.

Evaluation by excavation was undertaken by means of 23 Trenches. Geophysical survey followed by evaluation excavation resulted in the detection of no significant archaeological remains, indicating that the site is largely devoid of significant sub-surface archaeological remains.

It was determined that parts of the site had been impacted by previous phases of development which had truncated original ground sources below levels expected to contain any residual archaeological features.

Some potential for the survival of archaeological remains is considered to remain in parts of the site yet to be investigated, however, notably adjacent to the former Ravensflatt Farm, the origins of which may be 18th century or earlier, in the south-west quadrant of the site.

Given the apparent absence of archaeological remains across the parts of the site investigated and likely truncation of original ground surfaces, no further archaeological evaluation work is proposed there prior to the determination of planning consent, nor in the form of mitigation works following determination of planning consents.

1. PURPOSE OF EVALUATION

1.1 Prior to the determination of final planning consent for the proposed development of the Belmont Schools campus, located in the Belmont suburb of Durham (*Illus. 01-02*) and centred on grid reference *NZ 30523 43358*, Durham County Council Conservation Team stipulated that archaeological evaluation should be undertaken in order to determine the character and state of survival of any remains found to exist on the site and aid the determination of an appropriate mitigation strategy.

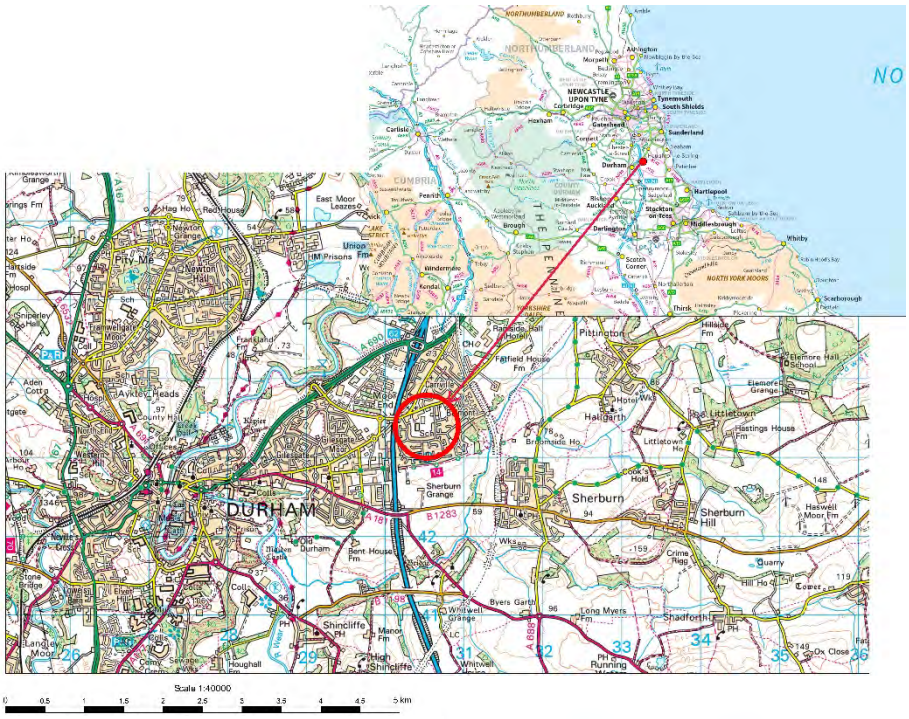
1.2 Historical Background and Previous Investigations

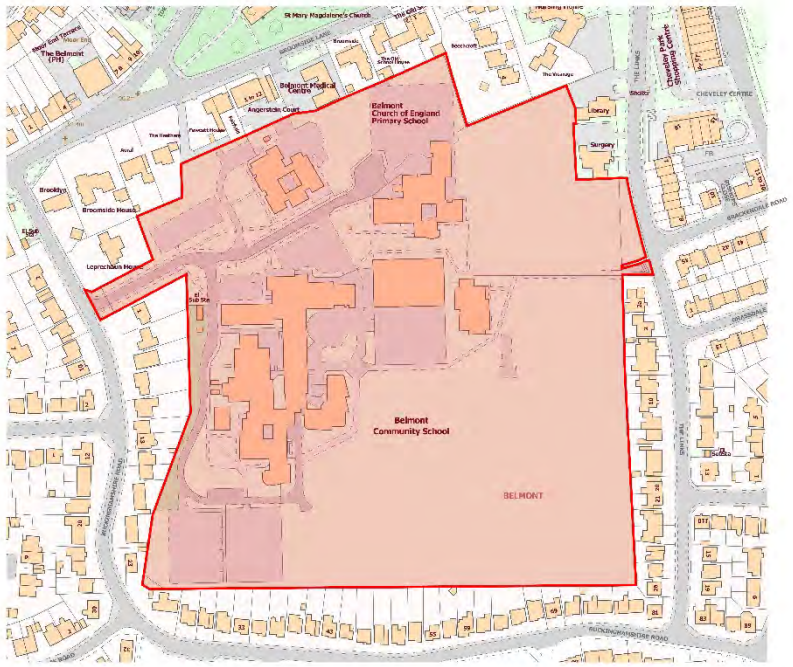
Information sourced from Historic England, the DCC Heritage Environment Record, published sources and historic map evidence suggests that, while there is likely to have been human occupation in and around the area since the end of the last ice-age (from around 8,000BC), the earliest known human occupation is represented by cropmarks of iron age enclosed settlement sites in the wider vicinity of the village. Some of these may be contemporary, or even post-date, the Roman occupation of this area which began with the construction of Dere Street around 80 A.D. Prior to the construction of modern housing and the associated Belmont School, the site was used for farming and associated with Ravensflatt Farm, which appears on historic Ordnance Survey plans in the south-west corner of the site (*see Illus. 04-09*).

In summary, while there is no direct evidence for human activity within the bounds of the proposed development area until the modern period, intermittent, possibly low-level human activity, based on food gathering, farming and transportation, is considered likely during all periods since prehistory, with more intensive exploitation of the site as farmland since the medieval period.

1.3 Previous Archaeological Investigation

No archaeological assessments or interventions have previously been carried out on the site and no sites of significance with respect to the current investigation are recorded on the county HER in the immediate vicinity. A crop-mark site of unknown provenance is, however, recorded on the HER close to the eastern site boundary.





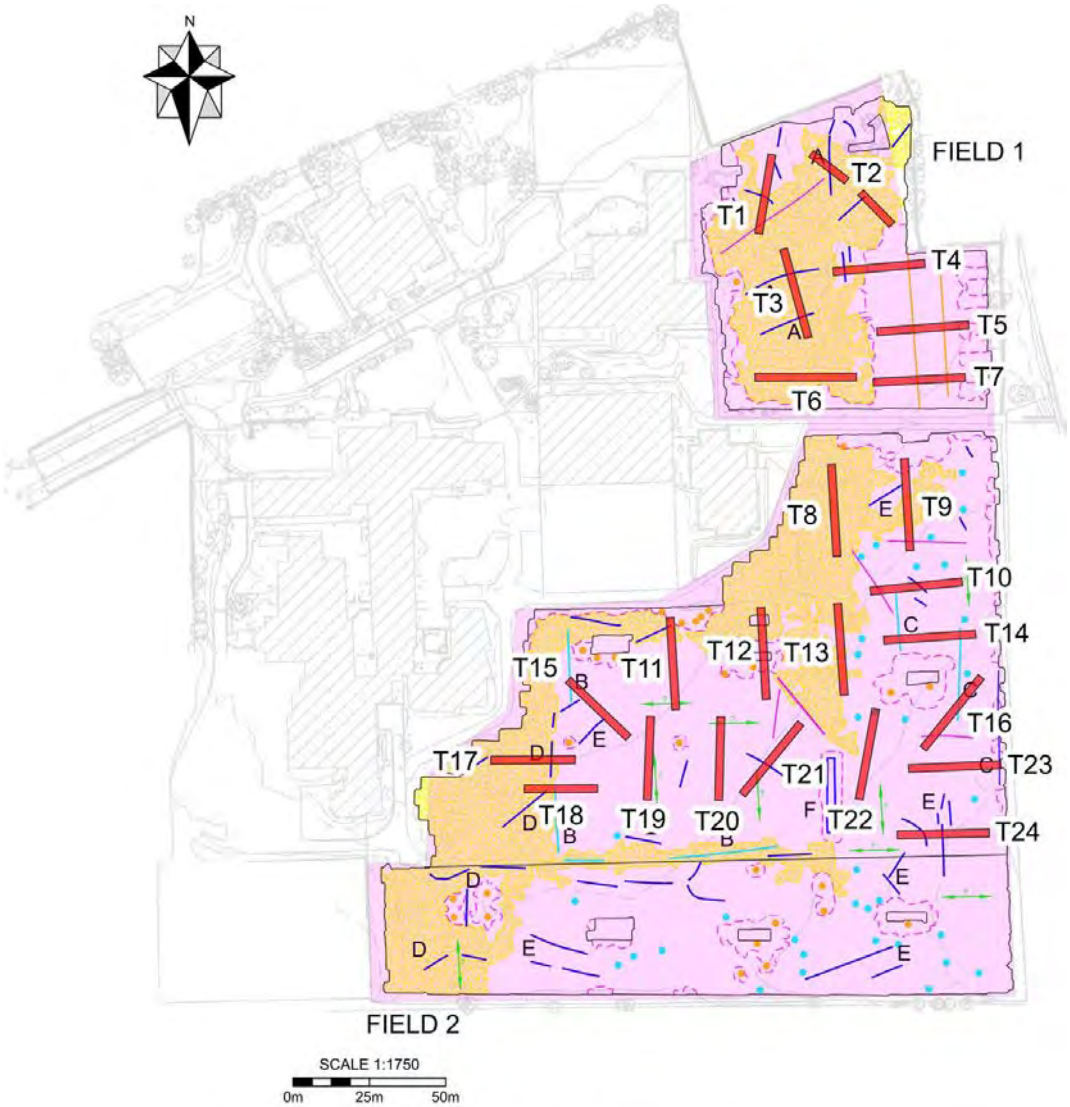
Illus. 01 (top): *City view, showing the approximate location of the study area (circled in red), within the wider region and within Durham.*

Illus. 02 (bottom): *Street view, showing the location of the study area (outlined in red) within the campus area.*

2. ARCHAEOLOGICAL EVALUATION

2.1 The programme of works stipulated by Durham County Council Archaeology took place in advance of the final determination of planning consent for the proposed scheme of building works and landscaping.

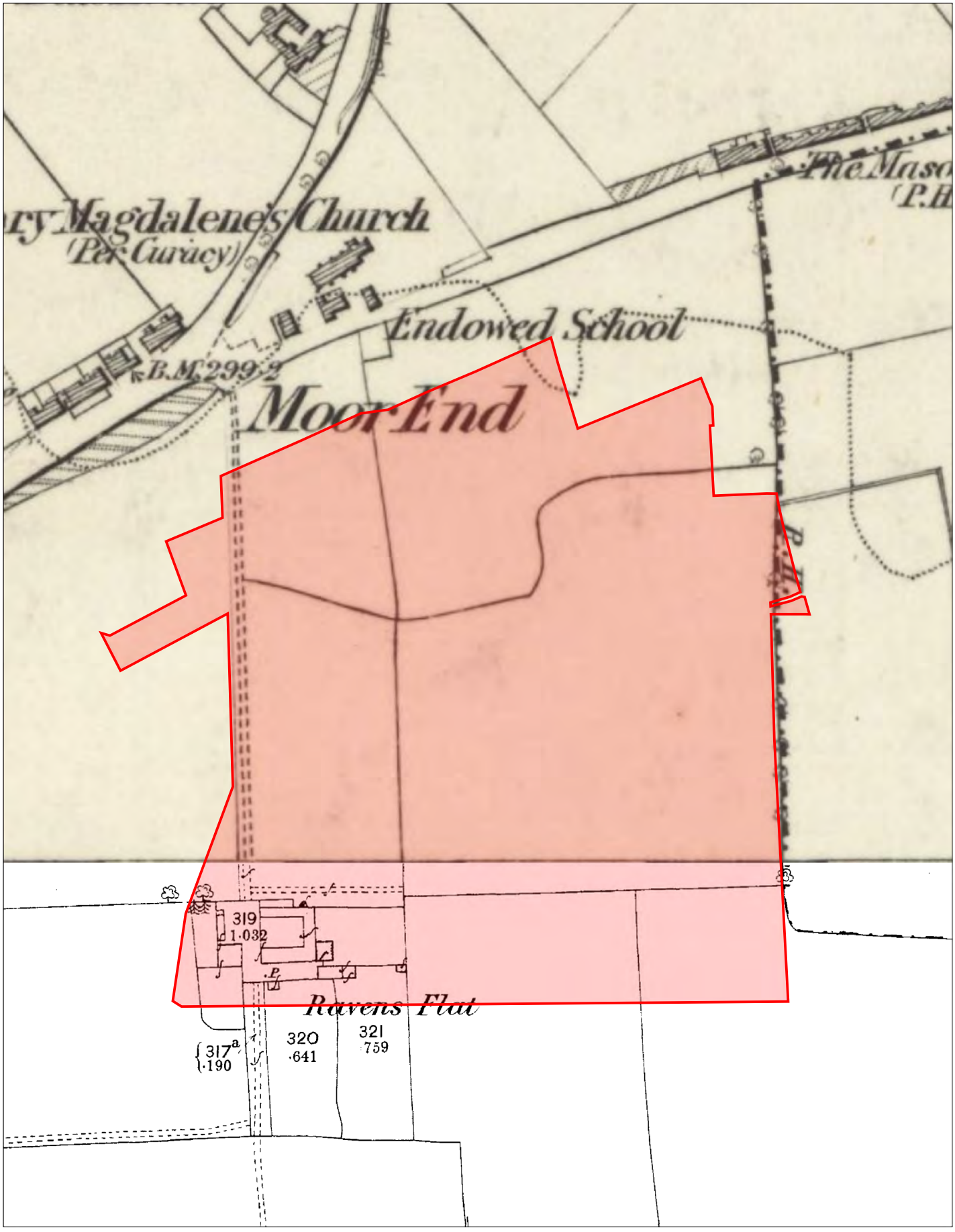
2.2 The fieldwork and reporting detailed here comply with a Written Scheme of Investigation approved by Durham County Council Archaeology in relation to a Condition attached to associated Planning Consent. The purpose of the trial trenching was to inform the Planning Authority of the character, nature, date, depth, degree of survival of archaeological deposits on this site, targeting positions of high potential based on known information as well as sampling areas where no geophysical anomalies were recorded.



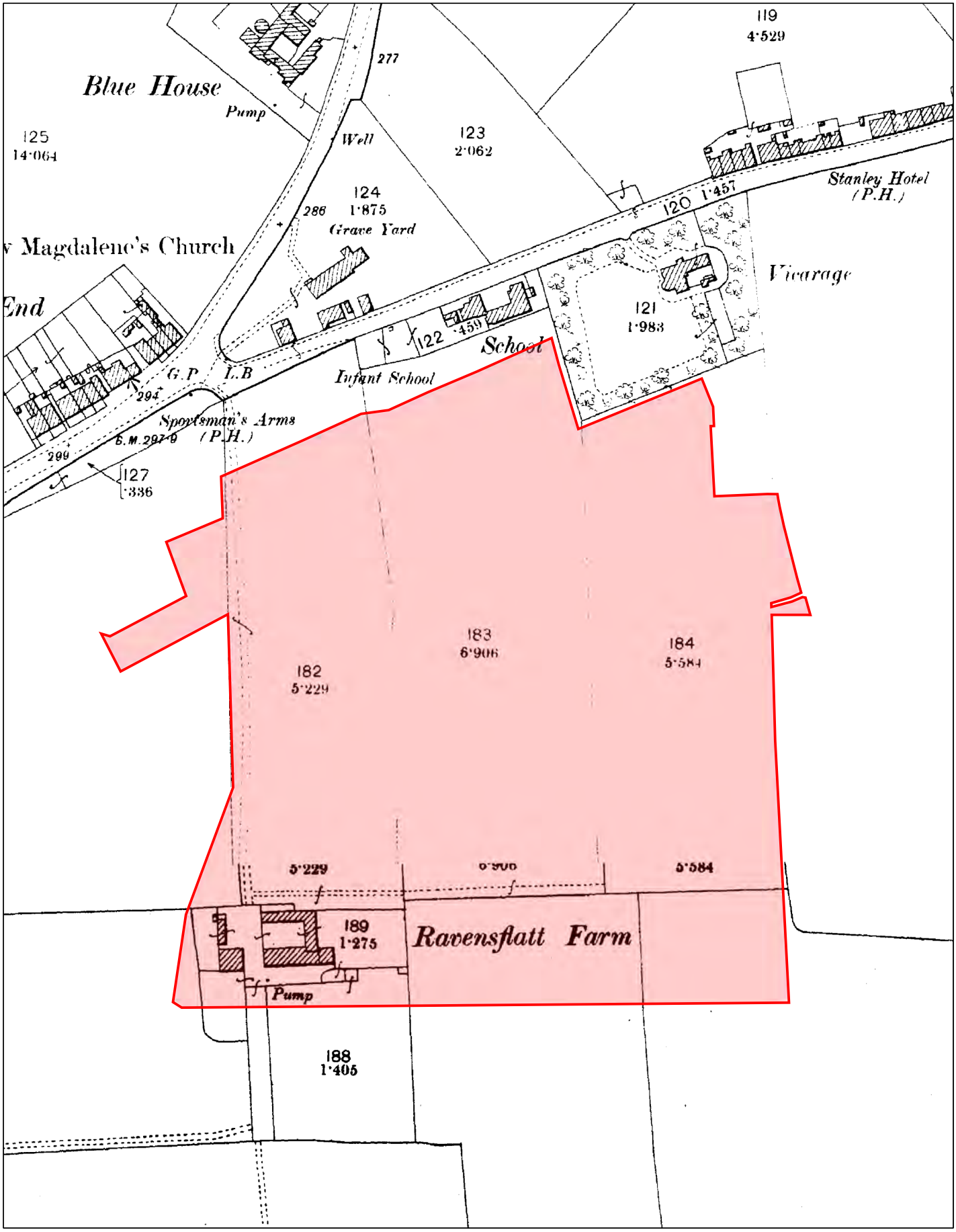
Illus. 03: Trench location plan, transposed over geophysical survey interpretation plan.

Trenching was designed to constitute a 4% sample of the land area of 27,600 m^2, with a contingency of 1%. The initial 4% sample equates to 1,104 m^2. On the assumption of a trench width of 1.50 m, this figure necessitated trenching totalling 736 m in length (or 25 x 30 m-long trenches).

2.3 The evaluation, reported in Section 3 (below) took the form of geophysical survey, carried out in March 2023, followed by excavation of 23 trenches (*Illus. 03*), initially excavated by mechanical excavator using a 2.00 m wide toothless ditching bucket to remove modern layers, after which the trenches were cleaned and recorded by hand. All monitoring of mechanical excavation and cleaning and recording processes were undertaken by suitably trained and experienced archaeologists from The Archaeological Practice Ltd. in late May and early June 2023.



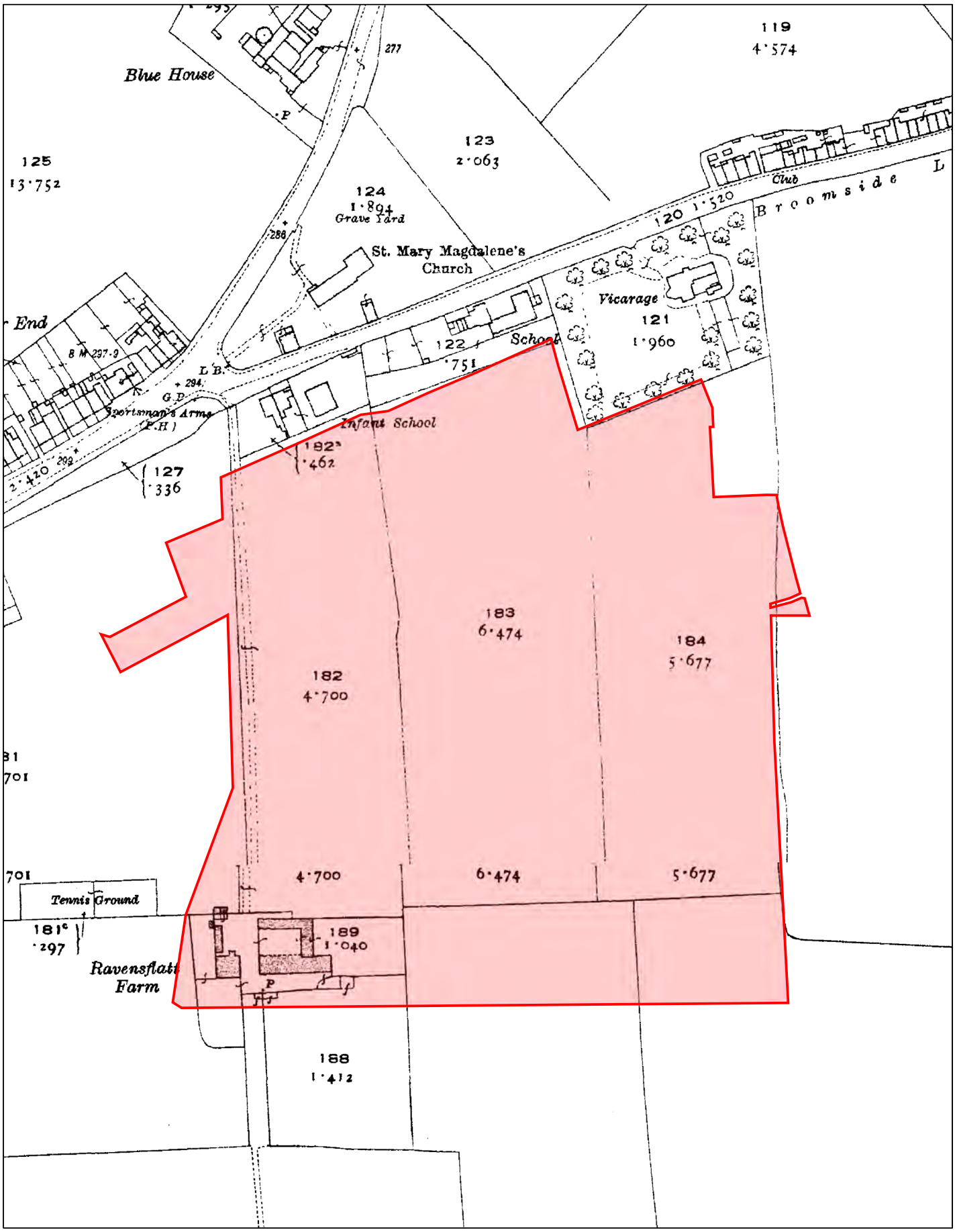
Illus. 04: *Amalgamated extracts from the 1st edition Ordnance Survey 25 inch (lower) and 6 inch (upper) series 1857-1859.showing the site area (highlighted in red).*



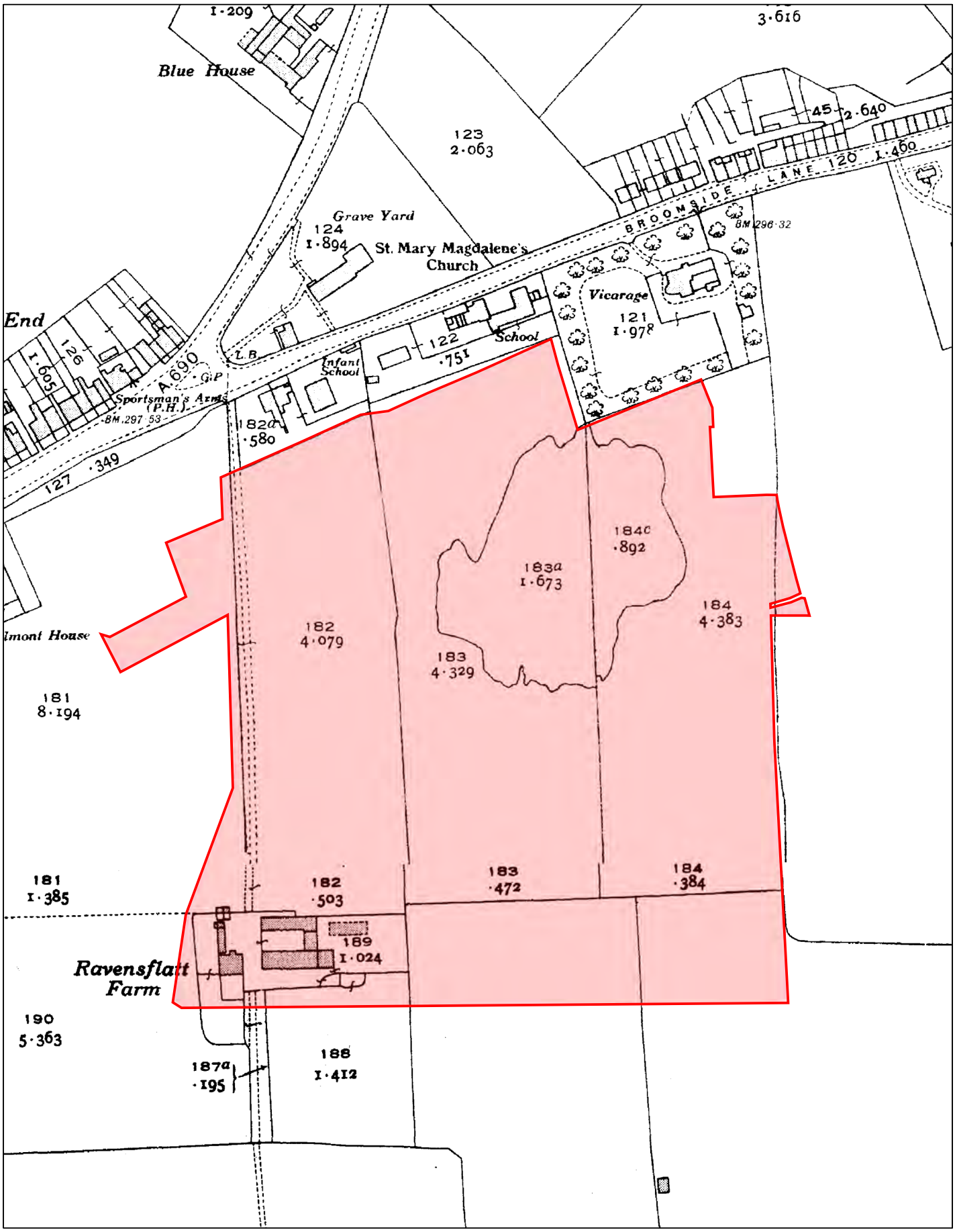
Scale 1:2500

0 20 40 60 80 100 120 140 160 180 200 m

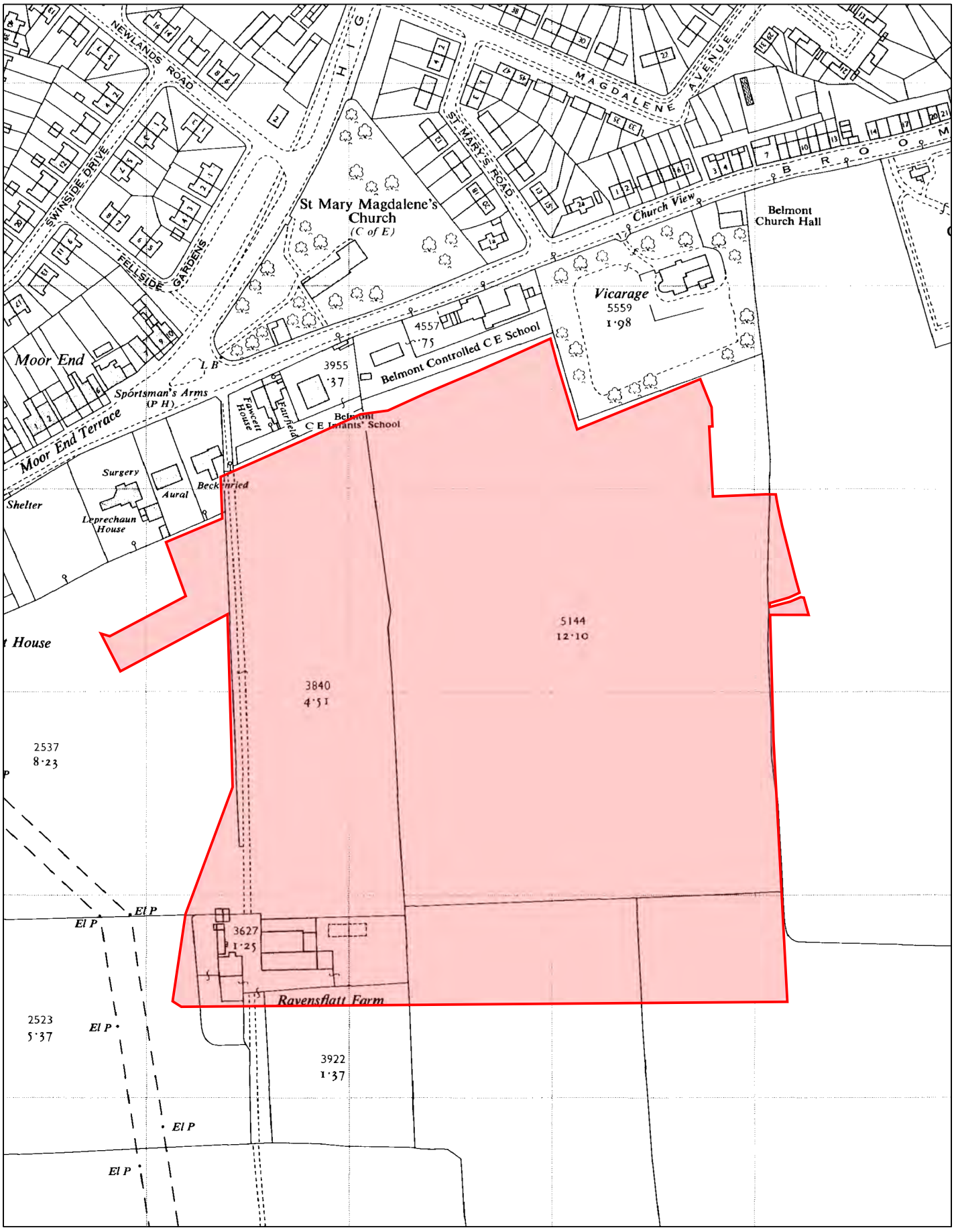
Illus. 05: *Extract from the 2nd edition Ordnance Survey 25 inch series 1896, showing the site area (highlighted in red).*



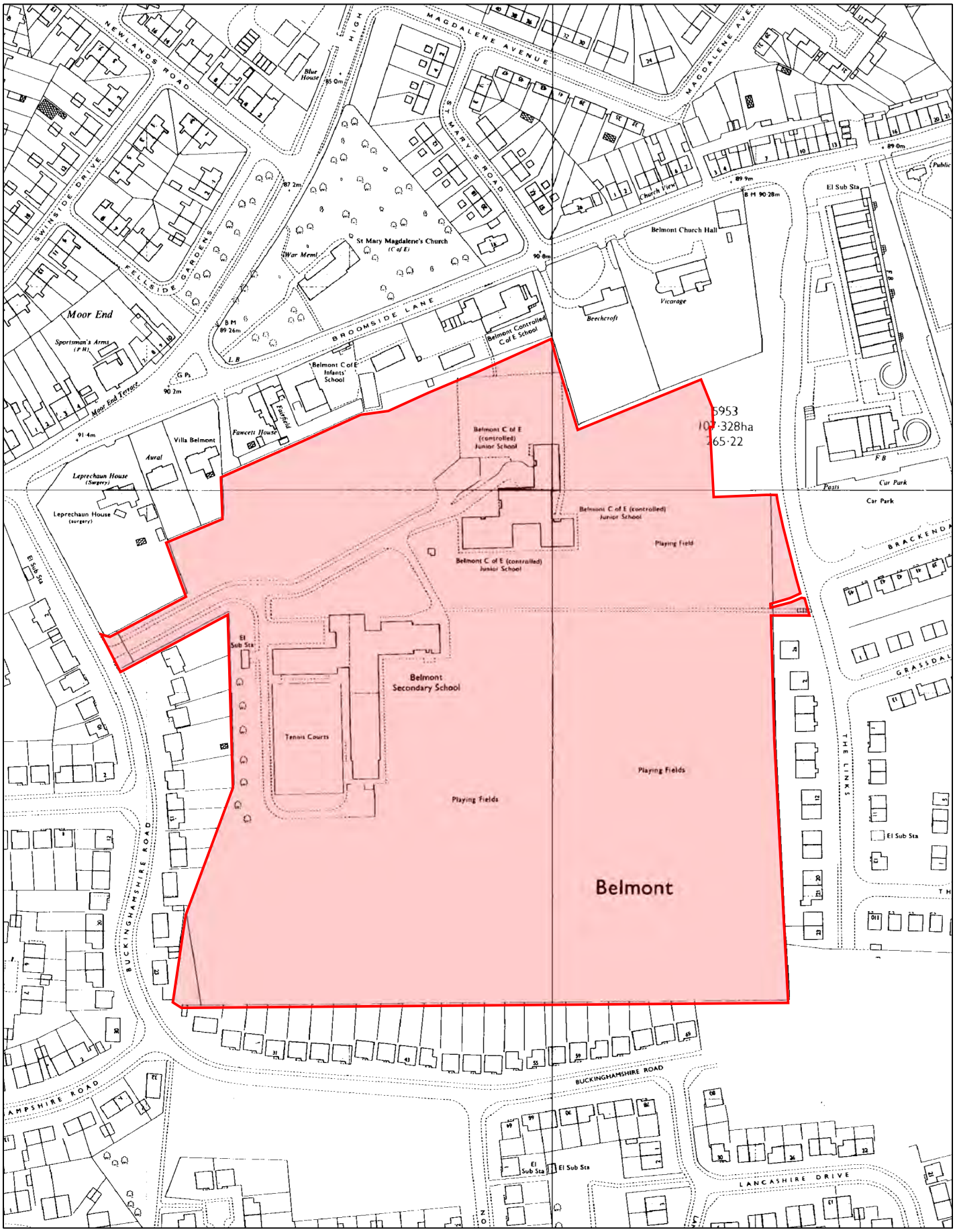
Illus. 06: *Extract from the 3rd edition Ordnance Survey 25 inch series 1919, showing the site area (highlighted in red).*



Illus. 07: *Extract from the 4th edition Ordnance Survey 25 inch series 1939, showing the site area (highlighted in red).*

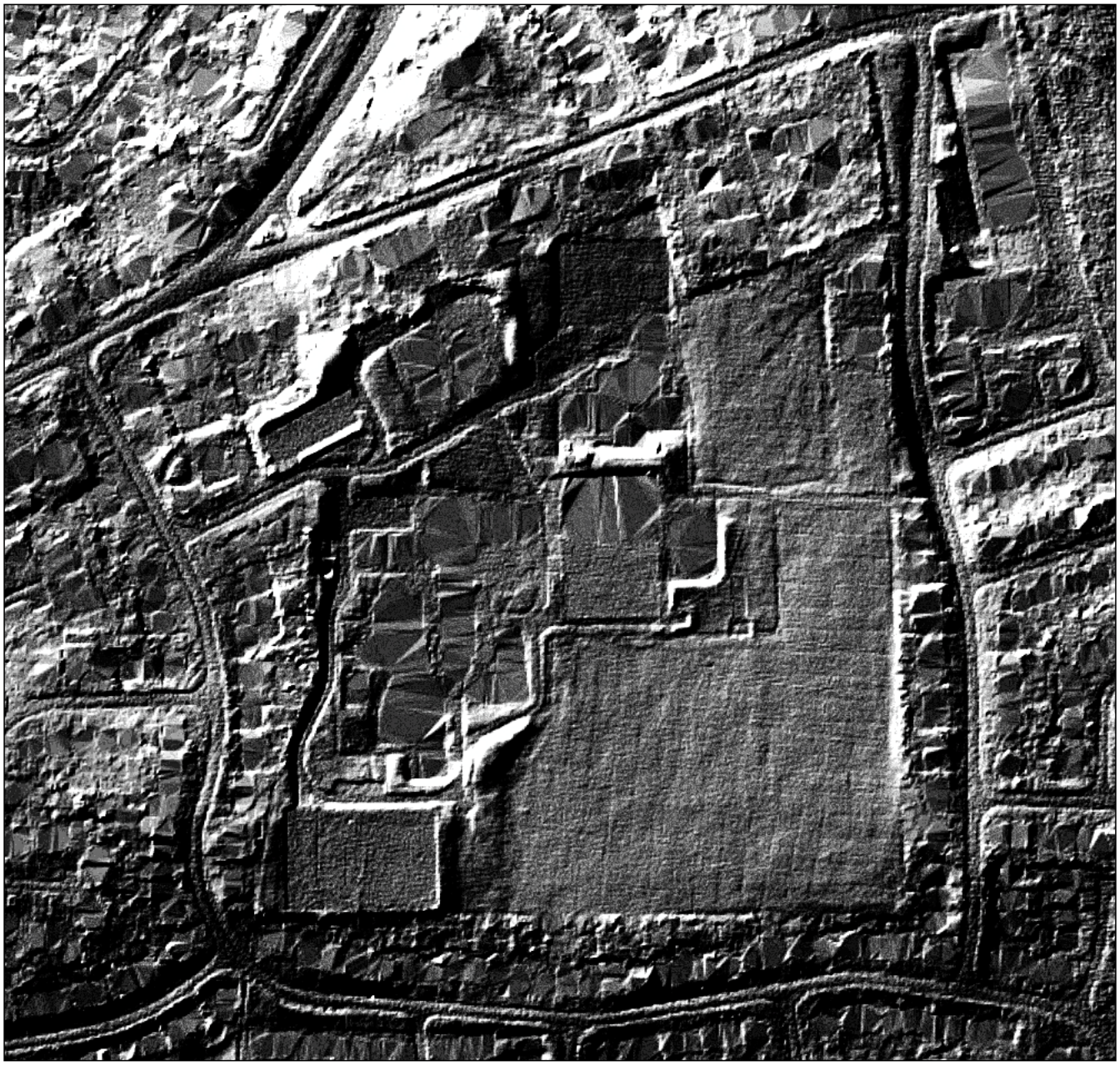


Illus. 08: *Extract from the 1960 edition Ordnance Survey 25 inch series, showing the site area (highlighted in red).*



Illus. 09: *Extract from the 1971 edition Ordnance Survey 25 inch series, showing the site area (highlighted in red).*

Illus. 10: *Aerial views of the study area, captured in December 1945 (top) and July 2006 (bottom). Courtesy of Google Earth.*



Illus. 11: *Enhanced LiDAR image of the study area (DTM 0.5-1m), © Environment Agency 2020 via National Library of Scotland).*

3. RESULTS

3.1 Geophysical Survey *(see Illus. 12-13; Appendix 02)*

Geophysical survey was carried out by magnetometry over the greater part of the playing fields area. The results of this survey consisted of few indications of archaeologically significant remains.

The aim of the magnetic gradient survey was to help establish the presence or absence, extent, character, relationships and date (as far as site circumstances and the inherent limitations of the technique permitted) of archaeological features within the survey area. The survey was undertaken using a Phase Site Investigations Ltd multi-sensor array cart system (MACS). The MACS comprised 8 Foerster 4.032 Ferex CON 650 gradiometers with a control unit and data logger. The MACS data was collected on profiles spaced 0.5 m apart with readings taken at between 0.1 and 0.15 m intervals.

The majority of the anomalies identified by this survey relate to modern material/objects, probable drainage and possible agricultural activity. There are a number of anomalies of uncertain origin. The majority of these were also probably related to modern features or activity but as their cause could not be determined with certainty, an archaeological cause for some of them could be completely ruled out.

Large areas of the site are dominated by very strong responses or magnetic disturbance from modern features/material. It should be recognised that the strength of these responses could mask anomalies from other sub-surface features in the area, if any such features were present.

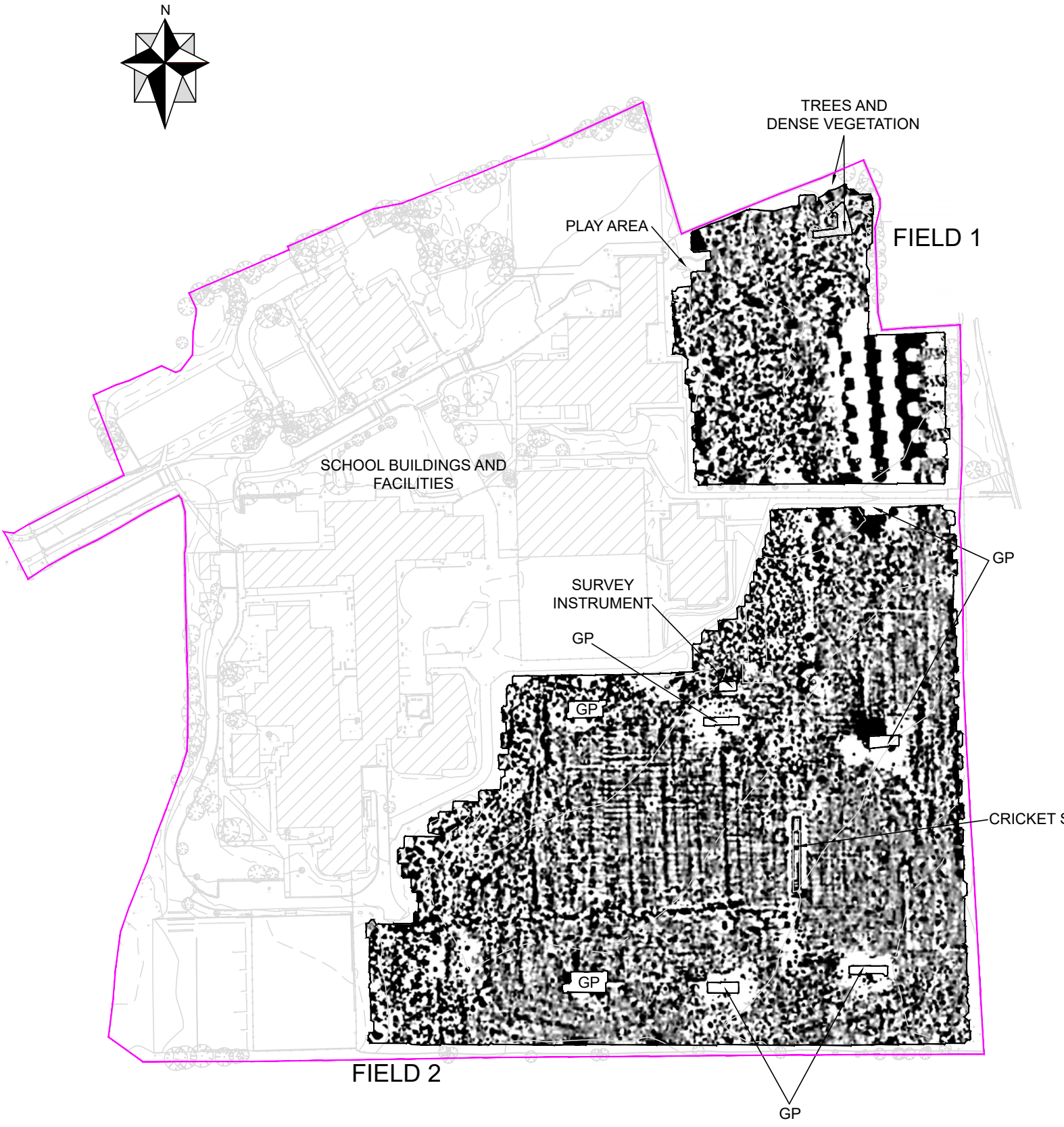
Although no anomalies indicative of likely archaeological remains were identified by geophysical survey, evaluation trenches were aligned over a number of linear anomalies which were considered to display some archaeological potential.

3.2 Location and Dimensions of Evaluation Trenches *(see Illus. 03; 14-36)*

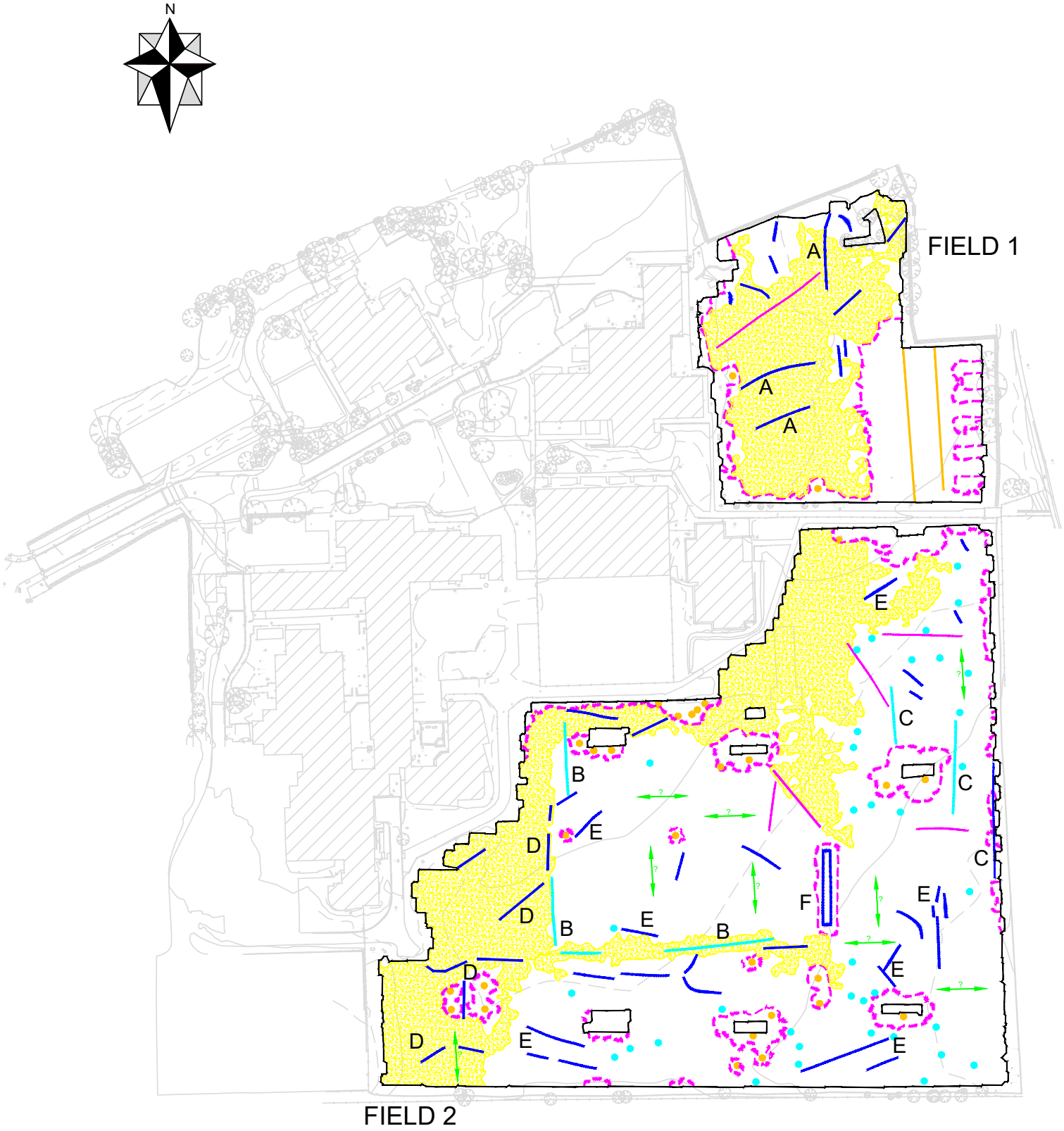
Evaluation by excavation was undertaken by means of 23 Trenches, opened in May and early June 2023. The south part of the site was excluded from this phase of works but will be evaluated in a subsequent phase should significant groundworks be required as part of developments in that area.

The archaeological sample trenching was originally proposed to be by means of 24 trenches, each of 30 m in length and 1.50 m wide. These trenches were plotted by the Archaeological Practice and were designed to be a mixture of targeted trenches placed deliberately to test anomalies from the geophysical survey, and trenches laid out to evenly sample areas of site where no anomalies were detected.

The northward re-siting of an east-west wooden fence dividing the main school buildings and current phase of works from the residual playing fields area, part of which may be evaluated in a later phase, resulted in a shrinkage of the overall area and reduction by one of the total number of trenches. The fence also bisected N-S trenches 13, 20 and 22. These trenches were extended at their northern ends to make up for the shortfall.



Illus. 12: *Geophysical survey, magnetic gradient data ('standard' range). Courtesy of Phase Site Investigations (see Appendix 1 for full report).*



Illus. 13: *Geophysical survey, interpretation of magnetic gradient data. Courtesy of Phase Site Investigations (see Appendix 1 for full report).*

Some of the trenches were excavated to slightly shorter lengths than 30m depending upon ground conditions. Additionally, the groundworks sub-contractor could only provide a ditching bucket of 2.00 m in width, meaning that all trenches were a minimum of 2.00 m wide, rather than the prescribed 1.50 m.

The excavation of the trenches generally revealed shallow deposits of topsoil, either directly overlying natural or overlying a buried ploughsoil. The north end of the site revealed a layer of redeposited natural subsoil containing sparse 20th century material and probably associated with modern landscaping of the school campus. The context numbers assigned to these deposits were kept consistent in their end numbers, so that topsoil deposit context numbers in all trenches ended [-001], buried ploughsoil number ended in [-002], natural subsoil in [-003] and redeposited natural in [-004].

3.3 Trench 1 *(Illus. 03; 14)*

3.3.1 Location and dimensions

Trench 1 measured 24 m long by 2.0 m wide and was orientated broadly N-S. It was located in the northern part of the site, within the area of former playing fields north of the path.

3.3.2 Description

Trench 1 consisted of a sequence of topsoil [101] overlying degraded ploughsoil [102]. This ploughsoil overlay redeposited natural clay [104], which overlay natural geology [103]. One modern land drain was present.

3.3.3 Discussion

No archaeological features were recorded within this trench.

3.3.4 Context List

[101] Dark grey brown sandy silt - **topsoil**, up to 0.19 m thick.
[102] Mid grey-brown sandy silt - **degraded plough-soil**, present at up to 0.74 m thickness.
[103] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.
[104] Mid grey-brown silty clay - **redeposited subsoil**, present at up to 1.25 m thickness.

3.4 Trench 2 *(Illus. 03; 15)*

3.4.1 Location and dimensions

Trench 2 measured 30 m long by 2.0 m wide and was orientated NW-SE. It was located in the northern part of the site within the area of former playing fields north of the path. A 6.0 m portion of the trench was not excavated so as to not risk disturbing an active water pipe. A further 6.0 m of trench was excavated at the south-east end in order to make up for this.

3.4.2 Description

Trench 2, much as Trench 1, consisted of a sequence of topsoil [201] overlying degraded ploughsoil [202]. This ploughsoil overlay redeposited natural clay [204], which overlay natural geology [203]. At least six ceramic land drains were observed within the trench.

3.4.3 Discussion

No archaeological features were recorded within this trench.

3.4.4 Context List
[201] Dark grey brown sandy silt - **topsoil**, up to 0.22 m thick.
[202] Mid grey-brown sandy silt - **degraded plough-soil**, present at up to 0.35 m thickness.
[203] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.
[204] Mid grey-brown silty clay - **redeposited subsoil**, present at up to 1.10 m thickness.

3.5 Trench 3 *(Illus. 03; 16)*

3.5.1 Location and dimensions
Trench 3 measured 29 m long by 2.0 m wide and was orientated broadly N-S. It was located in the northern part of the site within the area of former playing fields north of the path.

3.5.2 Description
Trench 3 again consisted of a sequence of topsoil [301] overlying degraded ploughsoil [302]. This ploughsoil overlay redeposited natural clay [304], which overlay natural geology [303]. Three modern land drains were present.

3.5.3 Discussion
No archaeological features were recorded within this trench.

3.5.4 Context List
[301] Dark grey brown sandy silt - **topsoil**, up to 0.25 m thick.
[302] Mid grey-brown sandy silt - **degraded plough-soil**, present at up to 0.22 m thickness.
[303] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.
[304] Mid grey-brown silty clay - **redeposited subsoil**, present at up to 1.03 m thickness.

3.6 Trench 4 *(Illus. 03; 17)*

3.6.1 Location and dimensions
Trench 4 measured 29 m long by 2.0 m wide and was orientated E-W. It was located in the northern part of the site within the area of former playing fields north of the path.

3.6.2 Description
Trench 4 also consisted of a sequence of topsoil [401] overlying degraded ploughsoil [402]. This ploughsoil overlay redeposited natural clay [404], which overlay natural geology [403]. Several patches of modern disturbance included land drains and plough furrows.

3.6.3 Discussion
No archaeological features were recorded within this trench.

3.6.4 Context List
[401] Dark grey brown sandy silt - **topsoil**, up to 0.22 m thick.
[402] Mid grey-brown sandy silt - **degraded plough-soil**, present at up to 0.13 m thickness.
[403] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.
[404] Mid grey-brown silty clay - **redeposited subsoil**, present at up to 0.91 m thickness.

3.7 Trench 5 *(Illus. 03; 18)*

3.7.1 Location and dimensions
Trench 5 measured 30 m long by 2.0 m wide and was orientated E-W. It was located in the northern part of the site within the area of former playing fields north of the path.

3.7.2 Description
Trench 5 consisted of a sequence of topsoil [501] overlying degraded ploughsoil [502]. This degraded ploughsoil overlay natural geology [503]. A slender, irregular plough furrow contained modern material while a significant patch of disturbance in the middle of the trench was attributed to a live service.

3.7.3 Discussion
No archaeological features were recorded within this trench.

3.7.4 Context List
[501] Dark grey brown sandy silt - **topsoil**, up to 0.36 m thick.
[502] Mid grey-brown sandy silt - **degraded plough-soil**, present at up to 0.42 m thickness.
[503] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.

3.8 Trench 6 *(Illus. 03; 19)*

3.8.1 Location and dimensions
Trench 6 measured 30 m long by 2.0 m wide and was orientated E-W. It was located in the northern part of the site within the area of former playing fields north of the path.

3.8.2 Description
Trench 6 consisted of a sequence of topsoil [601] overlying degraded ploughsoil [602]. This ploughsoil overlay redeposited natural clay [604], which overlay natural geology [603]. At least eight land drains were observed in T6.

3.8.3 Discussion
No archaeological features were recorded within this trench.

3.8.4 Context List
[601] Dark grey brown sandy silt - **topsoil**, up to 0.30 m thick.
[602] Mid grey-brown sandy silt - **degraded plough-soil**, present at up to 0.37 m thickness.
[603] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.
[604] Mid grey-brown silty clay - **redeposited subsoil**, present at up to 0.57 m thickness.

3.9 Trench 7 *(Illus. 03; 20)*

3.9.1 Location and dimensions
Trench 7 measured 30 m long by 2.0 m wide and was orientated E-W. It was located in the northern part of the site within the area of former playing fields north of the path.

3.9.2 Description
Trench 7 consisted of a sequence of topsoil [701] overlying degraded ploughsoil [702]. This ploughsoil overlay natural geology [703]. A large patch of modern disturbance (a mixture of sterile sand and ‘dolomite’ aggregate) was present in the middle of the trench.

3.9.3 Discussion
No archaeological features were recorded within this trench.

3.9.4 Context List
[701] Dark grey brown sandy silt - **topsoil**, up to 0.27 m thick.
[702] Mid grey-brown sandy silt - **degraded plough-soil**, present at up to 0.40 m thickness.
[703] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.

3.10 Trench 8 *(Illus. 03; 21)*

3.10.1 Location and dimensions
Trench 8 measured 30 m long by 2.0 m wide and was orientated N-S. It was located in the central part of the site within the area of former playing fields south of the path.

3.10.2 Description
Trench 8 consisted of a sequence of topsoil [801] overlying degraded ploughsoil [802]. This ploughsoil overlay redeposited natural clay [804], which overlay natural geology [803]. A single land drain was observed.

3.10.3 Discussion
No archaeological features were recorded within this trench.

3.10.4 Context List
[801] Dark grey brown sandy silt - **topsoil**, up to 0.29 m thick.
[802] Mid grey-brown sandy silt - **degraded plough-soil**, present at up to 0.33 m thickness.
[803] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.
[804] Mid grey-brown silty clay - **redeposited subsoil**, present at up to 0.58 m thickness.

3.11 Trench 9 *(Illus. 03; 22)*

3.11.1 Location and dimensions
Trench 9 measured 29 m long by 2.0 m wide and was orientated N-S. It was located in the central part of the site within the area of former playing fields south of the path.

3.11.2 Description
Trench 9 consisted of a sequence of topsoil [901] overlying degraded ploughsoil [902]. This ploughsoil overlay redeposited natural clay [904], which overlay natural geology [903]. A patch of modern disturbance with a distinct edge was given the number [905]. It proved to contain much modern material alongside possible 18th century, but more likely 19th century transfer-printed pottery.

Two ceramic land drains were present in the trench.

3.11.3 Discussion
No archaeological features were recorded within this trench besides the aforementioned [905]. [905] contained much modern material alongside the residual transfer-printed pottery and probably postdates the farm.

3.11.4 Context List
[901] Dark grey brown sandy silt - **topsoil**, up to 0.28 m thick.
[902] Mid grey-brown sandy silt - **degraded plough-soil**, present at up to 0.29 m thickness.

[903] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.
[904] Mid grey-brown silty clay - **redeposited subsoil**, present at up to 0.45 m thickness.
[905] Dark grey-brown silty clay - **modern deposit** probably associated with construction activities, not excavated to depth.

3.12 Trench 10 *(Illus. 03; 23)*

3.12.1 Location and dimensions
Trench 10 measured 29 m long by 2.0 m wide and was orientated E-W. It was located in the central part of the site within the area of former playing fields south of the path.

3.12.2 Description
Trench 10 consisted of a sequence of topsoil [1001] overlying degraded ploughsoil [1002]. This degraded ploughsoil overlay natural geology [1003]. It contained at least six land drains.

3.12.3 Discussion
No archaeological features were recorded within this trench.

3.12.4 Context List
[1001] Dark grey brown sandy silt - **topsoil**, up to 0.22 m thick.
[1002] Mid grey-brown sandy silt - **degraded plough-soil**, present at up to 0.27 m thickness.
[1003] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.

3.13 Trench 11 *(Illus. 03; 24)*

3.13.1 Location and dimensions
Trench 11 measured 30 m long by 2.0 m wide and was orientated N-S. It was located in the central part of the site within the area of former playing fields south of the path.

3.13.2 Description
Trench 11 consisted of a sequence of topsoil [1101] overlying degraded ploughsoil [1102]. This degraded ploughsoil overlay natural geology [1103]. It contained a single land drain.

3.13.3 Discussion
No archaeological features were recorded within this trench.

3.13.4 Context List
[1101] Dark grey brown sandy silt - **topsoil**, up to 0.21 m thick.
[1102] Mid grey-brown sandy silt - **degraded plough-soil**, present at up to 0.21 m thickness.
[1103] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.

3.14 Trench 12 *(Illus. 03; 25)*

3.14.1 Location and dimensions
Trench 12 measured 30 m long by 2.0 m wide and was orientated N-S. It was located in the central part of the site within the area of former playing fields south of the path.

3.14.2 Description
Trench 12 consisted of a sequence of topsoil [1201] overlying degraded ploughsoil [1202]. This degraded ploughsoil overlay natural geology [1203]. T12 contained three land drains and a water pipe trench.

3.14.3 Discussion
No archaeological features were recorded within this trench.

3.14.4 Context List
[1201] Dark grey brown sandy silt - **topsoil**, up to 0.25 m thick.
[1202] Mid grey-brown sandy silt - **degraded plough-soil**, present at up to 0.33 m thickness.
[1203] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.

3.15 Trench 13 *(Illus. 03; 26)*

3.15.1 Location and dimensions
Trench 13 measured 30 m long by 2.0 m wide and was orientated N-S. It was located in the central part of the site within the area of former playing fields south of the path.

3.15.2 Description
Trench 13 again consisted of a sequence of topsoil [1301] overlying degraded ploughsoil [1302]. This degraded ploughsoil overlay natural geology [1303]. A linear patch of modern disturbance, a land drain, and a water pipe (potentially the continuation of that in T12 - see 3.14.2) were present.

3.15.3 Discussion
No archaeological features were recorded within this trench.

3.15.4 Context List
[1301] Dark grey brown sandy silt - **topsoil**, up to 0.20 m thick.
[1302] Mid grey-brown sandy silt - **degraded plough-soil**, present at up to 0.31 m thickness.
[1303] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.

3.16 Trench 14 *(Illus. 03; 27)*

3.16.1 Location and dimensions
Trench 14 measured 30 m long by 2.0 m wide and was orientated E-W. It was located in the central part of the site within the area of former playing fields south of the path.

3.16.2 Description
Trench 14 consisted of a sequence of topsoil [1401] overlying degraded ploughsoil [1402]. This degraded ploughsoil overlay natural geology [1403]. T14 contained at least five land drains.

3.16.3 Discussion
No archaeological features were recorded within this trench.

3.16.4 Context List
[1401] Dark grey brown sandy silt - **topsoil**, up to 0.14 m thick.
[1402] Mid grey-brown sandy silt - **degraded plough-soil**, present at up to 0.23 m thickness.
[1403] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.

3.17 Trench 15 *(Illus. 03; 28)*

3.17.1 Location and dimensions
Trench 15 measured 27 m long by 2.0 m wide and was orientated broadly NW-SE. It was located in the southern part of the site within the area of former playing fields south of the path.

3.17.2 Description
Trench 15 consisted of a sequence of topsoil [1501] overlying degraded ploughsoil [1502]. This degraded ploughsoil overlay natural geology [1503]. Three land drains were present.

3.17.3 Discussion
No archaeological features were recorded within this trench.

3.17.4 Context List
[1501] Dark grey brown sandy silt - **topsoil**, up to 0.24 m thick.
[1502] Mid grey-brown sandy silt - **degraded plough-soil**, present at up to 0.40 m thickness.
[1503] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.

3.18 Trench 16 *(Illus. 03; 29)*

3.18.1 Location and dimensions
Trench 16 measured 30 m long by 2.0 m wide and was orientated NE-SW. It was located in the southern part of the site within the area of former playing fields south of the path.

3.18.2 Description
Trench 16 consisted of a sequence of topsoil [1601] overlying degraded ploughsoil [1602]. This degraded ploughsoil overlay natural geology [1603]. At least four modern land drains were evident.

3.18.3 Discussion
No archaeological features were recorded within this trench.

3.18.4 Context List
[1601] Dark grey brown sandy silt - **topsoil**, up to 0.21 m thick.
[1602] Mid grey-brown sandy silt - **degraded plough-soil**, present at up to 0.21 m thickness.
[1603] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.

3.19 Trench 17 *(Illus. 03; 30*

3.19.1 Location and dimensions
Trench 17 measured 27 m long by 2.0 m wide and was orientated E-W. It was located in the southern part of the site area, within the former playing field south of the path.

3.19.2 Description
Trench 17 consisted of a sequence of topsoil [1701] overlying degraded ploughsoil [1702]. This degraded ploughsoil overlay natural geology [1703]. Two land drains and two modern pipe runs were present in the trench.

3.19.3 Discussion
No archaeological features were recorded within this trench.

3.19.4 Context List
[1701] Dark grey brown sandy silt - **topsoil**, up to 0.23 m thick.
[1702] Mid grey-brown sandy silt - **degraded plough-soil**, present at up to 0.22 m thickness.
[1703] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.

3.20 Trench 18 *(Illus. 03; 31)*

3.20.1 Location and dimensions
Trench 18 measured 30 m long by 2.0 m wide and was orientated E-W. It was located in the southern part of the site area, within the former playing field south of the path.

3.20.2 Description
Trench 18 consisted of a sequence of topsoil [1801] direction overlying natural geology [1803]. Four field drains were present.

3.20.3 Discussion
No archaeological features were recorded within this very shallow trench.

3.20.4 Context List
[1801] Dark grey brown sandy silt - **topsoil**, up to 0.34 m thick.
[1803] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.

3.21 Trench 19 *(Illus. 03; 32)*

3.21.1 Location and dimensions
Trench 19 measured 27 m long by 2.0 m wide and was orientated N-S. It was located in the southern part of the site area, within the former playing field south of the path.

3.21.2 Description
Trench 19 consisted simply of a shallow topsoil [1901] overlaying natural geology [1903]. No buried or degraded ploughsoil was able to be discerned in the shallow trench. T20 also contained two land drains.

3.21.3 Discussion
No archaeological features were recorded within this trench.

3.21.4 Context List
[1901] Dark grey brown sandy silt - **topsoil**, up to 0.23 m thick.
[1903] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.

3.22 Trench 20 *(Illus. 03; 33)*

3.22.1 Location and dimensions
Trench 20 measured 27 m long by 2.0 m wide and was orientated N-S. It was located in the southern part of the site area, within the former playing field south of the path.

3.22.2 Description
Trench 20 consisted of a shallow topsoil [2001] overlying natural geology [2003]. T20 contained eleven land drains on four separate alignments.

3.22.3 Discussion
No archaeological features were recorded within this trench.

3.22.4 Context List
[2001] Dark grey brown sandy silt - **topsoil**, up to 0.17 m thick.
[2003] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.

3.23 Trench 21 *(Illus. 03; 34)*

3.23.1 Location and dimensions
Trench 21 measured 30 m long by 2.0 m wide and was orientated broadly NE-SW. It was located in the southern part of the site area, within the former playing field south of the path.

3.23.2 Description
Trench 21, as with trenches 19 and 20, consisted simply of a shallow topsoil [2101] overlying natural geology [2103]. Trench 21 also featured a patch of modern disturbance in the form of a 3.0 m long deposit of 'dolomite' aggregate of unknown depth. A single land drain was present.

3.23.3 Discussion
No archaeological features were recorded within this trench.

3.23.4 Context List
[2101] Dark grey brown sandy silt - **topsoil**, up to 0.22 m thick.
[2103] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.

3.24 Trench 22 *(Illus. 03; 35)*

3.24.1 Location and dimensions
Trench 22 measured 30 m long by 2.0 m wide and was orientated N-S. It was located in the southern part of the site area, within the former playing field south of the path.

3.24.2 Description
Trench 22 consisted of a sequence of topsoil [2201] overlying degraded ploughsoil [2202]. This degraded ploughsoil overlay natural geology [2203]. T22 contained at least three land drains.

3.24.3 Discussion
No archaeological features were recorded within this trench.

3.24.4 Context List
[2201] Dark grey brown sandy silt - **topsoil**, up to 0.14 m thick.
[2202] Mid grey-brown sandy silt - **degraded plough-soil**, present at up to 0.28 m thickness.
[2203] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.

3.25 Trench 23 *(Illus. 03; 36)*

3.25.1 Location and dimensions
Trench 23 measured 30 m long by 2.0 m wide and was orientated E-W. It was located in the southern part of the site, within the area of former playing field south of the path.

3.25.2 Description

Trench 23, again consisted of a shallow topsoil [2301] overlying natural geology [2303]. A patch of modern disturbance contained sterile builders' sand, while a single land drain was present.

3.25.3 Discussion

No archaeological features were recorded within this trench.

3.25.4 Context List

[2301] Dark grey brown sandy silt - **topsoil**, up to 0.27 m thick.
[2303] Mid grey-yellow-brown silty clay - **boulder-clay sub-soil**.

4. DISCUSSION

4.1 Geophysical survey followed by the excavation of 23 evaluation trenches in the grounds of Belmont Primary and Belmont Community School, County Durham resulted in the detection of no significant archaeological remains. The only features encountered in the trenches were modern in nature. These features were limited to patches of modern disturbance associated with landscaping, construction or services, and drainage runs usually containing ceramic terracotta pipes and interpreted as agricultural field drains. These field drains were present throughout the site.

4.2 Deposit models from the evaluation trenches generally showed a topsoil either directly overlying natural or overlying a buried ploughsoil. In the north end of the site, a layer of redeposited natural up to 1.25 m thick, with occasional pieces of 20th century material, was present overlying the natural subsoil (all contexts ending in -003), suggesting that substantial landscaping had occurred in the modern era. This landscaping was likely to have been related to construction of the school and the levelling of the school field. These landscaping activities are likely to have truncated a substantial amount of the natural horizons where archaeological features may have been expected to survive.

4.3 In the southern area of the site, the majority of trenches were quite shallow by comparison. Whether truncation occurred in these areas is unclear, but it seems very likely that the ground surface was planed flat before or during the creation of the playing fields. The sheer amount of land drains coursing through all areas of the site, as well as the farm known from historic mapping, would suggest that the area of the school fields consisted of farmland for much of the 19th and 20th centuries. What impact mechanised ploughing might have had on the archaeological resource before the construction of the school here is unclear.

5. CONCLUSIONS AND RECOMMENDATIONS

6.1 The following conclusions and recommendations take into account the findings of both archaeological geophysical survey and intrusive evaluation works.

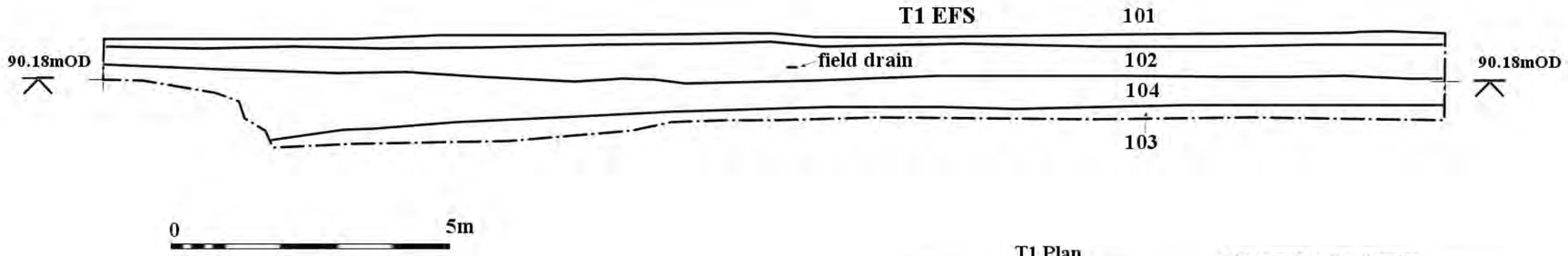
6.2 Conclusions

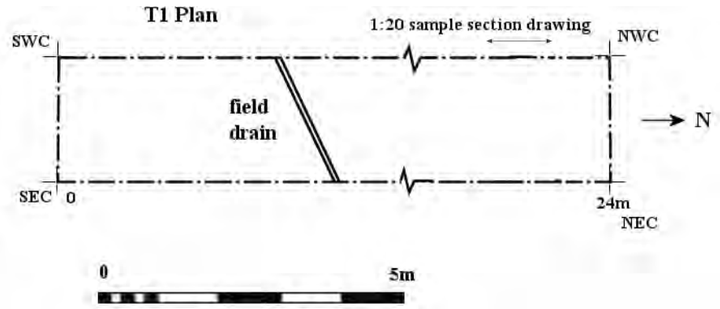
The 23 trenches excavated on the playing fields of the Belmont campus in the outskirts of the city of Durham resulted in the detection of no significant archaeological remains. Parts of the site had been impacted by previous phases of development which appear to have truncated original ground sources below levels expected to contain any residual archaeological features.

Some potential for the survival of archaeological remains exists in hitherto uninvestigated parts of the site, however, notably adjacent to the former Ravensflatt Farm, the origins of which may be 18th century or earlier, in the south-west quadrant of the site.

6.3 Recommendations

Given the apparent absence of archaeological remains across the parts of the site investigated and likely truncation of original ground surfaces, no further archaeological evaluation work is proposed there prior to the determination of planning consent, nor in the form of mitigation works following determination of planning consents.

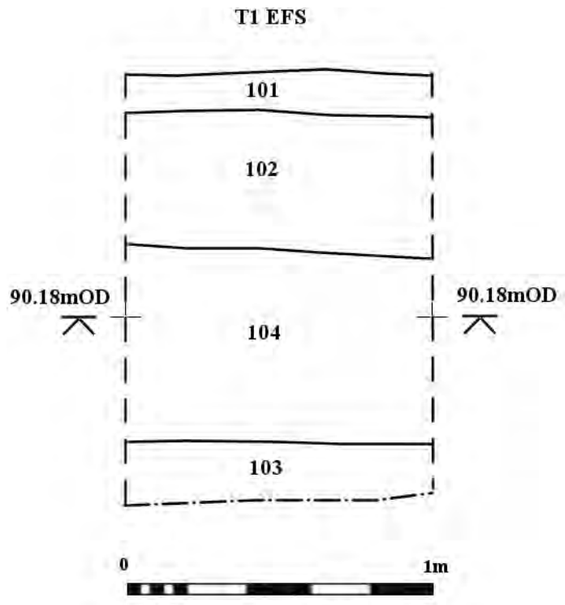




(Above) E facing trench section, 1:100.
(Right) Condensed plan of T1, 1:100.

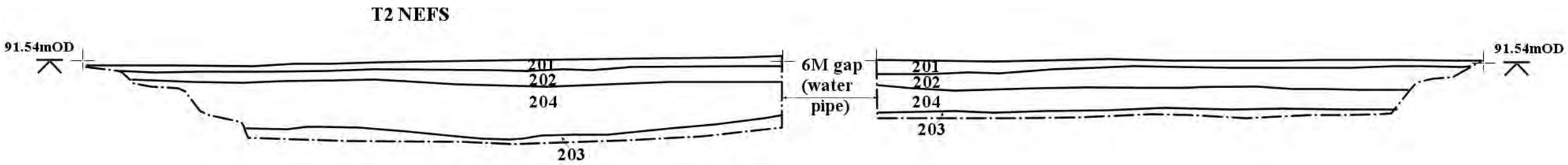
Overview shot of T1, looking N.

W view of E facing sample section.

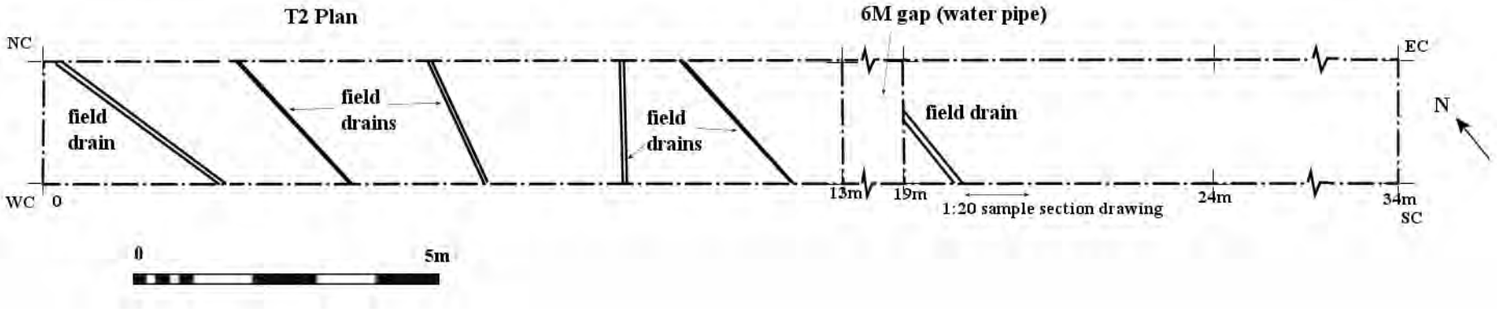


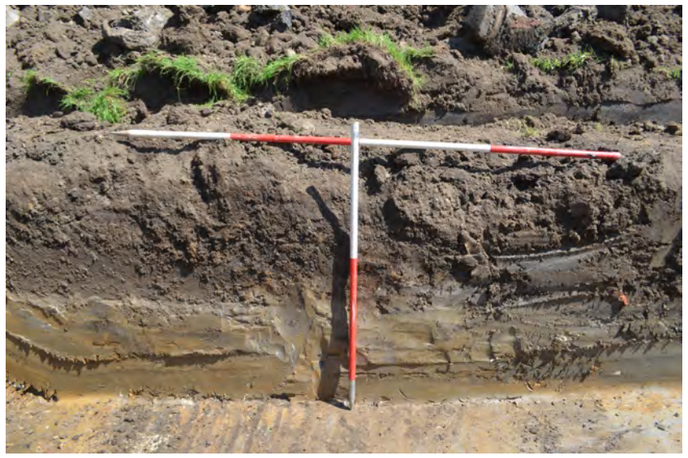
E facing sample section, 1:20.

Illus. 14: *Trench 1; Plan, section, sample section and selected photos.*

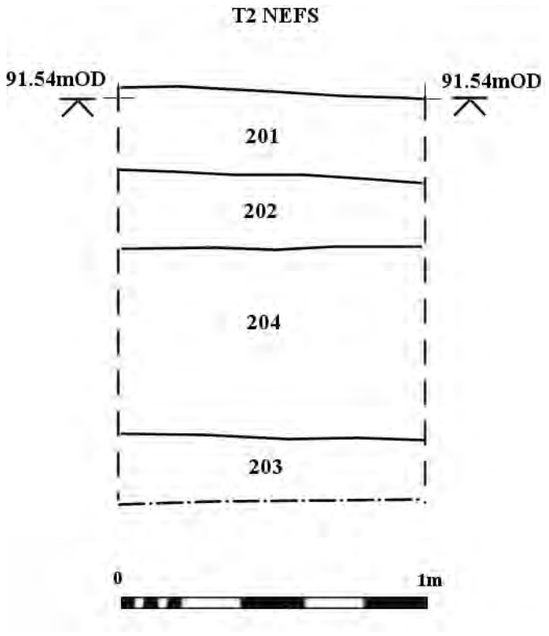


(Above) NE facing trench section, 1:100.
(Below) Condensed plan of T2, 1:100.





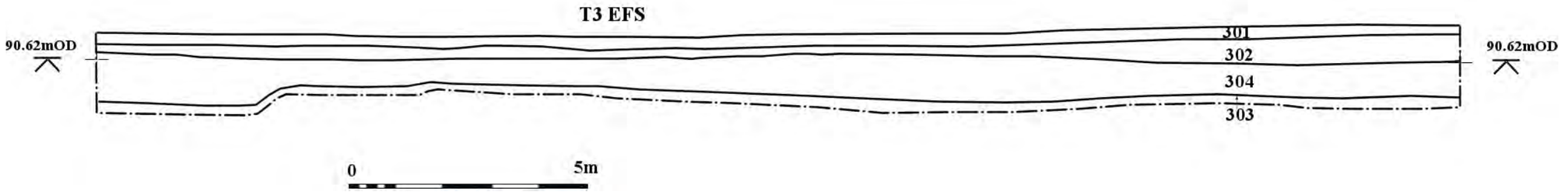
SW view of NE facing sample section.



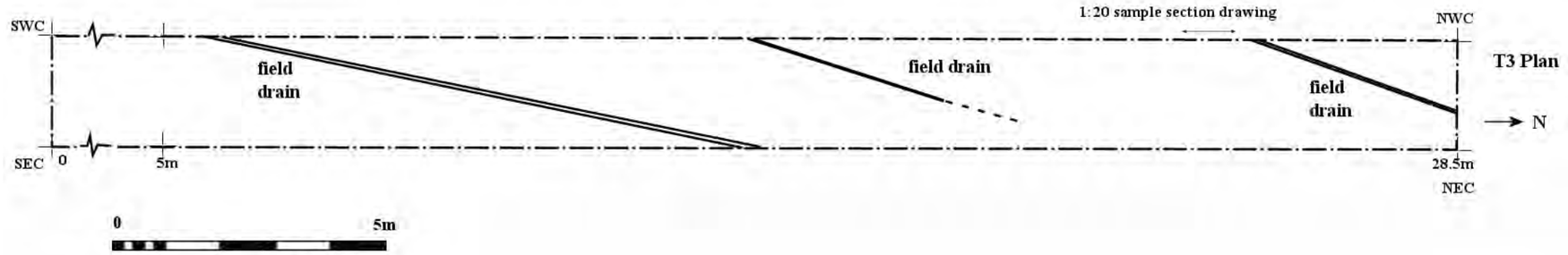
NE facing sample section, 1:20.

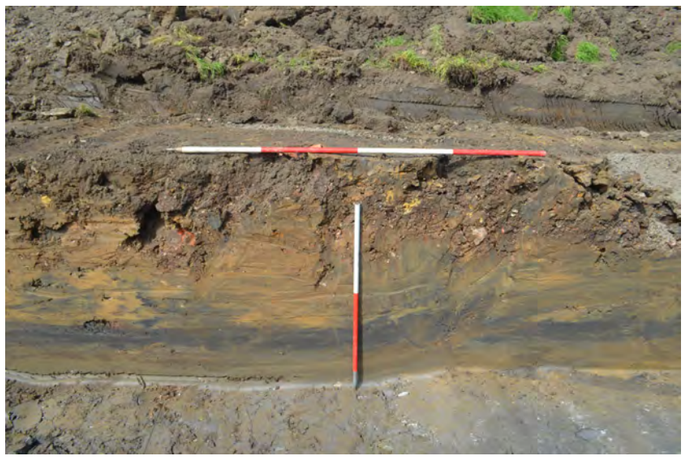
Overview shot of the N half of T2, looking NW.

Illus. 15: *Trench 2; Plan, section, sample section and selected photos.*

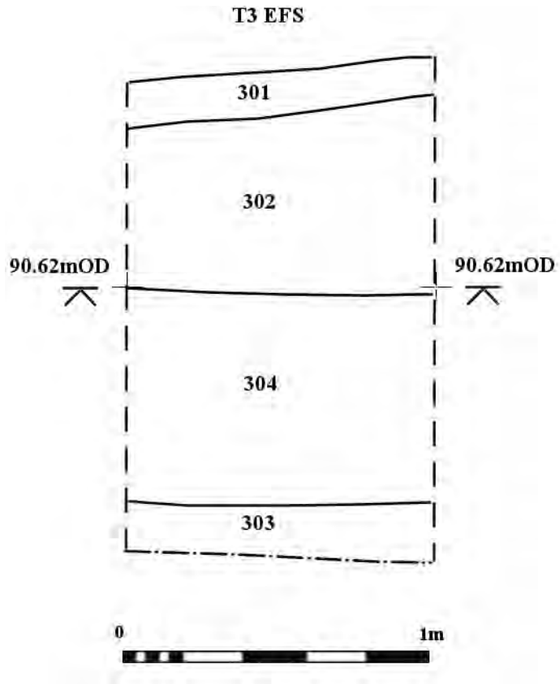


(Above) E facing trench section, 1:100.
(Below) Condensed plan of T3, 1:100.





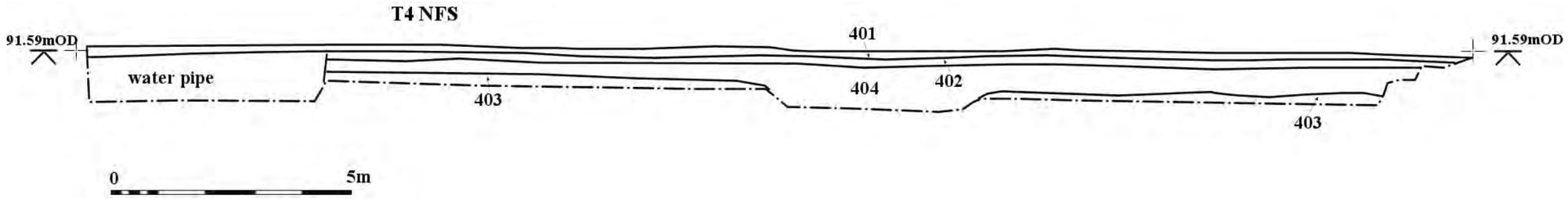
W view of E facing sample section.



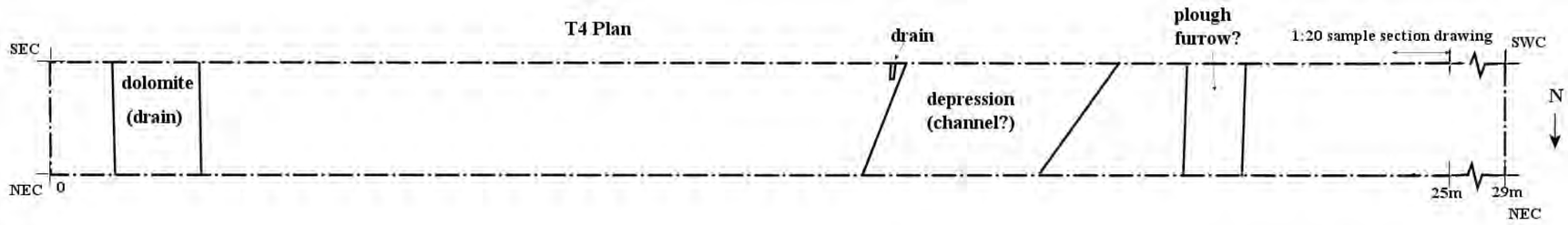
E facing sample section, 1:20.

Overview shot of T3, looking N.

Illus. 16: *Trench 3; Plan, section, sample section and selected photos.*



(Above) N facing trench section, 1:100.
(Below) Condensed plan of T4, 1:100.

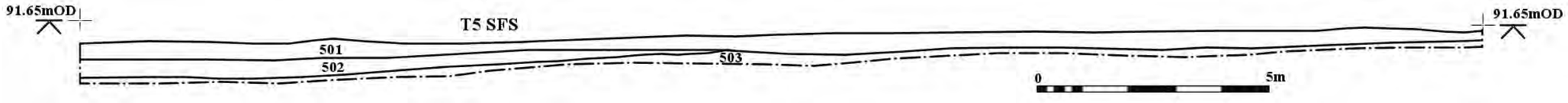


S view of N facing sample section.

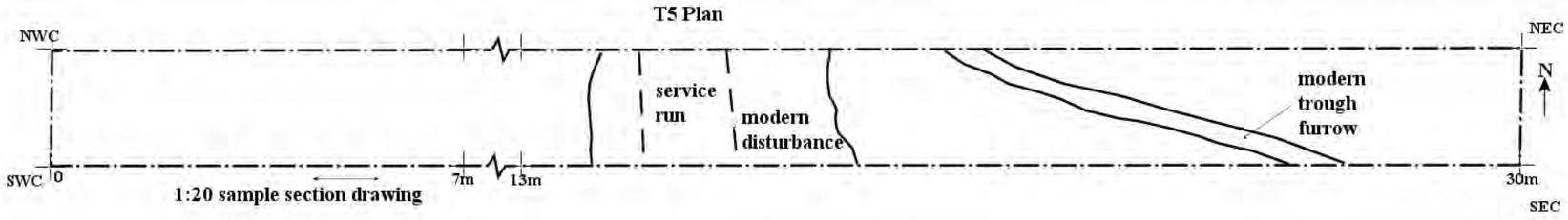
N facing sample section, 1:20.

Overview shot of T4, looking W.

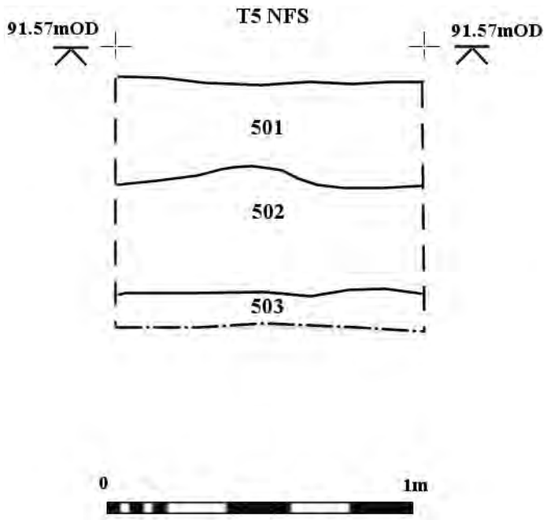
Illus. 17: *Trench 4; Plan, section, sample section and selected photos.*



(Above) S facing trench section, 1:100.
(Below) Condensed plan of T5, 1:100.



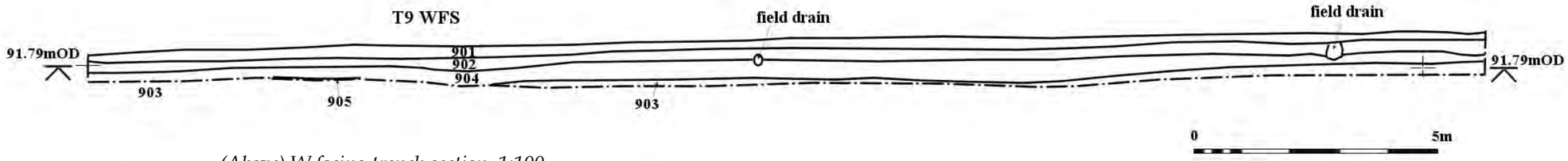
S view of N facing sample section.



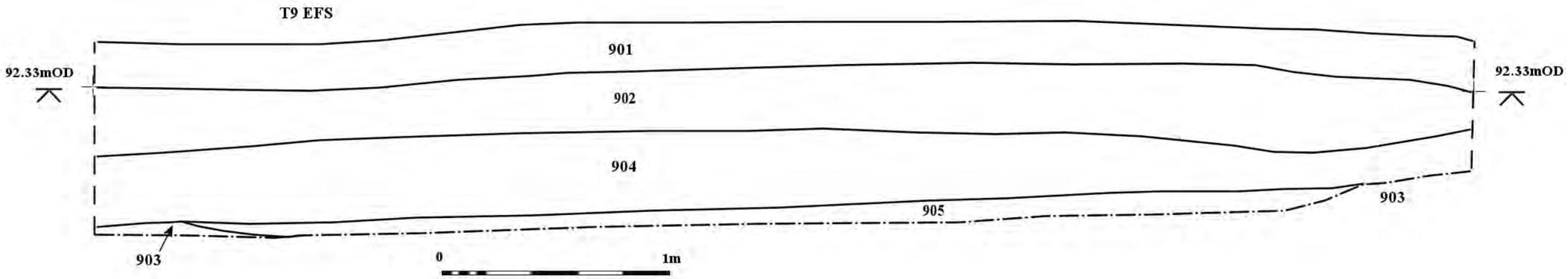
N facing sample section, 1:20.

Overview shot of T5, looking W.

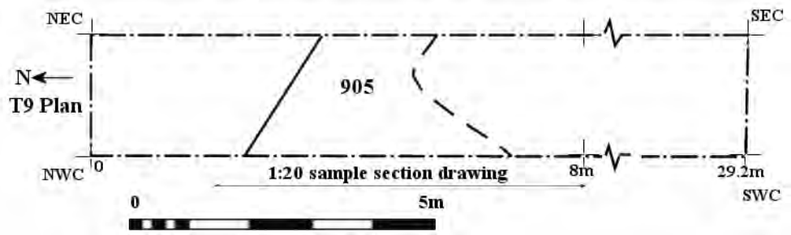
Illus. 18: *Trench 5; Plan, section, sample section and selected photos.*



(Above) W facing trench section, 1:100.
(Below) E facing sample section, 1:20.



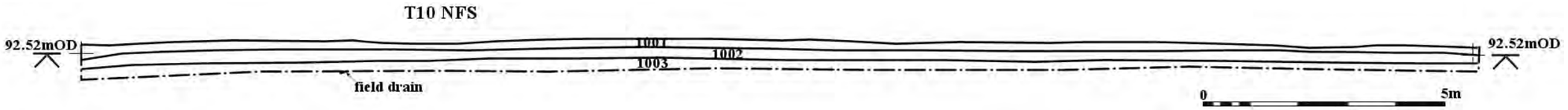
W view of E facing sample section, showing [905].



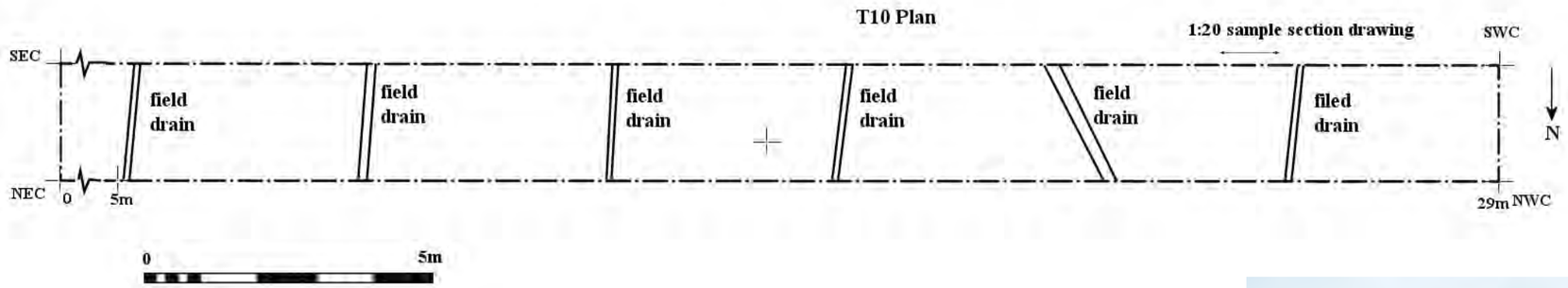
Condensed plan of T9

Overview shot of T9, looking S.

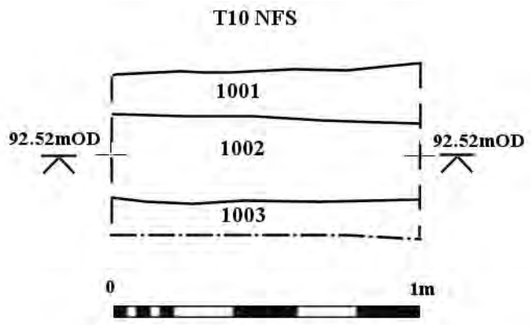
Illus. 22: *Trench 9; Plan, section, sample section and selected photos.*



(Above) N facing trench section, 1:100.
(Below) Condensed plan of T10, 1:100.



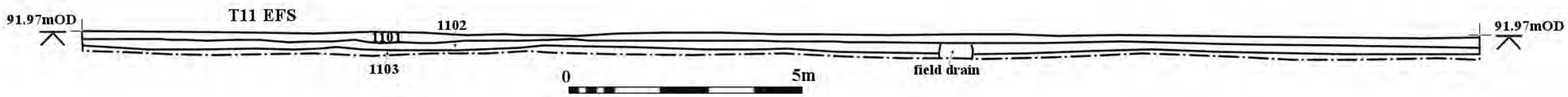
S view of N facing sample section.



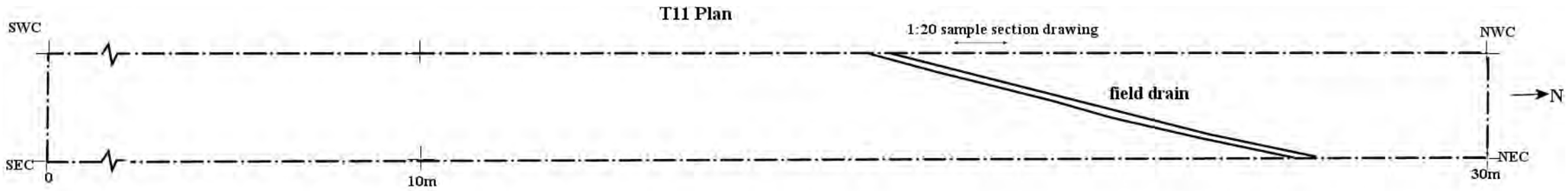
N facing sample section, 1:20.

Overview shot of T10, looking E.

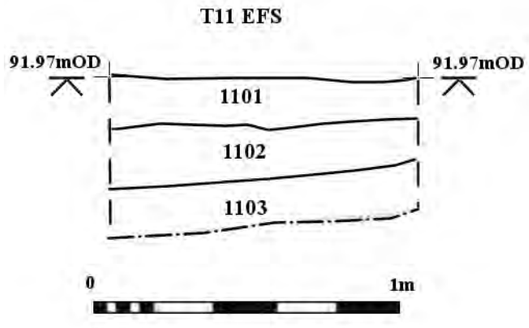
Illus. 23: *Trench 10; Plan, section, sample section and selected photos.*



(Above) E facing trench section, 1:100.
(Below) Condensed plan of T11, 1:100.



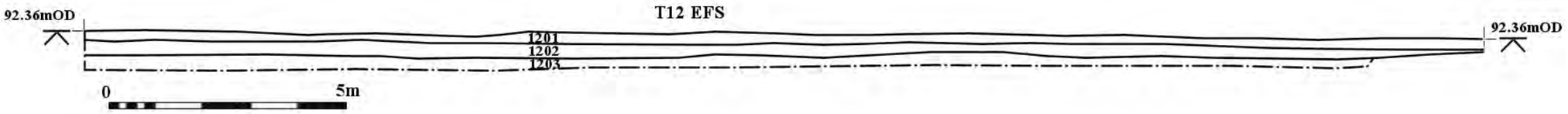
W view of E facing sample section.



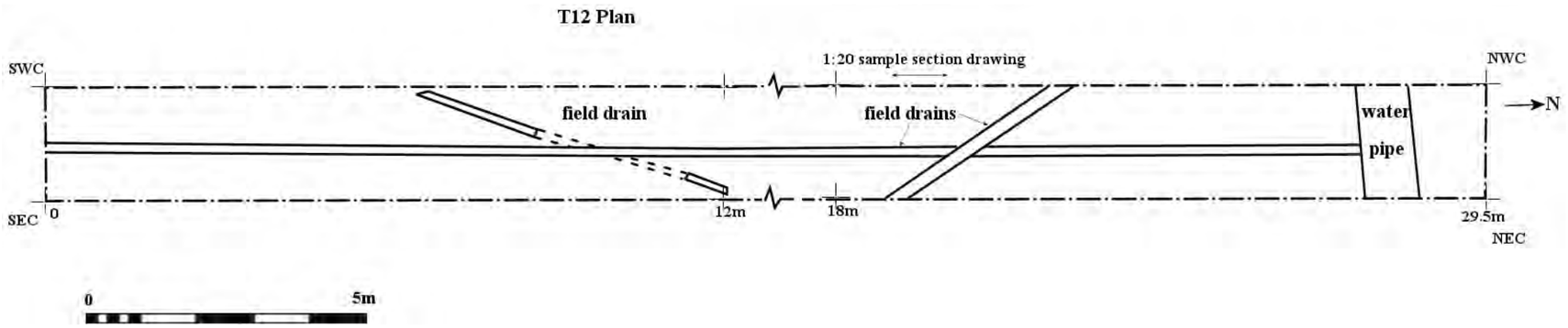
E facing sample section, 1:20.

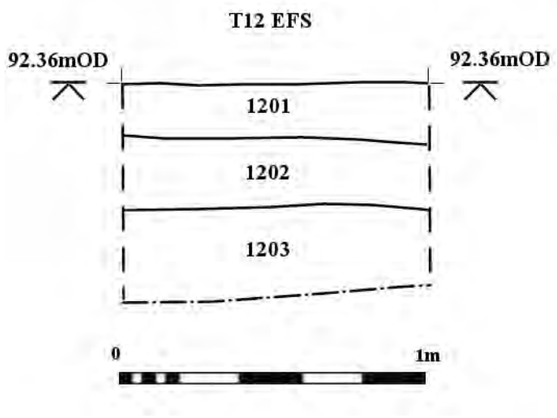
Overview shot of T11, looking N.

Illus. 24: *Trench 11; Plan, section, sample section and selected photos.*



(Above) E facing trench section, 1:100.
(Below) Condensed plan of T12, 1:100.



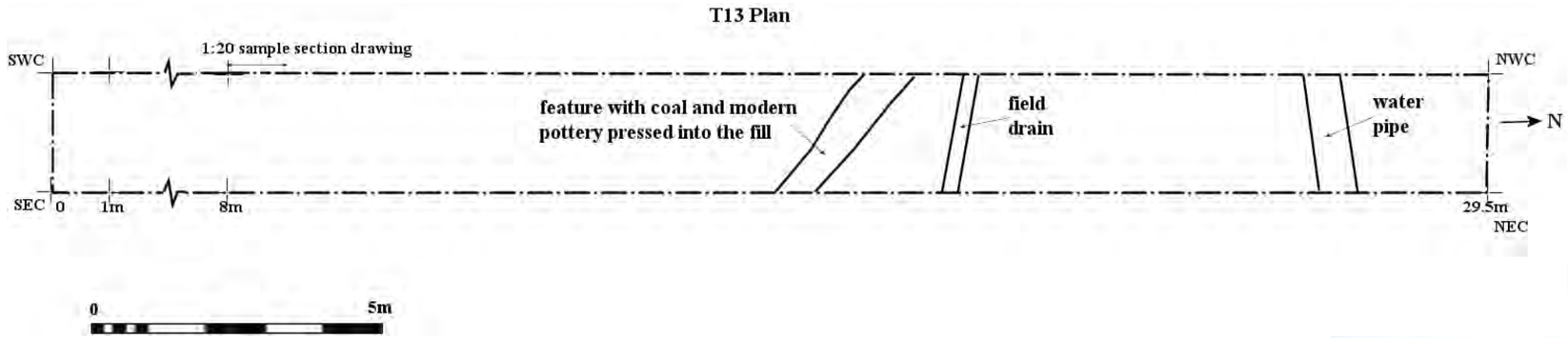


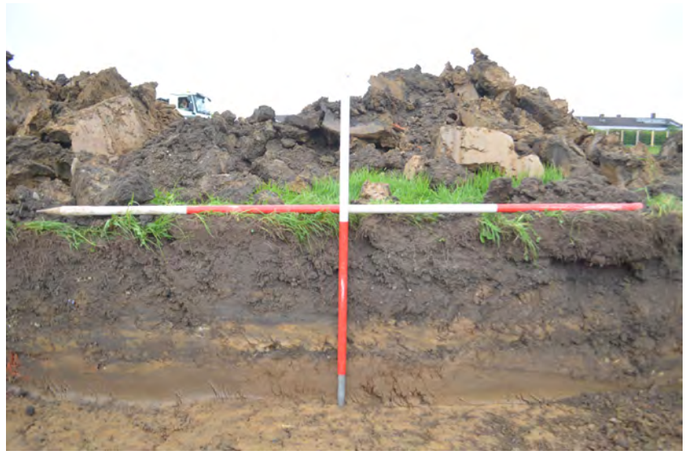
E facing sample section, 1:20.

Overview shot of T12, looking N.

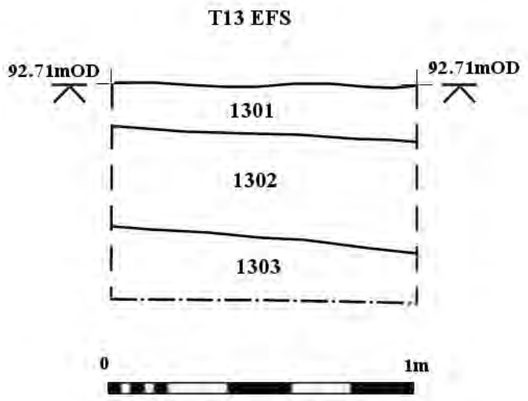
Illus. 25: *Trench 12; Plan, section, sample section and selected photos.*

(Above) E facing trench section, 1:100.
(Below) Condensed plan of T13, 1:100.





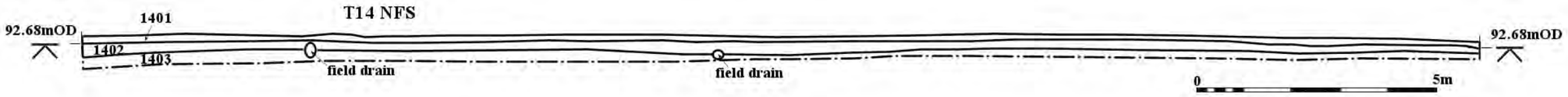
W view of E facing sample section.



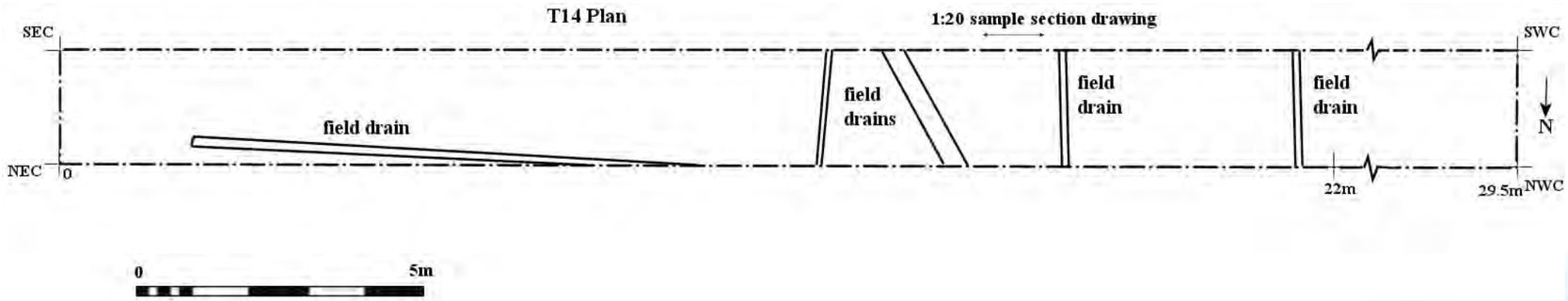
E facing sample section, 1:20.

Overview shot of T13, looking N.

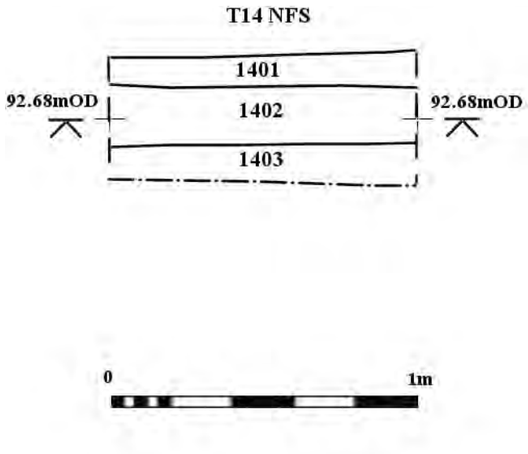
Illus. 26: *Trench 13; Plan, section, sample section and selected photos.*



(Above) N facing trench section, 1:100.
(Below) Condensed plan of T14, 1:100.



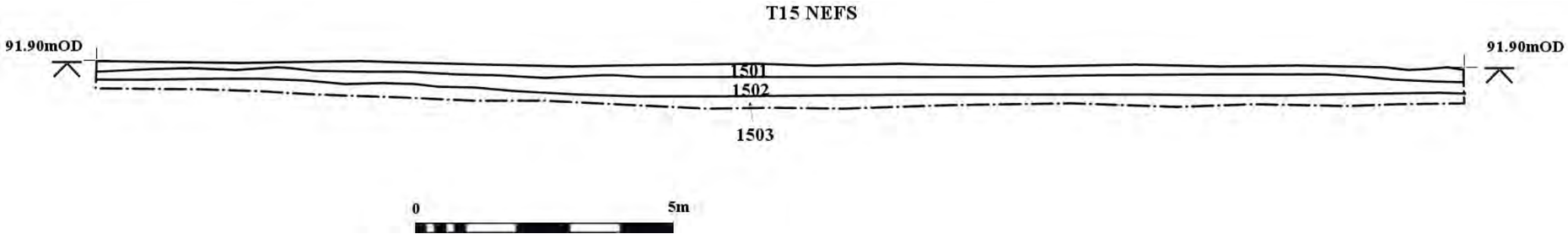
N view of S facing section.



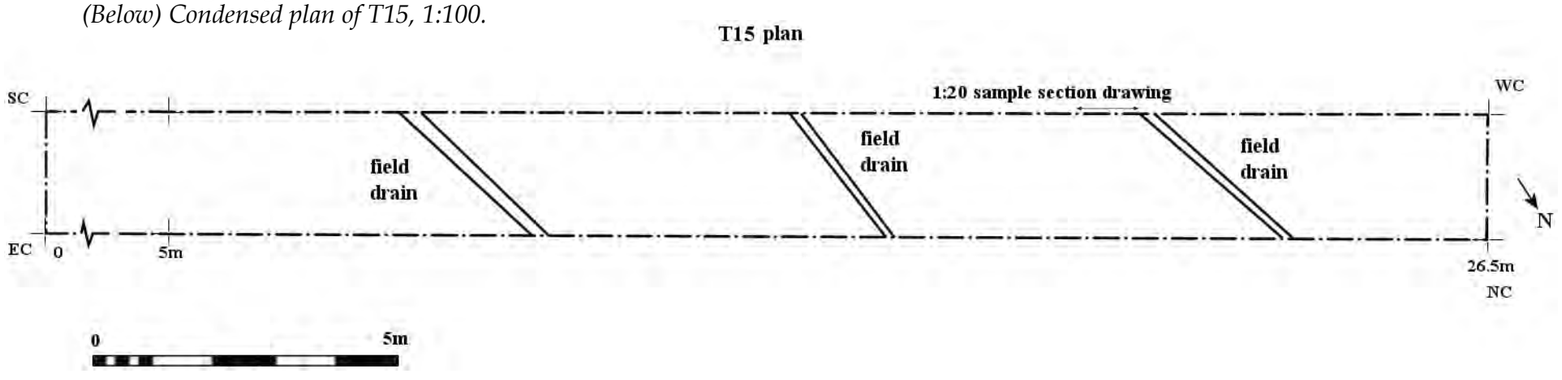
N facing sample section, 1:20.

Overview shot of T14, looking E.

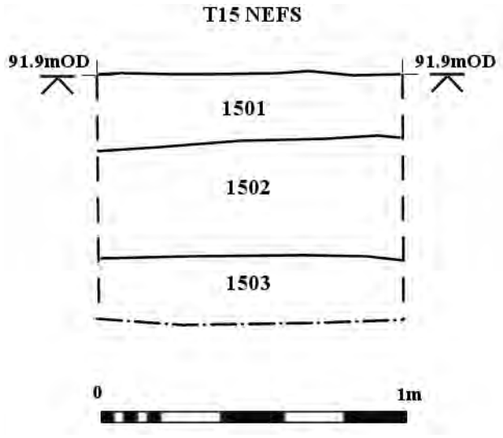
Illus. 27: *Trench 14; Plan, section, sample section and selected photos.*



(Above) NE facing trench section, 1:100.
(Below) Condensed plan of T15, 1:100.



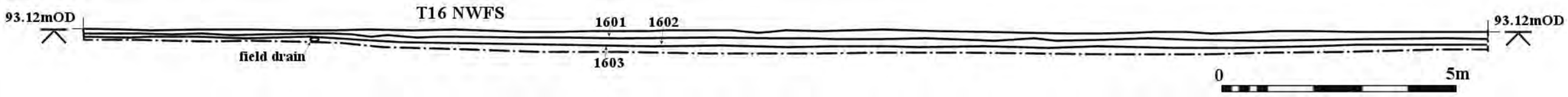
N view of S facing section.



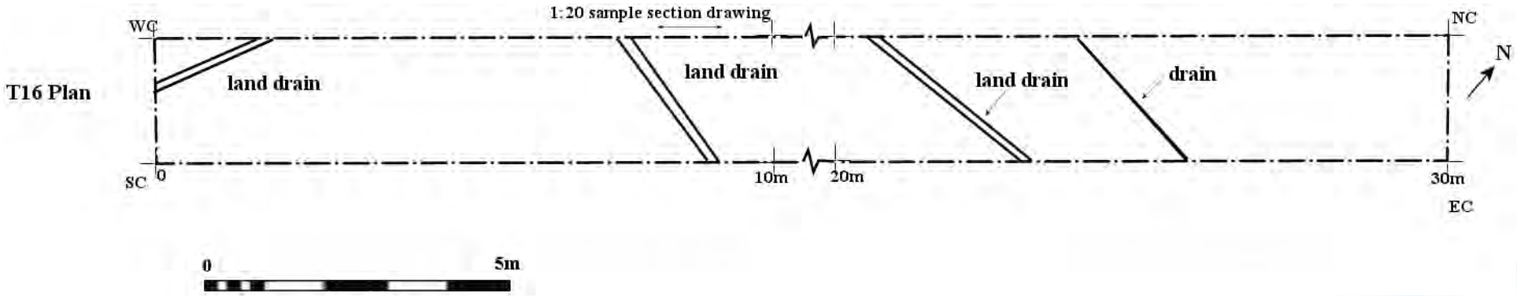
NE facing sample section, 1:20.

Overview shot of T15, looking SE.

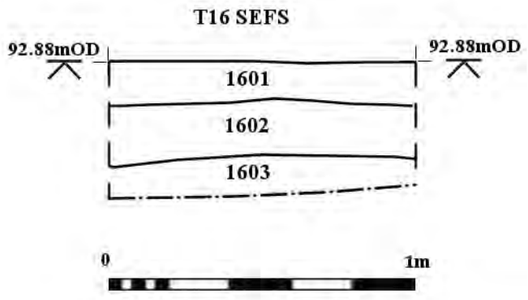
Illus. 28: *Trench 15; Plan, section, sample section and selected photos.*



(Above) NW facing trench section, 1:100.
(Below) Condensed plan of T16, 1:100.



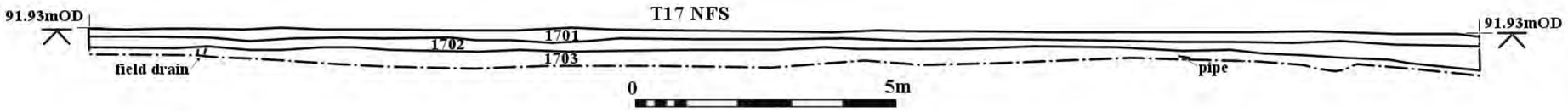
NW view of SE facing section.

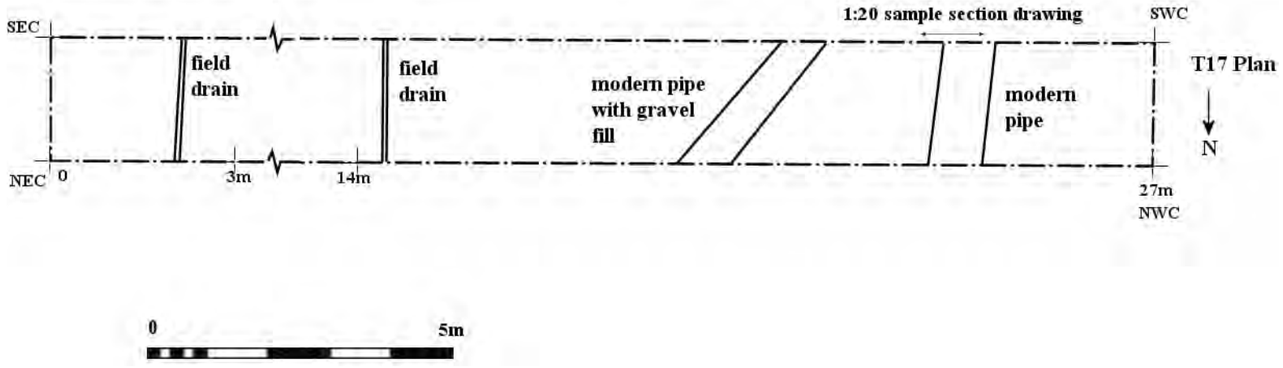


SE facing sample section, 1:20.

Overview shot of T16, looking SW.

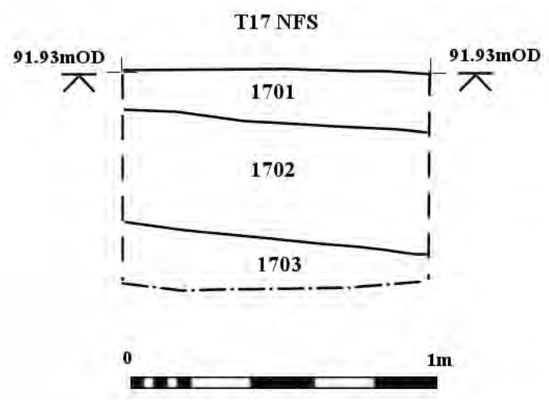
Illus. 29: *Trench 16; Plan, section, sample section and selected photos.*





(Above) N facing trench section, 1:100.
(Right) Condensed plan of T17, 1:100.

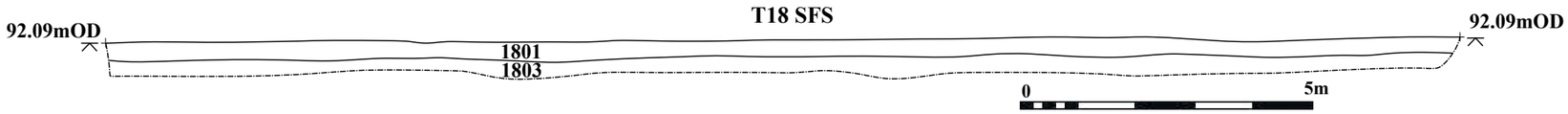
S view of N facing section.



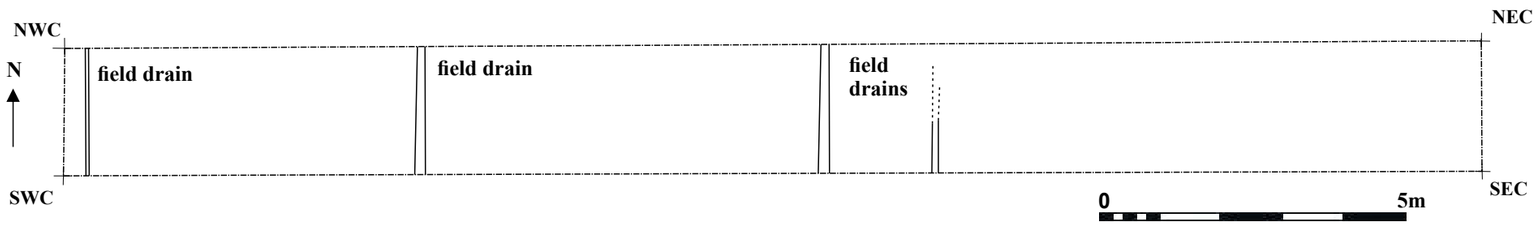
N facing sample section, 1:20.

Overview shot of T17, looking W.

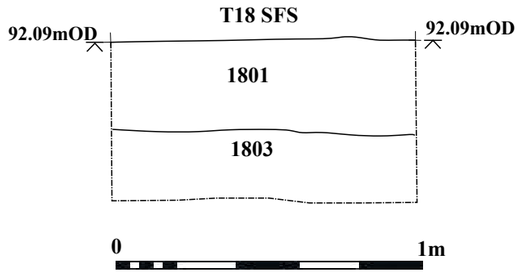
Illus. 30: *Trench 17; Plan, section, sample section and selected photos.*



(Above) S facing trench section, 1:100.
(Below) Condensed plan of T18, 1:100.



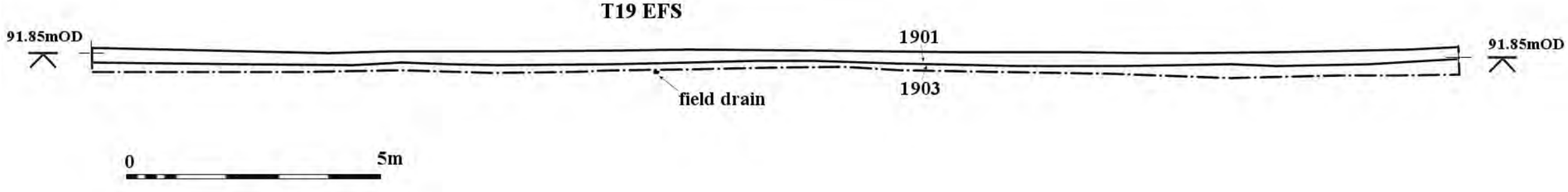
N view of S facing sample section.



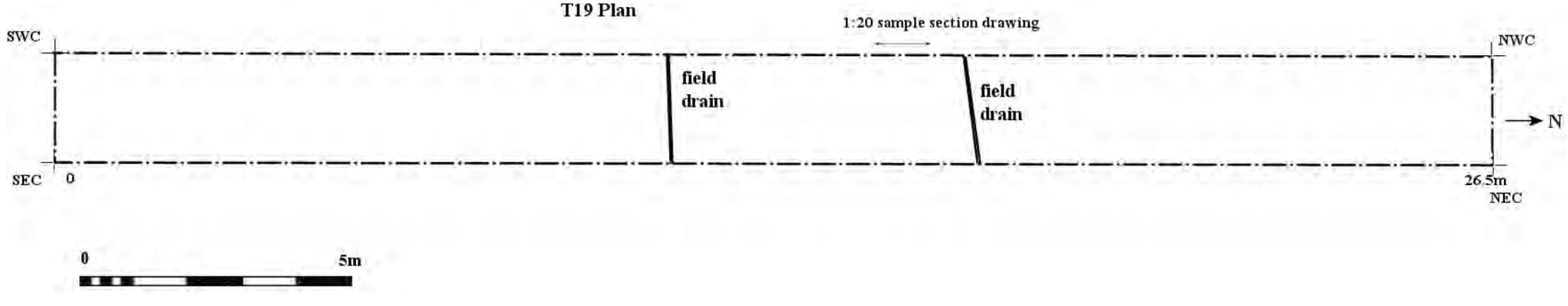
S facing sample section, 1:20.

Overview shot of T18, looking W.

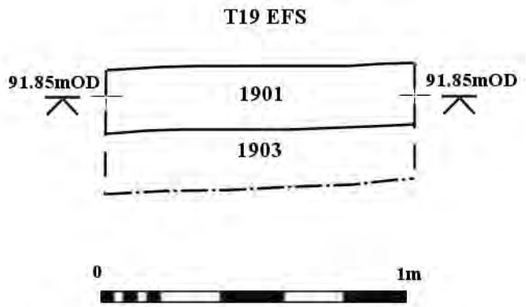
Illus. 31: *Trench 18; Plan, section, sample section and selected photos.*



(Above) E facing trench section, 1:100.
(Below) Condensed plan of T19, 1:100.



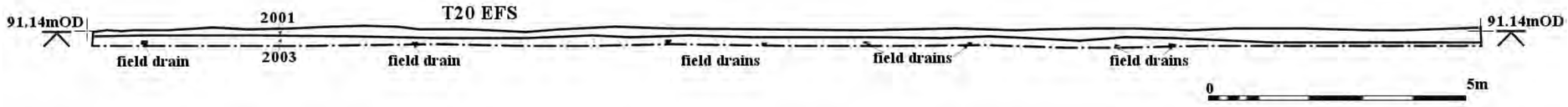
W view of E facing sample section.



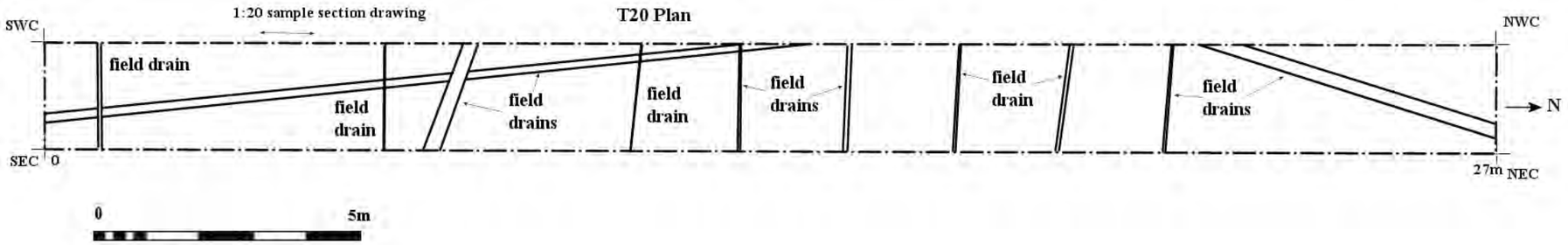
E facing sample section, 1:20.

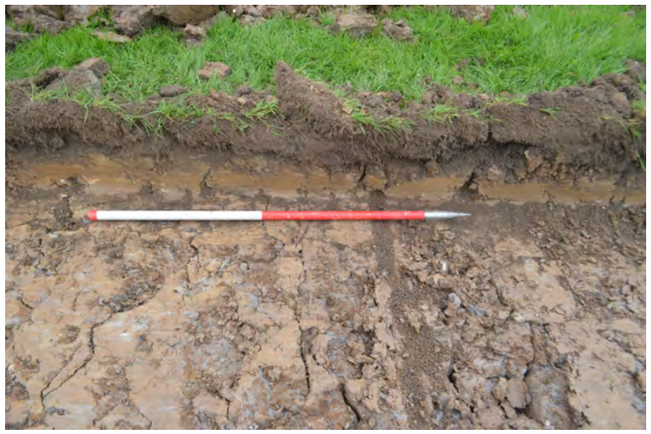
Overview shot of T19, looking N.

Illus. 32: *Trench 19; Plan, section, sample section and selected photos.*

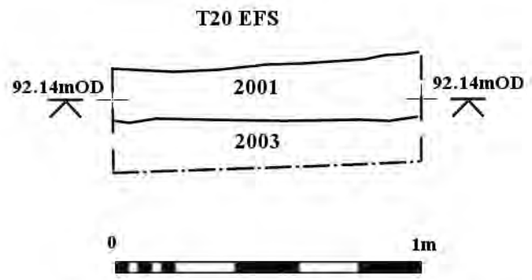


(Above) E facing trench section, 1:100.
(Below) Condensed plan of T20, 1:100.





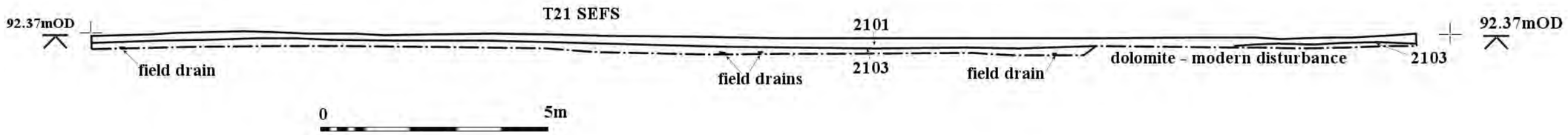
W view of E facing sample section.



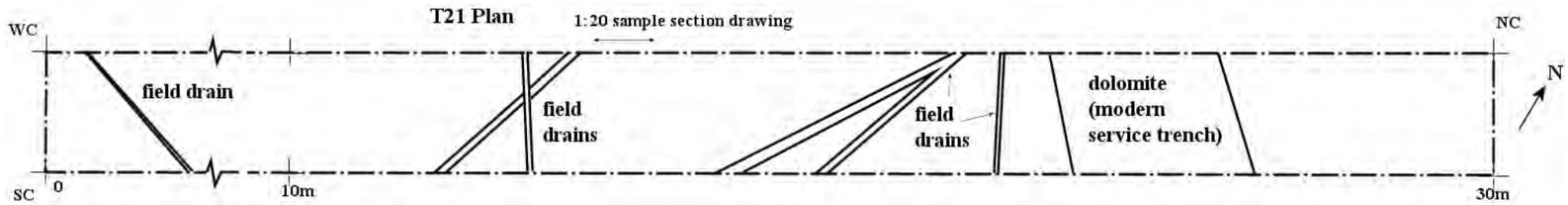
E facing sample section, 1:20.

Overview shot of T20, looking S.

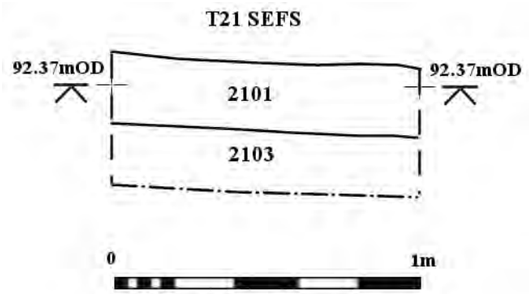
Illus. 33: *Trench 20; Plan, section, sample section and selected photos.*



(Above) SE facing trench section, 1:100.
(Below) Condensed plan of T21, 1:100.



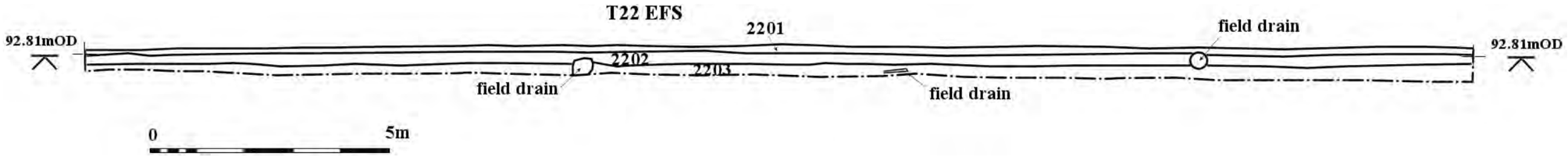
NW view of SE facing sample section.



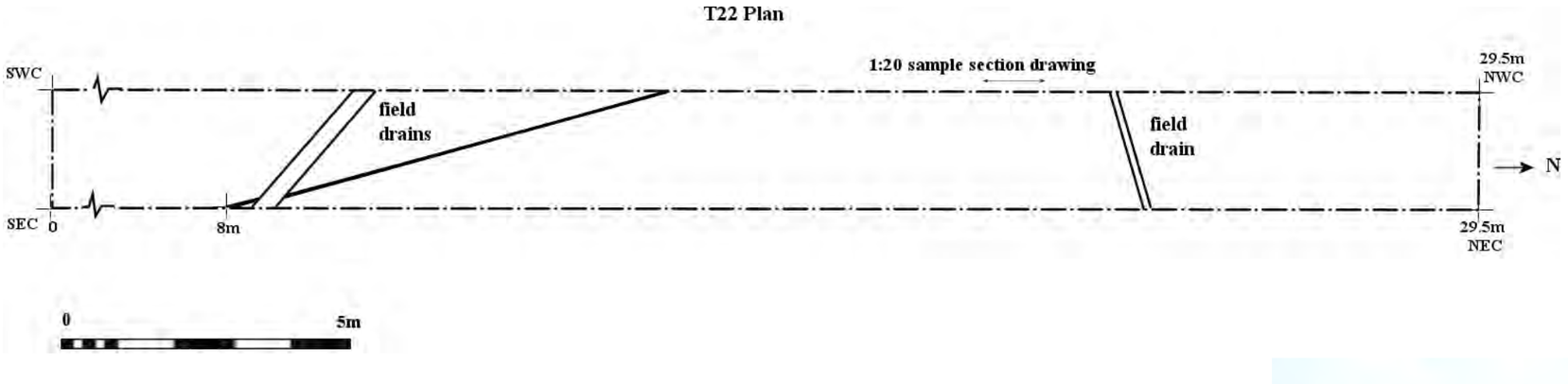
SE facing sample section, 1:20.

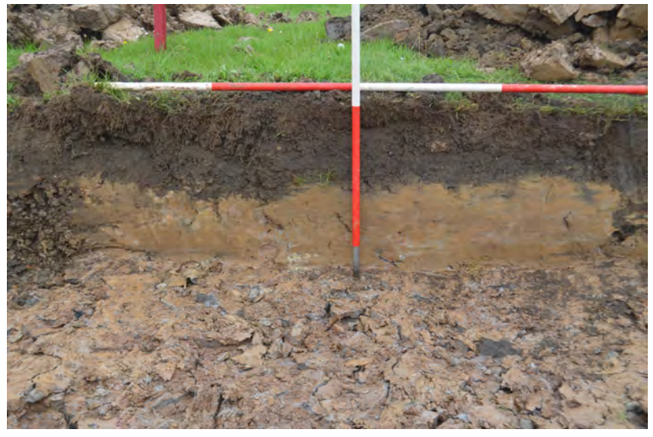
Overview shot of T21, looking SW.

Illus. 34: *Trench 21; Plan, section, sample section and selected photos.*

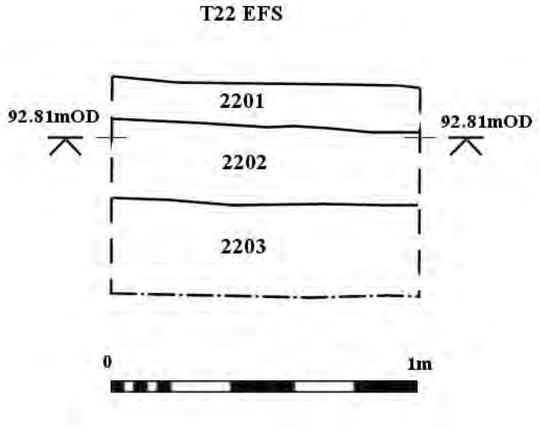


(Above) E facing trench section, 1:100.
(Below) Condensed plan of T22, 1:100.





W view of E facing sample section.

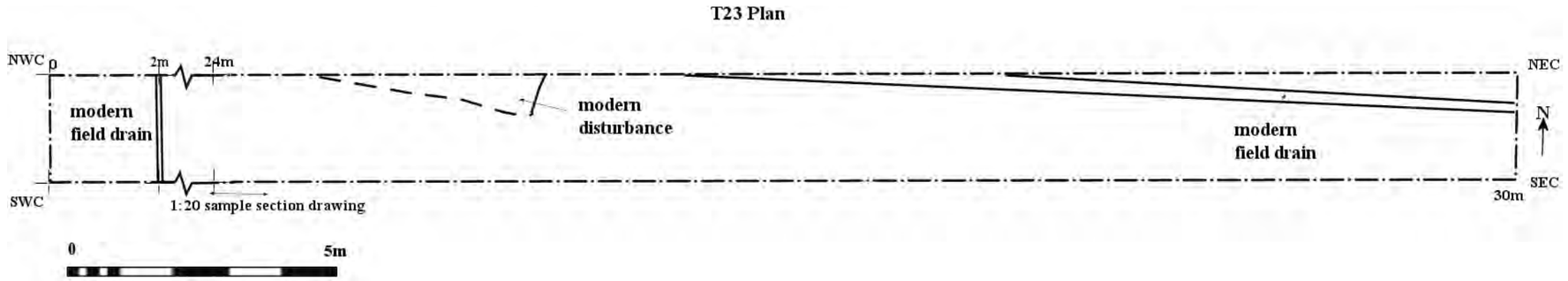


E facing sample section, 1:20.

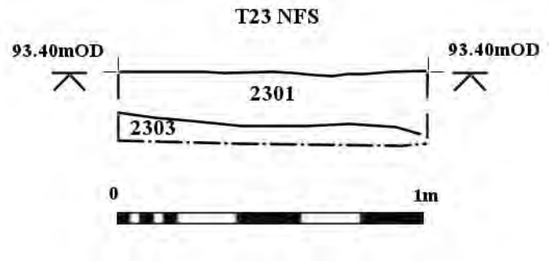
Overview shot of T22, looking N.

Illus. 35: *Trench 22; Plan, section, sample section and selected photos.*

(Above) N facing trench section, 1:100.
(Below) Condensed plan of T23, 1:100.



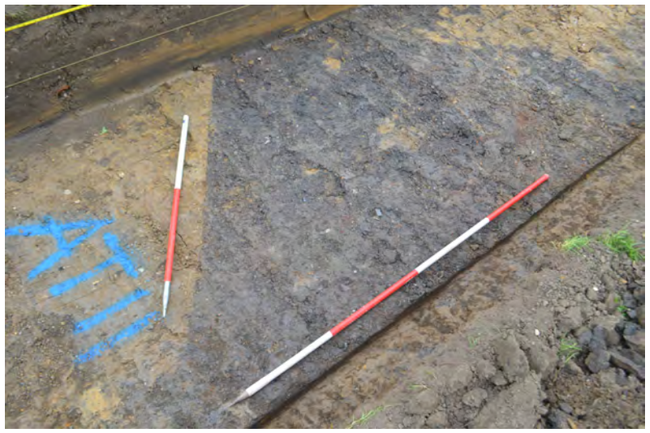
S view of N facing sample section.



N facing sample section, 1:20.

Overview shot of T23, looking W.

Illus. 36: *Trench 23; Plan, section, sample section and selected photos.*



SE view, oblique of modern feature [905] in T9.

Broadly NE view of a land drain in T11.

Working shot of the excavation of T3.

NW overview of the southern portion of T1.

S view of land drain in T12.

Working shot showing the excavation of T22.

Illus. 37: *Selected photos and working shots.*

APPENDIX 01: Belmont School, County Durham - Written Scheme of Investigation for an Archaeological Evaluation Excavation, Prepared for Conor O'Keeffe, Senior Project Manager, Kier Construction | North & Scotland. The Archaeological Practice Ltd., February 2023, Revised and updated May 2023.

1. INTRODUCTION AND RESEARCH BACKGROUND

1.1 Introduction

This document is provided as a written scheme of investigation, or project design, for a programme of archaeological work on the site of Belmont School east of Durham, County Durham (*Illus. 01 & 02*), in order to evaluate the impacts of groundworks associated with proposed extensions to the existing school buildings and landscaping of playing fields.

The research objectives of the work are to objectively investigate the site for any empirical evidence of remains likely to be considered archaeologically significant. Potentially significant in this regard are the presence adjacent to the site of the buried remains of an historic farm complex, the origins of which are unknown. Discovery of archaeological remains on the site will allow a period-focused strategy to be developed as part of mitigation works which have already been conditioned.

1.2 Historical and Documentary Background

Information has been sourced from sources including the Historic England, DCC Heritage Environment Record (see *Appendix 1*), published sources and historic map evidence information. Whilst there is likely to have been human occupation in and around the area since the end of the last ice-age (from around 8,000BC), the earliest known human occupation is represented by cropmarks of iron age enclosed settlement sites in the wider vicinity of the village. Some of these may be contemporary, or even post-date, the Roman occupation of this area which began with the construction of Dere Street around 80 A.D.

In summary, while there is no direct evidence for human activity within the bounds of the proposed development area until the modern period, intermittent, possibly low-level human activity, based on food gathering, farming and transportation, is considered likely during all periods since prehistory and more intensive exploitation of the site since the medieval period.

1.3 Previous Archaeological Investigation

No archaeological assessments or interventions have previously been carried out on the site and no sites of significance with respect to the current investigation are recorded on the county HER in the immediate vicinity. A crop-mark site of unknown provenance is, however, recorded on the HER east of the site boundary (*Appendix 1, Site 2*).

1.4 Nature of Proposed Developments

The application proposes rebuilding of existing school buildings and an extension to the east, with associated service connections, onto an area now largely occupied by playing fields. Playing fields elsewhere, notably in the south, will then be subject to landscaping.

1.5 Nature of Proposed Archaeological Works

The scheme of archaeological works proposed responds to a condition for an archaeological watching brief applied to the existing planning permission. It is proposed to carry out evaluation in advance of main works using the results of geophysical survey carried out over the entire site to target sites for invasive evaluation of the slightly smaller area subject to groundworks for new buildings, the purpose being to evaluate its archaeological potential in order to determine the implications of main works on the site and facilitate subsequent mitigation by watching brief.

> **Condition 1** ARCHP Archaeological Programme.
> No development shall commence until a written scheme of investigation setting out a programme of archaeological work in accordance with 'Standards for All Archaeological Work in County Durham and Darlington' has been submitted to and approved in writing by the Local Planning Authority. The programme of archaeological work will then be carried out in accordance with the approved scheme of works.
> *Reason: To safeguard any Archaeological Interest in the site, and to comply with part 16 of the National Planning Policy Framework. Required to be a pre-commencement condition as the archaeological investigation/mitigation must be devised prior to the development being implemented.*
>
> **Condition 2** ARCHR Archaeology Reporting & archiving
> The development shall not be occupied until the post investigation assessment has been completed in accordance with the approved Written Scheme of Investigation. The provision made for analysis, publication and dissemination of results, and archive deposition, should be confirmed in writing to, and approved by, the Local Planning Authority.
> *Reason: To comply with Paragraph 205 of the NPPF, which requires the developer to record and advance understanding of the significance of heritage assets, and to ensure information gathered becomes publicly accessible.*

The proposed evaluation will take the form of sample trenching based on the results of geophysical survey, followed by reporting and archiving.

The trial trenching is needed to inform the Planning Authority of the character, nature, date, depth, degree of survival of archaeological deposits on this site, targeting positions of high potential based on known information. The trenches will be excavated to the depth of sub-soil or archaeological features and may be widened should archaeological remains be found or suspected below depths of 1.2 m. The client will provide information on the location of services to ensure safe positioning of the trenches.

Trenching will take place over a 4% sample of 27,600 m^2, which equates to 1,104 m^2. Assuming the evaluation trenches are all 1.5 m in width, this will necessitate trial trenching totalling 736 m in length (or 25x 30 m-long trenches). The 1% contingency if activated would necessitate a further 276 m^2 or 184 m of 1.5 m-wide trenching. At least some of the trenches will target areas of car parking/hard standing – notably including the site of Ravensflatt Farm seen on historic OS plans in the south-west corner of the site - which are likely to be unsuitable for geophysical survey.

2. EXCAVATION PROGRAMME & METHODOLOGY

2.1 Overall Project Aims

The excavation project is guided by the following overall aims:

- To define and identify the nature of archaeological deposits on site, and date these if and where possible, establishing whether the features/deposits represent part of the adjacent farmstead.
- to attempt to characterise the nature of the archaeological sequence and recover as much information as possible about the spatial patterning of features present on the site.
- To address the research questions identified in the NERRF.

2.2 Excavation Strategy and Trench Positioning

The positioning of the trenches is based on the position of the proposed buildings extension and the results of geophysical survey provided in Appendix 1, but avoids existing known service connections indicated by the client.

Dimensions and orientation:

It is proposed to open a total 24 no. trenches measuring 30 m long by 1.5 m wide. The trenches will be excavated to the depth of sub-soil or significant archaeological features or, in the absence of either, to a depth exceeding, by at least 0.10 m and no more than 0.20 m, the proposed depth of foundation trenches which in this case are expected to be up to 0.80 m deep.

Illus. 03 is a site plan showing the approximate extent of geophysical survey coverage and placement of evaluation trenches based on the results of geophysical survey.

3. EXECUTION OF THE SCHEME OF INVESTIGATION – FIELDWORK

*[The archaeological works will be carried out in full compliance archaeological best practice as set out in the following publications: Standards for all Archaeological Work in County Durham and Darlington (*Durham County Council), *Yorkshire, the Humber and the North-East: A Regional Statement of Good Practice for Archaeology in the Development Process (WYAAS 2009) and Standard and Guidance: an archaeological evaluation (IFA 2008)]*

3.1 Excavation – general

3.1.1 The archaeological trenches will be excavated in the locations specified in the preceding section (*see* 2.2), determined by the principal aim of the project which is to determine the presence or otherwise of significant archaeological features within the proposed development area. Excavation, recording and sampling procedures will be undertaken using the strategies indicated below.

3.1.2 The setting out of the trenches will be undertaken by the Archaeological Practice in consultation with the landowner and county archaeologist.

3.1.3 Unstratified modern overburden may be removed mechanically using an appropriate machine with a toothless ditching blade under strict archaeological supervision. The removal of modern overburden above the first significant archaeological horizon will be executed in

successive level spits. All mechanical excavation will be supervised by archaeologically competent staff. Manual excavation will be undertaken by trained archaeological staff.

3.1.4 Spoil will be kept close-by and rapidly backfilled into the trenches at the conclusion of this work. The site is private property without public access, but signs will be displayed in the case of any deep excavations on the site. It is not, however, envisaged that any excavations will attain a hazardous depth.

3.1.5 On removal of overburden, all excavation of archaeological horizons and trench faces will be carried out by hand and every effort will be made to leave all nationally important remains *in situ*.

3.1.6 Sufficient of the archaeological features and deposits identified will be excavated by hand through a sampling procedure to enable their date, nature, extent and condition to be described. Pits and postholes will normally be sampled by half-sectioning although some features may require complete excavation. Linear features will be sectioned as appropriate. No archaeological deposits will be entirely removed unless this is unavoidable.

3.2 Recording

3.2.1 Archaeological stratigraphy revealed by excavation will be recorded by the following means:

3.2.2 Written descriptions. Each archaeological context will be recorded on a pro-forma sheet. Minimum recorded details will consist of the following: a unique identifier; an objective description which includes measurements of extent and details of colour and composition; an interpretative estimate of function, clearly identified as such; at least one absolute height value; the identifiers of related contexts and a description of the relationship with such contexts (for preference, executed as a mini Harris matrix); references to other recording media in which representations of the context are held (plans, sections, photographs).

3.2.3 Measured illustrations. Detail plans and sectional profiles of archaeological features will be at appropriate scales (sections: 1:10; plans: 1:20 or 1:50). Archaeological contexts will be referenced by their unique identifiers. All illustrations will be properly identified, scaled and referenced to the site survey control.

3.2.4 Photographs. Digital photographs will be taken for purposes of record. Any features of archaeological note will also be recorded on colour film stock. A system will be used for identifying the archaeological features photographed.

3.2.5 An appropriate control network for the survey of any archaeological remains revealed in excavation will be established.

3.2.6 The survey control network will be related to the OS grid.

3.2.7 The survey control network and the position of recorded structures, features and finds will be located on a map of an appropriate scale (1:2500 or 1:500)

3.2.8 At least one absolute height value related to OD will be recorded for each archaeological context.

3.2.9 All processing, storage and conservation of finds will be carried out in compliance with the relevant IFA and UKIC (United Kingdom Institute of Conservation) guidelines.

3.2.10 Portable remains will be removed by hand; all artifacts encountered will be recovered.

3.3 Environmental Sampling and Scientific Dating

3.3.1 The investigations will be undertaken in a manner consistent with Historic England's *Management of Research Projects in the Historic Environment* – MoRPHE (2015) and with *Archaeological Science at PPG16 Interventions: Best Practice for Curators and Commissioning Archaeologists*, English Heritage, 2003. The following strategy for environmental sampling has been confirmed with Don O'Meara, Historic England Regional Advisor for Archaeological Science (0191 2691250).

3.3.2 Deposits/fills with potential for environmental evidence will be assessed by taking up to two bulk samples of 30 litres from any context selected for analysis by the excavator from suitable (i.e. uncontaminated) deposits. Deposits/fills totalling less than 30 litres in volume will be sampled in their entirety. Samples which are judged to be most suitable on grounds of being derived from uncontaminated and reasonably well-dated deposits and/or recognisable features will be selected for full analysis, reporting and publication. In the event of a large number of deposits potentially being available for sampling, the advice of the Historic England Regional Science Advisor will be sought.

3.3.3 Deposits will be sampled for remains of pollen, food residues, microfossils, small boned ecofacts (e.g. fish & insects/micro-fauna), industrial residues (e.g. micro-slags - hammer-scale and spherical droplets), cloth and timber. Flotation samples and samples taken for coarse-mesh sieving from dry deposits will be processed at the time of fieldwork wherever possible.

3.3.4 Any significant ecofactual assemblages will be assessed by a recognised specialist.

3.3.5 Deposits will be assessed for their potential for radiocarbon, archaeo-magnetic and Optically Stimulated Luminescence dating. As well as providing information on construction techniques, timbers will be assessed for their potential for dendrochronology dating, in which case sampling will follow procedures in *Dendrochronology: guidelines on producing and interpreting dendrochronological dates* (Hillam 1998) and *Guidelines on the recording, sampling, conservation and curation of waterlogged wood* (R. Brunning 1996). A maximum of 5 samples of material suitable for dating by scientific means (e.g: Radiocarbon, Luminescence, Remnant Magnetism, etc.) will be collected.

3.3.6 In the event that hearths, kilns or ovens (of whatever period, date or function) are identified during the watching brief, provision will be made to collect at least one archaeo-magnetic date to be calculated from each individual hearth surface (or in the case of domestic dwellings sites a minimum of one per building identified). Where applicable, samples will be collected from the site and processed by a suitably trained specialist for dating purposes. In the event that such deposits or structures are identified, HE and DCCAS will be contacted to discuss the appropriate response.

3.3.7 Information on the nature and history of the site, aims and objectives of the project, summary of archaeological results, context types and stratigraphic relationships, phase and dating information, sampling and processing methods, sample locations, preservation conditions, residuality/contamination, etc. will be provided with each sample submitted for analysis.

3.3.8 Laboratory processing of samples shall only be undertaken if deposits are found to be reasonably well dated, or linked to recognisable features and from contexts the derivation of which can be understood with a degree of confidence.

3.4 Human Remains and Treasure

3.4.1 Human remains will be treated with care, dignity and respect, in full compliance with the relevant legislation (essentially the Burial Act 1857) and local environmental health concerns. If found, human remains will be left in-situ, covered and protected, and the police, coroner, Inspector of Ancient Monuments and County Archaeologist informed. If it is agreed that removal of the remains is essential, the Archaeological Practice Ltd, will apply for a licence from the Home Office. Analysis of the osteological material will take place according to published guidelines, *Human Remains from Archaeological Sites, Guidelines for producing assessment documents and analytical reports (*English Heritage 2002).

3.4.2 If anything is found which could be Treasure, under the Treasure Act 1996, it is a legal requirement to report it to the local coroner within 14 days of discovery. The Archaeological Practice Ltd. will comply with the procedures set out in The Treasure Act 1996. Any treasure will be reported to the coroner and to The Portable Antiquities Scheme Finds Liaison Officer, Benjamin Westwood (03000 267011 or benjamin.westwood@durham.gov.uk), for guidance on the Treasure Act procedures. Treasure is defined as the following:

- Any metallic object, other than a coin, provided that at least 10% by weight of metal is precious metal and that is at least 300 years old when found
- Any group of two or more metallic objects of any composition of prehistoric date that come from the same find
- All coins from the same find provided that they are at least 300 years old when found, but if the coins contain less than 10% gold or silver there must be at least ten
- Any object, whatever it is made of, that is found in the same place as, or had previously been together with, another object that is Treasure
- Any object that would previously have been treasure trove, but does not fall within the specific categories given above. Only objects that are less than 300 years old, that are made substantially of gold or silver, that have been deliberately hidden with the intention of recovery and whose owners or heirs are unknown will come into this category

4. SCHEME OF INVESTIGATION - POST-EXCAVATION ANALYSIS, REPORTING & ARCHIVING

4.1 Analysis and Reporting of Recovered Data

4.1.1 Following the completion of the Field Investigation and before any of the archaeological post-excavation work is commenced, an archive (the Site Archive) containing all the data gathered during fieldwork will be prepared. This material will be quantified, ordered, indexed and rendered internally consistent. It will be prepared according to the guidelines given in Historic England's MoRPHE: https://historicengland.org.uk/images-books/publications/morphe-project-managers-guide/ and D.H. Brown *Archaeological Archives: A guide to best practice* (2011) http://www.archaeologyuk.org/archives/aaf_archaeological_archives_2011.pdf

4.1.2 Following completion of the Field Investigation and Site Archive, a report will be prepared collating and synthesizing the structural, artefactual and environmental data relating to each agreed component part of the evaluation and recording process.

4.2 Production of Final Report

4.2.1 Copies of the report will be provided within two months of the completion of fieldwork to the client and Durham County Council (DCC) archaeologist and HER abiding by the standards and procedures set out in Section 7.6 of DCC's *Standards for all Archaeological Work in County Durham and Darlington.*

4.2.2 Three copies of the report will be provided. Each will be bound, with each page and heading numbered. Any further copies required will be produced electronically. The report will include as a minimum the following:

A summary statement of methodologies used.
A location plan of the site and any archaeological discoveries of note.
A summary statement of results.
Conclusions
A table summarizing the deposits, features, classes and numbers of artefacts encountered and spot dating of significant finds.

4.2.3 Following completion of the analysis phase of the work, an archive (the Research Archive) containing all the data derived from the work done during the analysis phase will be prepared. The archive will be prepared to the standard specified by Historic England (MoRPHE 2011) and in accordance with the United Kingdom Institute of Conservation guidelines.

4.2.4 Arrangements will be made to deposit the Site Archive (including Finds) and the Research Archive with the designated museum, Sevenhills Repository, Spennymoor , within 6 months of the end of the fieldwork. Additionally, a copy shall be offered to the National Monuments Record (NMR).

4.3 Dissemination and Publication of Results of Archaeological Works

4.3.1 An entry for inclusion in the Durham County HER will be prepared and submitted.

4.3.2 Summary reports of the project will be prepared, if necessary, for inclusion in the appropriate Notices, Annual Reviews, Reports, etc.

4.3.3 In particular a summary of the results of the investigation will be prepared for *Archaeology County Durham* and submitted to DCCAS, by December of the year in which the work is completed.

4.3.4 A short report on the work will be submitted to a local academic journal if appropriate.

4.3.5 OASIS: The Archaeological Contractor will complete the online form for the Online Access to Index of Archaeological Investigations Project (OASIS), following consultation with HE and DCCAS. The Contractor agrees to the procedure whereby the information on the form will be placed in the public domain on the OASIS website, following submission of the final report (see 3.6) into the Durham County HER.

5 PERSONNEL

Archaeological Practice Delivery Team	***Specialists – Post-excavation***
Project Management Richard Carlton (RC): *Site Directors* Marc Johnstone (MJ) & Adam Leigh (AL)	*Environmental analysis & Scientific Dating:* Archaeological Services Durham University – Palaeo-Environmental Laboratory *Finds analysis:* LAJ: Lindsay Allason-Jones (Roman and Medieval Small Finds) JV: Jenny Vaughan (Medieval Pottery) RY: Rob Young (Prehistoric worked stone and pottery)

APPENDIX 1:
Sites Listed in the Durham HER in the immediate vicinity of the site of investigation:

Catalogue no. 01. Belmont, Ravensflatt Farmhouse*. HER ID: D36430; Period: Post Medieval; Listing Entry no. D6917; NGR: NZ1032655436*
Description:
When St.Giles Parish was formed in the 14th century, its lands included the manors of Caldecotes and Clifton, together with Ravensflatt. Bishops Flambard and Du Puiset had endowed Kepier hospital with the two manors in the 12th century for its upkeep, but the Ravensflatt lands remained with the Prior and Convent of Durham until they were given to Durham University at its foundation. They were included in Belmont Parish when it was formed in 1852 from the greater part of St. Giles Parish. The farmhouse was surrounded by good farmland, but the extent of the farm boundary is not clear. It was sold by the University during the 1960s, and much of the land was developed as housing. The farmhouse, its site just inside the south boundary of the Belmont schools complex, was demolished. A proposal to preserve its ancient name in the name of the new secondary school (now Belmont Comprehensive School) built on the site was not agreed.

Catalogue no. 02. Rectangular cropmark, Broomside, Durham City*. HER ID: D3064; Period: Unknow, poss. prehistoric; Listing Entry no. D6917; NGR: NZ430700 543500*

Catalogue no. 03. Carrville Toll, Durham*. HER ID: D3064; Period: Unknow, poss. prehistoric; Listing Entry no. D*65780*; NGR: NZ* 430001 543331
Description:
A turnpike tollhouse was shown at this location on a map of 1840, but isn't shown on the first edition Ordnance Survey map of 1860 or later editions.

Catalogue no. 04. Church of St Mary*. HER ID: D6917; Period: Post Medieval; Listing Entry no. D6917; NGR:* NGR 430397 543615

Catalogue no. 05. Churchyard of St Mary*. HER ID: D*36026*; Period: Post Medieval; Listing Entry no. D6917; NGR:* NGR 430416 543634

Catalogue no. 06. Old school community centre and house attached*. HER ID: D*35982*; Period: Post Medieval; NGR:* NGR 430471 543584.

APPENDIX 02: Belmont Primary and Belmont Community School, County Durham - Archaeological geophysical survey, Report prepared by Jelmer Wubs, Phase Site Investigations Ltd., March 2023 [Project No. ARC/3477/1317].

Belmont Primary and Belmont Community School
County Durham

Archaeological geophysical survey

Project No. ARC/3477/1317

March 2023

Belmont Primary and Belmont Community School County Durham

Archaeological geophysical survey

Project No. ARC/3477/1317

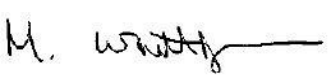
Report prepared by		Report checked by	
Name	Jelmer Wubs BA MA	Name	Mark Whittingham BSc MA MCIfA
Signature		Signature	
Date	15/03/23	Date	16/03/23

Table of Contents

1. SUMMARY

Phase Site Investigations Ltd was commissioned to carry out a magnetic gradient survey at Belmont Primary and Belmont Community School, County Durham. The aim of the survey was to help establish the presence / absence, extent, character, relationships and date (as far as circumstances and the inherent limitations of the technique permits) of archaeological features within the survey area.

The survey was undertaken using a Phase Site Investigations Ltd multi-sensor array cart system (MACS). The MACS comprised 8 Foerster 4.032 Ferex CON 650 gradiometers with a control unit and data logger. The MACS data was collected on profiles spaced 0.5 m apart with readings taken at between 0.1 and 0.15 m intervals.

The majority of the anomalies identified by this survey relate to modern material / objects, probable drainage and possible agricultural activity. There are a number of anomalies of uncertain origin. The majority of these are also probably related to modern features / activity but as their cause cannot be determined with certainty an archaeological cause for some of them cannot be completely ruled out.

Large areas of the site are dominated by very strong responses or magnetic disturbance from modern features / material. It should be recognised that the strength of these responses could mask anomalies from other sub-surface features in the area, if any such features were present.

2. INTRODUCTION

2.1 Overview

Phase Site Investigations Ltd was commissioned by The Archaeological Practice Ltd to carry out an archaeological geophysical survey at Belmont Primary and Belmont Community School, County Durham utilising magnetic gradiometers.

The aim of the survey was to help establish the presence / absence, extent, character, relationships and date (as far as circumstances and the inherent limitations of the technique permits) of archaeological features within the survey area.

The location of the site is shown in drawing ARC_3477_1317_01.

2.2 Site description

The site is situated at Belmont Primary and Belmont Community School, County Durham (approximate centre at NGR NZ 305 434), approximately 3 km to the west of Durham city centre and covered an area of approximately 8.1 ha.

The site encompassed two playing fields, a number of school buildings and associated paths and other hardstanding areas. Only the school playing fields were suitable for magnetic survey.

The geology of the site consists of mudstone, siltstone and sandstone of the Pennine Middle Coal Measures Formation. The majority of the site is overlain by glacial till, except for a small area in the south-east of the site which is shown to be overlain by glaciofluvial deposits (British Geological Survey, 2023).

2.3 Archaeological background

An archaeological / heritage desk-based assessment, or other archaeological background information, was not available at the time of writing this report.

Historic maps (maps.nls.uk, 2023) indicate that school buildings have been on the northern part of the site since the 1870s. Farm buildings (Ravensflatt Farm) are shown to have been present in the south-west of the site (under a yard area). The majority of the rest of the site was in use for agriculture since the 1870s until the 1960s when the majority of the current school was built. Two field boundaries sub-divided the agricultural fields, prior to their conversion into playing fields.

2.4 Scope of work

The survey area was specified by the client.

Only the two playing fields were suitable for survey, which reduced the area surveyed to approximately 3.4 ha, the extents of which are shown in drawing ARC_3477_1317_02.

No other problems were encountered during the survey which was carried out on 20 February 2023.

3. SURVEY METHODOLOGY

3.1 Magnetic survey

The survey was undertaken using a Phase Site Investigations Ltd multi-sensor array cart system (MACS).

The MACS comprised 8 Foerster 4.032 Ferex CON 650 gradiometers with a control unit and data logger. The Foerster gradiometers do not require balancing as each sensor is automatically 'zeroed' using the control unit software.

The MACS utilises an RTK GNSS system which means that survey grids do not have to be established. Instead an area is surveyed over a series of continuous profiles and the position of each data point is recorded using an RTK GNSS system. The sensors have a separation of 0.5 m which means that data was collected on profiles spaced at 0.5 m apart. Readings were taken at between 0.1 m and 0.15 m intervals.

Data is collected on zig-zag profiles along the full length or width of a field, although fields can be sub-divided if they are particularly large. Marker canes are set-out along field boundaries at set intervals and these are used to align the profiles. The survey profiles are usually offset from field boundaries, buildings and other metallic features by several metres to reduce the detrimental effect that these surface magnetic features have on the data. The location of the MACS data is converted direct to Ordnance Survey co-ordinates using the UK OSTN15 projection. As the survey is referenced direct to Ordnance Survey National Grid co-ordinates temporary survey stations are not established.

3.2 Data processing and presentation

The MACS data was stored direct to a laptop using in-house software which automatically corrects for instrument drift and calculates a mean value for each profile. A positional value is assigned to each data point based on the sensor number and recorded GNSS co-ordinates. The data is gridded using in-house software and parameters are set based on the sensor spacing and mean values. No additional processing is required. The gridded data is then displayed in Surfer 9 (Golden Software) and image files of the data are created.

The data was exported as greyscale raster images (PNG files) and is shown with an accompanying interpretation at a scale of 1:1500. Greyscale plots have been 'smoothed' using a visual interpolation but the data itself has not been interpolated.

The data is relatively 'noisy' and so greyscale plots of the data have been shown at two ranges; a range of -2 nT to 3 nT, which is 'standard' for archaeological surveys and a relatively wide (for archaeological surveys) range of -5 to 5 nT. The latter smooths out the data and can make it easier to identify some anomalies but very weak responses may not be visible in the wider range.

The data has been displayed relative to a digital base plan provided by the client as drawing *'P22048 – F+G – Belmont School, Durham.dwg'*. The base plan was in the Ordnance Survey National Grid co-ordinate system and as the survey grids / data were referenced directly to National Grid co-ordinates the data could be simply superimposed onto the base plan in the correct position.

X-Y trace plots were examined for all of the data and overlain onto the greyscale plot to assist in the interpretation, primarily to help identify dipolar and bipolar responses that will probably be associated with surface / near-surface iron objects. However, X-Y trace plots have not been presented here as they do not show any additional anomalies that are not

visible in the greyscale data. A digital drawing showing the X-Y trace plot overlain on the greyscale plot is provided in the digital archive.

All isolated responses have been assessed using a combination of greyscale and X-Y trace plots. There are a large number of 'iron spike', isolated dipolar anomalies present in the data. There is no evidence to suggest that they are associated with archaeological features and so these have not been shown in the interpretation.

Anomalies associated with possible agricultural or drainage regimes are present in the data but each individual anomaly has not been shown on the interpretation. Instead the general orientation of the regime is indicated.

The data was examined over several different ranges during the interpretation to ensure that the maximum information possible was obtained from the data.

The anomalies have been categorised based on the type of response that they exhibit and an interpretation as to the cause(s) or possible cause(s) of each anomaly type is also provided.

A general discussion of the anomalies is provided for the entire site and then the results are discussed on a field by field basis. A discussion of the general categories of anomaly which have been identified by the survey is provided in Appendix 1.5.

The geophysical interpretation drawing must be used in conjunction with the relevant results section and appendices of this report.

4. RESULTS

4.1 General

The data quality across the majority of the survey area is very good allowing the data to be viewed at a narrow range of readings to better identify weak anomalies. There are areas that have a more disturbed magnetic background but this is due to the presence of modern magnetic material in the topsoil or sub-surface, rather than low data quality.

The disturbed magnetic background is extensive and there are also areas of strong magnetic disturbance and strong responses from modern features. All of these have made it difficult to identify individual responses across the site. For this reason individual isolated dipolar and small bipolar anomalies have not been shown on the interpretation and only selected stronger isolated bipolar and positive responses have been shown. It should also be noted that the strong responses from modern features / material could potentially mask responses from other sub-surface features, should any such features be present.

4.2 Field 1

Basic topography: Relatively level.

Field description: Playing field. The field was firm underfoot and bounded by a path to the west and metal fencing in the other directions. A play area was present to the north-west and some trees and dense vegetation in the north-west.

Summary of anomalies: Numerous isolated dipolar and small bipolar responses, that are all thought to be associated with modern material. These have not been shown on the interpretation.

Larger isolated bipolar responses. These will be related to a concentration of, or a larger object or feature of, relatively modern ferrous or fired material. They are not thought to be archaeologically significant but have been shown to indicate where there may be relatively large modern material or features.

Two linear bipolar anomalies associated with sub-surface utility apparatus (pipes, drains or cables).

An area of magnetic disturbance associated with relatively modern features / material.

Very strong responses associated with strongly magnetic relatively modern features / material. These responses can extend for some distance beyond the feature and in some cases the feature causing the strong response may be located beyond the survey area.

A negative linear response possibly related to non-magnetic pipe or drain.

Trends of uncertain origin.

Further discussion / additional information:

The majority of the field is dominated by very strong responses or magnetic disturbance from modern features / material. The strength of the responses within the magnetic disturbance

suggest that the majority of them are caused by a near surface spread of material, rather than significant made ground, although there may be some areas of deeper material. It should be recognised that the strength of the strong responses and magnetic disturbance are sufficiently high enough to mask anomalies from other sub-surface features in the area, should any such features be present.

There are several trends within the area of magnetic disturbance. It is not certain if these are related to features underlying the modern material, are caused by modern features or are a product of the responses within the magnetic disturbance that coincidently form linear patters and are not related to sub-surface features. **Anomalies A** are suggestive of sub-surface features but the exact type and date of feature is not certain. The other trends within the area of magnetic disturbance are too small to determine whether they are related to sub-surface features or a product of the magnetic disturbance.

The remaining trends within the survey area are all too weak and short to reliably interpret. They do not form any patterns or relationships that would help determine their cause.

4.3 Field 2

Basic topography: Relatively level.

Field description: Playing field. The field was firm underfoot and bounded by a path to the west and metal fencing in the other directions. Eight goal posts and a cricket square were present in the field. A survey instrument was present in the north of the field.

Summary of anomalies: Numerous isolated dipolar and small bipolar responses, that are all thought to be associated with modern material. These have not been shown on the interpretation.

Larger isolated bipolar responses. These will be related to a concentration of, or a larger object or feature of, relatively modern ferrous or fired material. They are not thought to be archaeologically significant but have been shown to indicate where there may be relatively large modern material or features.

Areas of magnetic disturbance associated with relatively modern features / material.

Very strong responses associated with strongly magnetic relatively modern features / material. These responses can extend for some distance beyond the feature and in some cases the feature causing the strong response may be located beyond the survey area.

Two or more series of broadly parallel positive linear responses associated with either drainage, agricultural or other modern features. They are probably related to a regime of field drains.

Negative linear responses probably related to drainage, or other modern, features such as non-magnetic pipes.

Trends of uncertain origin.

Numerous isolated positive responses, the majority of which are probably related to relatively modern buried ferrous / fired

material. Some could be related to natural variations or discrete features.

Positive linear responses are present that are suggestive of drainage, agricultural or other modern features but some anomalies could be related to other sub-surface features / remnants of features.

Further discussion / additional information:

The majority of the field is dominated by very strong responses or magnetic disturbance from modern features / material. The strength of the responses within the magnetic disturbance adjacent to the edge of the field suggests that they could be caused by made ground, possibly related to the construction of the adjacent school buildings and facilities. The remaining areas are more suggestive of a near surface spread of material, rather than significant made ground, although there may be some areas of deeper material. It should be recognised that the strength of the strong responses and magnetic disturbance are sufficiently high enough to mask anomalies from other sub-surface features in the area, should any such features be present.

One or more series of broadly parallel linear responses are present. These are probably related to regimes of field drains but some could be associated with the remnants of agricultural activity, such as ridge and furrow.

One of the series of positive linear responses appear to be bounded by slightly stronger positive linear anomalies (**Anomalies B**). It is likely that the series of responses are related to a field drain regime and Anomalies B also caused by drainage features. However, it is possible that some of the Anomaly B responses could be unrelated to drainage features and so their cause cannot be determined with certainty.

There are other anomalies (**Anomalies C**) with a similar north to south alignment as some of Anomalies B and which may be slightly oblique to the adjacent obvious agricultural / drainage anomalies. These could be related to drainage or agricultural activity but it is also possible that they have a different cause but again it is not possible to determine their origin with any certainty.

There are several trends within the area of magnetic disturbance. It is not certain if these are related to features underlying the modern material, are caused by modern features or are a product of the responses within the magnetic disturbance that coincidently form linear patters and are not related to sub-surface features. **Anomalies D** could be related to sub-surface features but the exact type and date of feature is not certain. The other trends within the area of magnetic disturbance are too small to determine whether they are related to sub-surface features or a product of the magnetic disturbance.

Several other trends (**Anomalies E**) stand out slightly and could be related to sub-surface features but again it is not possible to reliably determine their cause. The remaining trends within the survey area are all too weak and short to reliably interpret. They do not form any patterns or relationships that would indicate that they are associated with sub-surface features and it is likely that they are a product of drainage or other modern activity but as their cause cannot be determined with certainty the possibility that some of them could be related to sub-surface features cannot be ruled out.

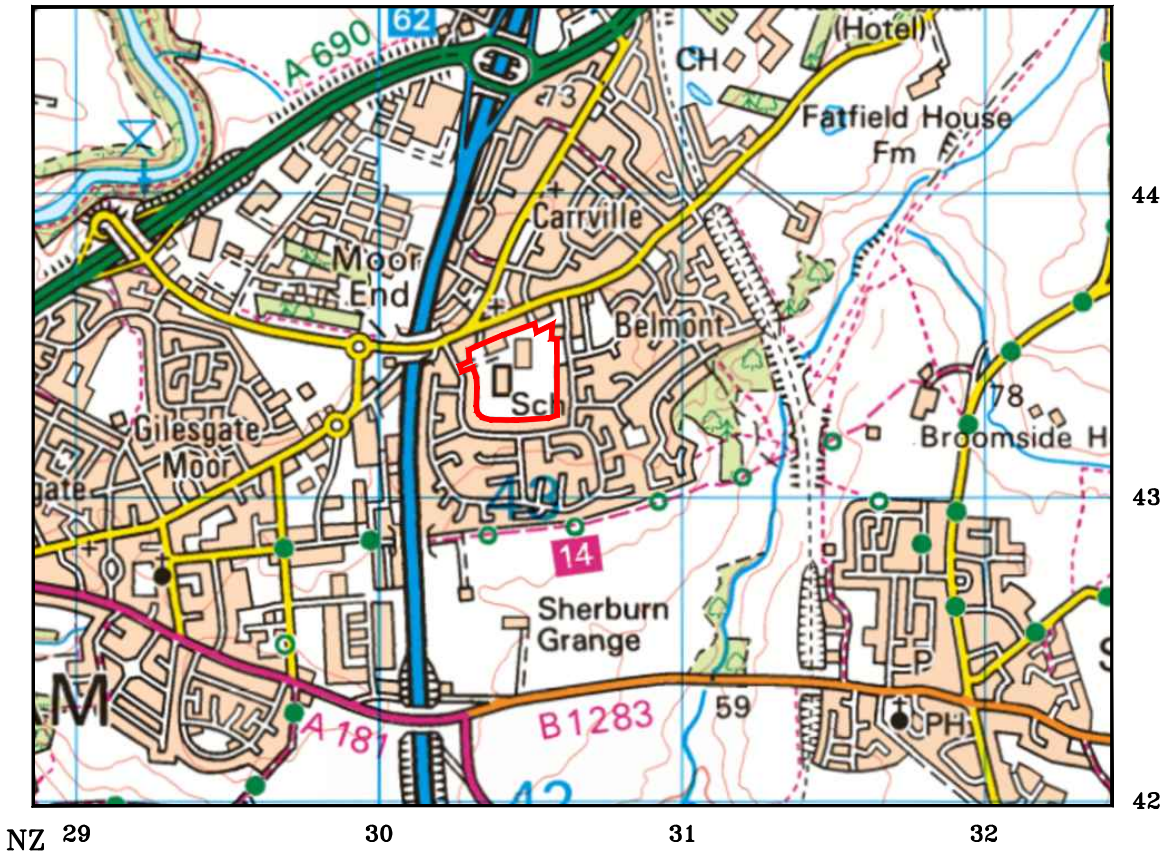
Anomalies F are strong linear responses that are related to a cricket square.

5. DISCUSSION AND CONCLUSIONS

The majority of the anomalies identified by this survey relate to modern material / objects, probable drainage and possible agricultural activity. There are a number of anomalies of uncertain origin. The majority of these are also probably related to modern features / activity but as their cause cannot be determined with certainty an archaeological cause for some of them cannot be completely ruled out.

Large areas of the site are dominated by very strong responses or magnetic disturbance from modern features / material. It should be recognised that the strength of these responses could mask anomalies from other sub-surface features in the area, if any such features were present.

It should be noted that a geophysical survey does not directly locate sub-surface features - it identifies variations or anomalies in the background response caused by features. The interpretation of geophysical anomalies is often subjective and it is rarely possible to identify the cause of all such anomalies. Not all features will produce a measurable anomaly and the effectiveness of a geophysical survey is also dependant on the site-specific conditions. The main factors that may limit whether a feature can be detected are the composition of a feature, its depth and size and the surrounding material. It is not possible to guarantee that a geophysical survey will identify all sub-surface features. Confirmation on the identification of anomalies and the presence or absence of sub-surface features can only be achieved by intrusive investigation.



SITE LOCATION

SCALE

0m 500m 1000m

NOTE

PHASE SITE INVESTIGATIONS

Phase Site Investigations Ltd, 703A Whinfield Drive, Aycliffe Business Park, Newton Aycliffe, County Durham, DL5 6AU

T: +44 [0] 01325 311 751
E: enquiries@PhaseSI.com
W: www.PhaseSI.com

Scale [A4 Sheet]	Drawing	Status
AS SHOWN	ARC_3477_1317_01	FINAL

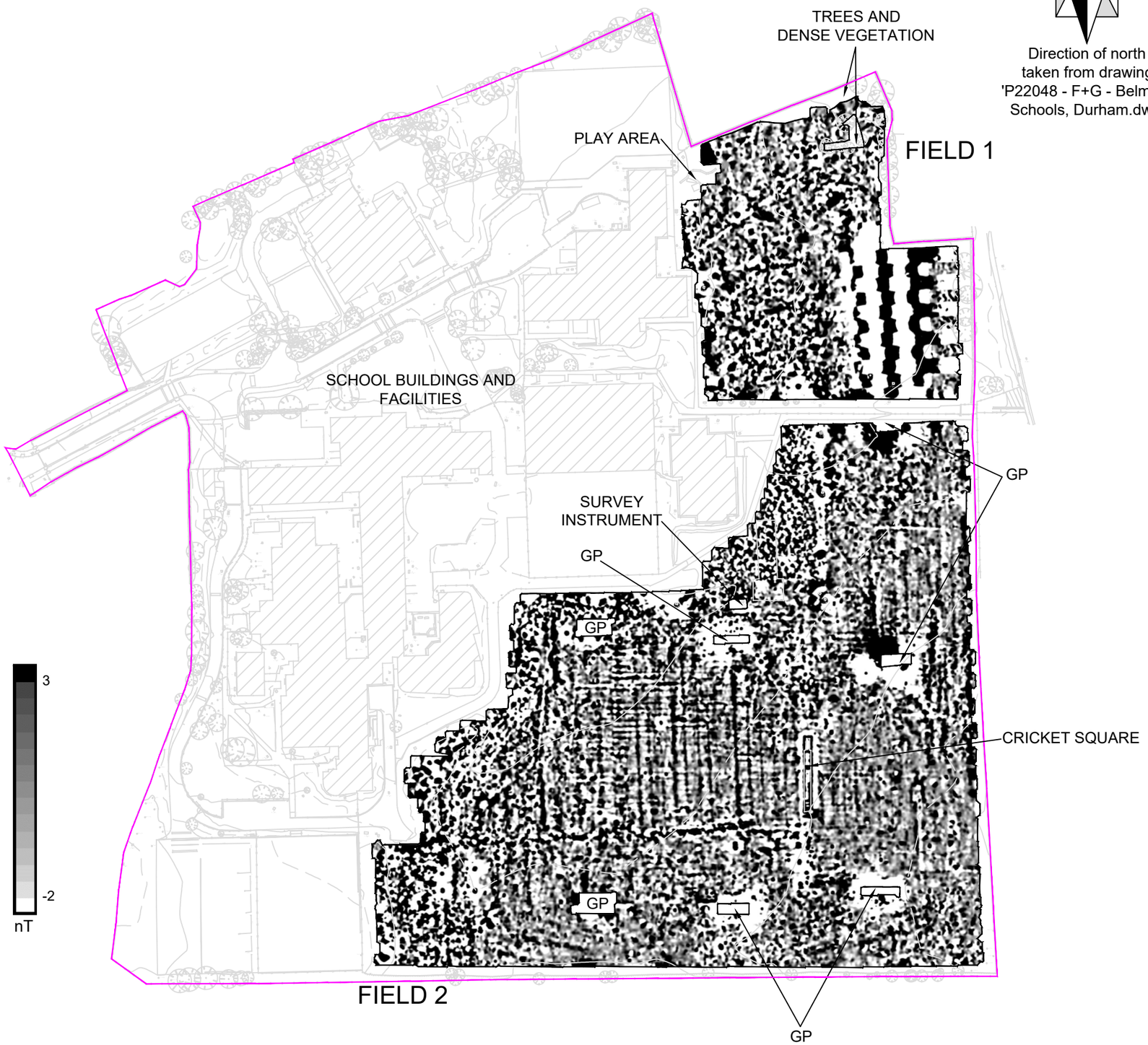
Client: THE ARCHAEOLOGICAL PRACTICE LTD NEWCASTLE UPON TYNE

Site: BELMONT PRIMARY AND BELMONT COMMUNITY SCHOOL COUNTY DURHAM

Title: SITE LOCATION MAP

Job No: ARC_3477_1317

		Drawn	CW
Chk.	MW	Date	01/03/2023



NOTES

1. THIS DRAWING MUST BE USED IN CONJUNCTION WITH THE ACCOMPANYING REPORT (ARC_3477_1317_RPT .PDF) WHICH PROVIDES DETAILS OF THE TECHNIQUES EMPLOYED, THEIR INHERENT LIMITATIONS AND ANY SITE SPECIFIC ISSUES.
2. THIS DRAWING IS BASED UPON DRAWING 'P22048 - F+G - Belmont Schools, Durham.dwg' PROVIDED BY THE CLIENT. THE ORDNANCE SURVEY CO-ORDINATES OBTAINED FOR THIS SURVEY WERE MEASURED USING THE UKOSTN15 PROJECTION. THIS PROJECTION SHOULD BE TAKEN INTO ACCOUNT IF THE SURVEY GRID IS RELOCATED.
3. PHASE SITE INVESTIGATIONS CANNOT ACCEPT RESPONSIBILITY FOR THE RELIABILITY OR ACCURACY OF ANY INFORMATION PROVIDED BY A THIRD PARTY.
4.

ALWAYS EXERCISE CAUTION WHEN EXCAVATING

KEY

	SITE BOUNDARY
GP	GOAL POSTS

PHASE SITE INVESTIGATIONS

Phase Site Investigations Ltd, 703A Whinfield Drive, Aycliffe Business Park, Newton Aycliffe, County Durham, DL5 6AU

T: +44 [0] 01325 311 751
E: enquiries@PhaseSI.com
W: www.PhaseSI.com

Scale [A3 Sheet]	Drawing	Status
1:1500	ARC_3477_1317_02	FINAL

Client
THE ARCHAEOLOGICAL PRACTICE LTD
NEWCASTLE UPON TYNE

Site
BELMONT PRIMARY AND BELMONT COMMUNITY SCHOOL
COUNTY DURHAM

Title
LOCATION OF SITE SHOWING MAGNETIC GRADIENT DATA ('STANDARD' RANGE)

Job No
ARC_3477_1317

Surveyed	RS, MP	Drawn	RS
Chk.	MW	Date	20/02/2023

SCALE
0m 25m 50m

NOTES

1. THIS DRAWING MUST BE USED IN CONJUNCTION WITH THE ACCOMPANYING REPORT (ARC_3477_1317_RPT .PDF) WHICH PROVIDES DETAILS OF THE TECHNIQUES EMPLOYED, THEIR INHERENT LIMITATIONS AND ANY SITE SPECIFIC ISSUES.
2. THIS DRAWING IS BASED UPON DRAWING 'P22048 - F+G - Belmont Schools, Durham.dwg' PROVIDED BY THE CLIENT. THE ORDNANCE SURVEY CO-ORDINATES OBTAINED FOR THIS SURVEY WERE MEASURED USING THE UKOSTN15 PROJECTION. THIS PROJECTION SHOULD BE TAKEN INTO ACCOUNT IF THE SURVEY GRID IS RELOCATED.
3. PHASE SITE INVESTIGATIONS CANNOT ACCEPT RESPONSIBILITY FOR THE RELIABILITY OR ACCURACY OF ANY INFORMATION PROVIDED BY A THIRD PARTY.
4. THIS DRAWING AND THE INFORMATION CONTAINED THEREIN IS ISSUED IN CONFIDENCE AND IS THE COPYRIGHT OF PHASE SITE INVESTIGATIONS LIMITED. DISCLOSURE OF THIS INFORMATION TO THIRD PARTIES AND UNAUTHORISED COPYING OR REPLICATION OF THIS DATA WITHOUT APPROVAL IS FORBIDDEN.

ALWAYS EXERCISE CAUTION WHEN EXCAVATING

N

Direction of north
taken from drawing
'P22048 - F+G - Belmont Schools, Durham.dwg'

PHASE SITE INVESTIGATIONS

Phase Site Investigations Ltd, 703A Whinfield Drive, Aycliffe Business Park, Newton Aycliffe, County Durham, DL5 6AU

T: +44 [0] 01325 311 751
E: enquiries@PhaseSI.com
W: www.PhaseSI.com

Scale [A3 Sheet]	Drawing	Status
1:1500	ARC_3477_1317_03	FINAL

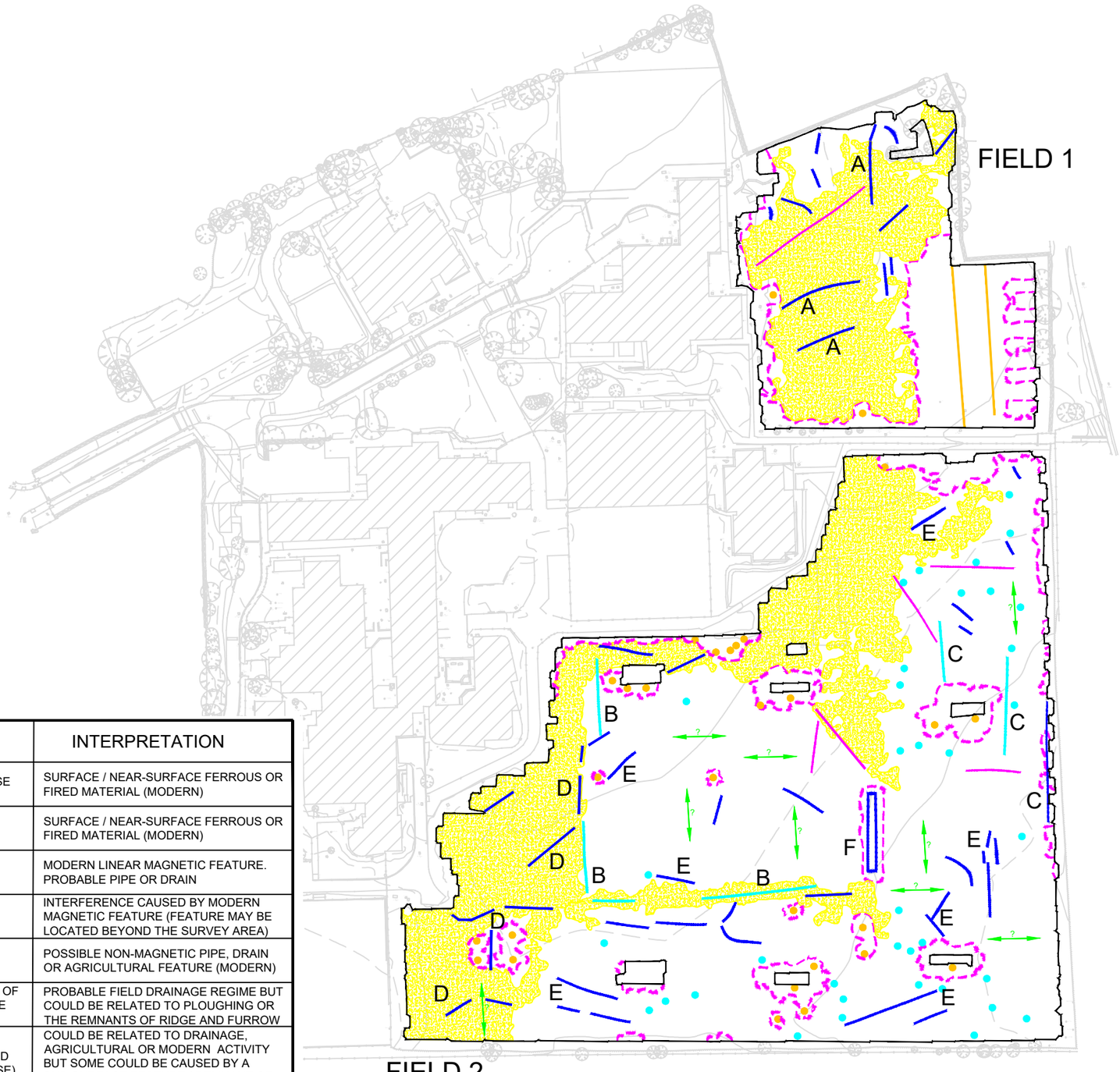
Client
THE ARCHAEOLOGICAL PRACTICE LTD
NEWCASTLE UPON TYNE

Site
BELMONT PRIMARY AND
BELMONT COMMUNITY SCHOOL
COUNTY DURHAM

Title
GREYSCALE PLOTS OF
MAGNETIC GRADIENT DATA
(RELATIVELY WIDE RANGE)

Job No
ARC_3477_1317

Surveyed	RS, MP	Drawn	RS
Chk.	MW	Date	20/02/2023



NOTES

1. THIS DRAWING MUST BE USED IN CONJUNCTION WITH THE ACCOMPANYING REPORT (ARC_3477_1317_RPT .PDF) WHICH PROVIDES DETAILS OF THE TECHNIQUES EMPLOYED, THEIR INHERENT LIMITATIONS AND ANY SITE SPECIFIC ISSUES.
2. THIS DRAWING IS BASED UPON DRAWING 'P22048 - F+G - Belmont Schools, Durham.dwg' PROVIDED BY THE CLIENT. THE ORDNANCE SURVEY CO-ORDINATES OBTAINED FOR THIS SURVEY WERE MEASURED USING THE UKOSTN15 PROJECTION. THIS PROJECTION SHOULD BE TAKEN INTO ACCOUNT IF THE SURVEY GRID IS RELOCATED.
3. PHASE SITE INVESTIGATIONS CANNOT ACCEPT RESPONSIBILITY FOR THE RELIABILITY OR ACCURACY OF ANY INFORMATION PROVIDED BY A THIRD PARTY.
4.

ALWAYS EXERCISE CAUTION WHEN EXCAVATING

ANOMALY TYPE	INTERPRETATION
ISOLATED BIPOLAR RESPONSE	SURFACE / NEAR-SURFACE FERROUS OR FIRED MATERIAL (MODERN)
AREA OF STRONG DIPOLAR / BIPOLAR RESPONSES (MAGNETIC DISTURBANCE)	SURFACE / NEAR-SURFACE FERROUS OR FIRED MATERIAL (MODERN)
BIPOLAR LINEAR RESPONSE	MODERN LINEAR MAGNETIC FEATURE. PROBABLE PIPE OR DRAIN
LIMIT OF VERY STRONG RESPONSE	INTERFERENCE CAUSED BY MODERN MAGNETIC FEATURE (FEATURE MAY BE LOCATED BEYOND THE SURVEY AREA)
NEGATIVE LINEAR	POSSIBLE NON-MAGNETIC PIPE, DRAIN OR AGRICULTURAL FEATURE (MODERN)
APPROXIMATE ORIENTATION OF BROADLY PARALLEL POSITIVE LINEARS	PROBABLE FIELD DRAINAGE REGIME BUT COULD BE RELATED TO PLOUGHING OR THE REMNANTS OF RIDGE AND FURROW
LINEAR / CURVI-LINEAR TREND (WEAK OR DIFFUSE RESPONSE)	COULD BE RELATED TO DRAINAGE, AGRICULTURAL OR MODERN ACTIVITY BUT SOME COULD BE CAUSED BY A SUB-SURFACE FEATURE / REMNANT OF FEATURE
ISOLATED POSITIVE RESPONSE	PROBABLE BURIED FERROUS / FIRED MATERIAL. SOME COULD BE RELATED TO NATURAL VARIATIONS OR OTHER DISCRETE FEATURES
LINEAR / CURVI-LINEAR POSITIVE RESPONSE	PROBABLY RELATED TO DRAINAGE, AGRICULTURAL OR OTHER MODERN ACTIVITY BUT SOME ANOMALIES COULD BE RELATED TO OTHER SUB-SURFACE FEATURES / REMNANTS OF FEATURES

SCALE
0m 25m 50m

N

Direction of north
taken from drawing
'P22048 - F+G - Belmont Schools, Durham.dwg'

PHASE SITE INVESTIGATIONS

Phase Site Investigations Ltd, 703A Whinfield Drive, Aycliffe Business Park, Newton Aycliffe, County Durham, DL5 6AU

T: +44 [0] 01325 311 751
E: enquiries@PhaseSI.com
W: www.PhaseSI.com

Scale [A3 Sheet]	Drawing	Status
1:1500	ARC_3477_1317_04	FINAL

Client
THE ARCHAEOLOGICAL PRACTICE LTD
NEWCASTLE UPON TYNE

Site
BELMONT PRIMARY AND
BELMONT COMMUNITY SCHOOL
COUNTY DURHAM

Title
INTERPRETATION OF MAGNETIC GRADIENT DATA

Job No
ARC_3477_1317

Surveyed	RS, MP	Drawn	RS
Chk.	MW	Date	20/02/2023

BIBLIOGRAPHY AND REFERENCES

British Geological Survey, 2023, online resource - www.bgs.ac.uk

National Library of Scotland, 2023, online resource - maps.nls.uk

APPENDIX 1

Magnetic survey: technical information

1.1 Theoretical background

1.1.1 Magnetic instruments measure the value of the Earth's magnetic field; the units of which are nanoTeslas (nT). The presence of surface and sub-surface features can cause variations or anomalies in this magnetic field. The strength of the anomaly is dependent on the magnetic properties of a feature and the material that surrounds it. The two magnetic properties that are of most interest are magnetic susceptibility and thermoremnant magnetism.

1.1.2 Magnetic susceptibility indicates the amount of ferrous (iron) minerals that are present. These can be redistributed or changed (enhanced) by human activity. If enhanced material subsequently fills in features such as pits or ditches then these can produce localised increases in magnetic responses (anomalies) which can be detected by a magnetic gradiometer even when the features are buried under additional soil cover.

1.1.3 In general, it is the contrast between the magnetic susceptibility of deposits filling cut features, such as ditches or pits, and the magnetic susceptibility of topsoils, subsoils and rocks into which these features have been cut which causes the most recognisable responses. This is primarily because there is a tendency for magnetic ferrous compounds to become concentrated in the topsoil, thereby making it more magnetic than the subsoil or the bedrock. Linear features cut into the subsoil or geology, such as ditches, that have been silted up or have been backfilled with topsoil will therefore usually produce a positive magnetic response relative to the background soil levels. Discrete feature, such as pits, can also be detected. Less magnetic material such as masonry or plastic service pipes which intrude into the topsoil may give a negative magnetic response relative to the background level. The strength of magnetic responses that a feature will produce will depend on the background magnetic susceptibility, how rapidly the feature has been infilled, the level and type of human activity in the area and the size and depth of a feature. Not all infilled features can be detected and natural variations can also produce localised positive and negative anomalies.

1.1.4 Thermoremnant magnetism indicates the amount of magnetism inherent in an object as a result of heating. Material that has been heated to a high temperature (fired), such as brick, can acquire strong magnetic properties and so although they may not appear to have a high iron content they can produce strong magnetic anomalies

1.1.5 The magnetic survey method is highly sensitive to interference from surface and near-surface magnetic 'contaminants'. Surface features such as metallic fencing, reinforced concrete, buildings or walls all have very strong magnetic signatures that can dominate readings collected adjacent to them. Identification of anomalies caused by sub-surface features is therefore more difficult, or even impossible, in the vicinity of surface magnetic features. The presence of made ground also has a detrimental effect on the magnetic data quality as this usually contains magnetic material in the form of metallic scrap and brick. Identification of features beneath made ground is still possible if the target feature is reasonably large and has a strong magnetic response but smaller features or magnetically weak features are unlikely to be identified.

1.1.6 The interpretation of magnetic anomalies is often subjective and it is rarely possible to identify the cause of all magnetic anomalies. Not all features will produce a measurable magnetic response and the effectiveness of a magnetic survey is also dependant on the site-specific conditions. The main factors that may limit whether a feature can be detected are the

composition of a feature, its depth and size and the surrounding material. It is not possible to guarantee that a magnetic survey will identify all sub-surface features.

1.1.7 Most high resolution, near surface magnetic surveys utilise a magnetic gradiometer. A gradiometer is a hand-held instrument that consists of two magnetic sensors, one positioned directly above the other, which allows measurement of the magnetic gradient component of the magnetic field. A gradiometer configuration eliminates the need for applying corrections due to natural variations in the overall field strength that occur during the course of a day but it only measures relative variations in the local magnetic field and so comparison of absolute values between sites is not possible.

1.1.8 Features that are commonly located using magnetic surveys include archaeological ditches and pits, buried structures or foundations, mineshafts, unexploded ordnance, metallic pipes and cables, buried piles and pile caps. The technique can also be used for geological mapping; particularly the location of igneous intrusions.

1.2 Instrumentation

1.2.1 A multi-sensor array cart system (MACS) utilising 8 Foerster 4.032 Ferex CON 650 gradiometers, spaced at 0.5 m intervals, with a control unit and data logger was used for the magnetic survey.

1.3 Survey methodology

1.3.1 The MACS utilises an RTK GNSS system which means that survey grids do not have to be established. Instead an area is surveyed over a series of continuous profiles and the position of each data point is recorded using an RTK GNSS system. The sensors have a separation of 0.5 m which means that data was collected on profiles spaced at 0.5 m apart. Readings were taken at between 0.1 m and 0.15 m intervals.

1.3.2 Data is collected on zig-zag profiles along the full length or width of a field, although fields can be sub-divided if they are particularly large. Marker canes are set-out along field boundaries at set intervals and these are used to align the profiles. The survey profiles are usually offset from field boundaries, buildings and other metallic features by several metres to reduce the detrimental effect that these surface magnetic features have on the data. The location of the MACS data is converted direct to Ordnance Survey co-ordinates using the UK OSTN15 projection. As the data is related direct to Ordnance Survey National Grid co-ordinates temporary survey stations are not established.

1.3.3 The Foerster gradiometers have a resolution of 0.2 nT but the stability of the cart system significantly reduces noise caused by instrument tilt and movement when compared with a traditional hand-held gradiometer system and the increased data intervals provide a higher resolution data set. The sensors have a range of ± 10,000nT and readings are taken at 0.1 nT resolution.

1.4 Data processing and presentation

1.4.1 The MACS data is stored direct to a laptop using in-house software which automatically corrects for instrument drift and calculates a mean value for each profile. A positional value is assigned to each data point based on the sensor number and recorded GNSS co-ordinates. The data is gridded using in-house software and parameters are set based on the sensor spacing and mean values. No additional processing is required. The gridded data is then displayed in Surfer 9 (Golden Software) and image files of the data are created.

1.4.2 The data was exported as greyscale raster images (PNG files) and is shown with an accompanying interpretation at a scale of 1:1500. Greyscale plots have been 'smoothed' using a visual interpolation but the data itself has not been interpolated.

1.4.3 The data is relatively 'noisy' and so greyscale plots of the data have been shown at two ranges; a range of -2 nT to 3 nT, which is 'standard' for archaeological surveys and a relatively wide (for archaeological surveys) range of -5 to 5 nT. The latter smooths out the data and can make it easier to identify some anomalies but very weak responses may not be visible in the wider range.

1.4.4 The data has been displayed relative to a digital base plan provided by the client as drawing *'P22048 – F+G – Belmont School, Durham.dwg'*. The base plan was in the Ordnance Survey National Grid co-ordinate system and as the survey grids / data were referenced directly to National Grid co-ordinates the data could be simply superimposed onto the base plan in the correct position.

1.5 Interpretation

1.5.1 The anomalies have been categorised based on the type of response that they have and an interpretation as to the cause(s) or possible cause(s) of each anomaly type is also provided. The following anomaly types may be present within the data:

Dipolar, bipolar and strong responses

Dipolar and bipolar responses are those that have a sharp variation between strongly positive and negative components.

In the majority of cases these responses are usually caused by modern ferrous features / objects, although fired material (such as brick), some ferrous or industrial archaeological features and strongly magnetic gravel could also produce dipolar and bipolar responses.

Isolated dipolar responses are those that have a single positive and negative element. They are usually caused by isolated, ferrous or fired material on or near to the surface. The objects that cause dipolar responses are usually relatively small, such as spent shotgun cartridges, iron nails and horseshoes (hence they are often referred to as 'iron spikes') or pieces of modern brick or pot. Some types of archaeological artefacts can also produce this type of response but unless there is strong supporting evidence to the contrary they are assumed not to be of archaeological significance.

Bipolar anomalies have strong positive and negative components but are not technically magnetic dipoles. The majority of **isolated bipolar responses** are caused by ferrous or fired material on or near to the surface. These responses tend to be produced from larger objects, compared to dipolar anomalies, or a concentration of smaller objects. Some archaeological features/ activity, including areas of burning or industrial activity can also produce this type of response but unless there is strong supporting evidence to the contrary they are assumed not to be of archaeological significance.

Smaller isolated dipolar and bipolar responses have not been shown on the interpretation as there is no evidence to suggest that they are related to archaeological activity. Several larger isolated bipolar responses have been shown as these could be associated with more significant sub-surface features or material (although in this instance they are not thought to be of archaeological interest).

Bipolar linear anomalies are usually produced by metallic buried pipes / cables, although some ceramic pipes or features containing fired material, such as brick structures or

foundations, can also produce bipolar anomalies. In some instances the anomaly can extend for a significant distance beyond the feature that produces the anomaly. Bipolar anomalies are often very strong and can potentially mask responses from other sub-surface features in the vicinity of the underlying feature.

Areas containing numerous **strong dipolar / bipolar responses** (**magnetic disturbance)** are usually caused by greater concentrations of ferrous or fired material and are often found adjacent to field boundaries where such material tends to accumulate. Above ground metallic or strongly magnetic features, such as fences, gates, pylons and buildings can also produce very strong bipolar responses. If an area of magnetic disturbance is located away from existing field boundaries then it could indicate a former field boundary, several large isolated objects in close proximity, an area where modern material has been tipped or an infilled cut feature, such as a quarry pit. Areas of dipolar / bipolar response can occasionally be caused by features / material associated with archaeological industrial activity or natural deposits that have varying magnetic properties but they are usually caused by modern activity. Responses in areas of magnetic disturbance can sometimes be so strong that archaeological features located beneath them may not be detected.

Very strong responses, notably bipolar anomalies, from modern features can dominate the data for a significant distance beyond the feature. The extent of these areas is usually shown either as part of the bipolar anomaly or as a **limit of very strong response.** It should be noted that this effect extends beyond the feature and so the limit of the response does not correspond to the actual size or location of the feature within it. In many cases where these strong responses are present at the edge of survey area the feature causing the anomaly be actually be located beyond the survey area. It should be recognised that other sub-surface features located within these areas may not be detected.

Negative linear / curvi-linear anomalies

Negative linear / curvi-linear anomalies occur when a feature has lower magnetic readings than the surrounding material and can often be associated with ploughing regimes or plastic / concrete pipes or natural features.

They can also indicate the presence of a feature that cuts into magnetic soils or bedrock and which is infilled with less magnetic material and in certain geologies can be associated with archaeological features.

Any negative linear anomalies in this data set are thought to relate to drainage, agricultural or other relatively modern activity.

Linear / curvi-linear anomalies (probable agricultural)

In many geological / pedological conditions agricultural features / regimes can produce magnetic anomalies due to the accumulation / alignment of magnetic topsoil. In most cases these are exhibited as a series of **broadly parallel positive linear** anomalies. The majority of these responses are associated with modern ploughing regimes but in some instances, where the responses are broader and more widely spaced, they can indicate the presence of the remnants of ridge and furrow.

Field drain systems can also produce linear anomalies, usually where the drains are made from fired ceramic or infilled with magnetic gravels.

Where a series of parallel anomalies are present then the approximate orientation of the anomalies are shown on the interpretation drawing to indicate the direction of the agricultural regime but for the sake of clarity individual anomalies have not been shown.

Individual anomalies may be shown if the response is not part of a regime.

Broad area of positive / negative responses

Broad areas of positive / negative responses can have a variety of causes. If the areas are generally quite large and irregular in shape then they are usually suggestive of natural features, such as lenses of sand and gravel deposits, palaeochannels or other natural features / variations where the natural material differs from the surrounding sub-surface. In some instances anomalies of this type can be associated with anthropogenic (usually modern) activity.

There are no anomalies of this type in this data set.

Linear / curvi-linear trends

An anomaly is categorised as a **trend** if it is not certain that the response is associated with an extant sub-surface feature. Trends are usually weak, irregular, diffuse or discontinuous and it is usually not certain what their cause is, if they represent significant sub-surface features or even if they are associated with definite features.

It is possible that some of the trends are associated with geological / pedological variations. Others may be produced by artificial constructs within the data, either caused by processing or in some instances by intersecting anomalies (usually different agricultural regimes) that give the appearance of curving or regular shapes. Many trends are a product of weak, naturally occurring responses that happen to form a regular pattern but which are not associated with a sub-surface feature.

In some instances former features that have been severely truncated can still produce broad, diffuse or weak responses even if the underlying feature has been removed. This is due to the presence of magnetic soils associated with the former feature still being present along its route. In other instances the magnetic properties of the soils filling a feature may vary and so the magnetic signature of the feature can change, even if the sub-surface feature itself remains uniform. If a response from a feature becomes significantly weak or diffuse then part of the anomaly may be shown as a trend as it is uncertain if the feature is still present or has been severely truncated or removed.

Isolated positive responses

Isolated positive responses can occur if the magnetism of a feature, area or material has been enhanced or if a feature is naturally more magnetic than the surrounding material. It is often difficult to determine which of these factors causes any given responses and so the origin of this type of anomaly can be difficult to determine. They can have a variety of causes including geological variations, infilled archaeological features, areas of burning (including hearths), industrial archaeological features, such as kilns, or deeper buried ferrous material and modern fired material.

The large number of isolated responses and lack of an obvious pattern to their distribution suggests that these anomalies are probably associated with geological / pedological variations or deeper buried ferrous or fired material. Only the larger or stronger areas of positive response have been shown on the interpretation. The majority, if not all of these

responses, will be related to natural variations or relatively modern material but have been shown as their exact cause cannot be determined with certainty.

Positive linear / curvi-linear anomalies

Positive magnetic anomalies indicate an increase in magnetism and if the resulting anomaly is linear or curvi-linear then this can indicate the presence of a man-made feature. **Positive or enhanced linear / curvi-linear** anomalies can be associated with agricultural activity, drainage features but they can also be caused by ditches that are infilled with magnetically enhanced material and as such can indicate the presence of archaeological features. Some natural infilled features can also produce positive anomalies.

1.5.2 Several different ranges of data were used in the interpretation to ensure that the maximum information possible is obtained from the data.

1.5.3 X-Y trace plots were examined for all of the data and overlain onto the greyscale plot to assist in the interpretation, primarily to help identify dipolar / bipolar responses that will probably be associated with surface / near-surface iron objects. X-Y trace plots have not been used in the report as they do not show any additional anomalies that are not visible in the greyscale data. A digital drawing showing the X-Y trace plot overlain on the greyscale plot has been provided in the digital archive.

1.5.4 All isolated responses have been assessed using a combination of greyscale and X-Y trace plots.

1.5.5 Anomalies associated with probable agricultural regimes are present in the data. The general orientation of these regimes has been shown on the interpretation but, for the sake of clarity, each individual anomaly has not been shown.

1.5.6 The greyscale plots and the accompanying interpretations of the anomalies identified in the magnetic data are presented as 2D AutoCAD drawings. The interpretation is made based on the type, size, strength and morphology of the anomalies, coupled with the available information on the site conditions. Each type of anomaly is displayed in separate, easily identifiable layers annotated as appropriate.

1.6 Limitations of magnetic surveys

1.6.1 The magnetic survey method requires the operator to walk over the site at a constant walking pace whilst holding the instrument. The presence of an uneven ground surface, dense, high or mature vegetation or surface obstructions may mean that some areas cannot be surveyed.

1.6.2 The depth at which features can be detected will vary depending on their composition, size, the surrounding material and the type of magnetometer used for the survey. In good conditions large, magnetic targets, such as buried drums or tanks can be located at depths of more than 4 m. Smaller targets, such as buried foundations or archaeological features can be located at depths of between 1 m and 2 m.

1.6.3 A magnetic survey is highly sensitive to interference from surface and near-surface magnetic ‘contaminants’. Surface features such as metallic fencing, reinforced concrete, buildings or walls all have very strong magnetic signatures that can dominate readings collected adjacent to them. Identification of anomalies caused by sub-surface features is therefore more difficult or even not possible in the vicinity of surface and near-surface magnetic features.

1.6.4 The presence of made ground also has a detrimental effect on the magnetic data quality as this usually contains magnetic material in the form of metallic scrap and brick. Identification of features beneath made ground is still possible if the target feature is reasonably large and

has a strong magnetic response but smaller features or magnetically weak features are unlikely to be identified.

1.6.5 It should be noted that anomalies that are interpreted as modern in origin may be caused by features that are present in the topsoil or upper layers of the subsoil. Removal of soil to an archaeological or natural layer can therefore remove the feature causing the anomaly.

1.6.6 A magnetic survey does not directly locate sub-surface features - it identifies variations or anomalies in the local magnetic field caused by features. It can be possible to interpret the cause of anomalies based on the size, shape and strength of response but it should be recognised that a magnetic survey produces a plan of magnetic variations and not a plan of all sub-surface features. Interpretation of the anomalies is often subjective and it is rarely possible to identify the cause of all magnetic anomalies. Geological or pedological (soil) variations or features can produce responses similar to those caused by man-made (anthropogenic) features.

1.6.7 Anomalies identified by a magnetic survey are located in plan. It is not usually possible to obtain reliable depth information on the features that cause the anomalies.

1.6.8 Not all features will produce a measurable magnetic response and the effectiveness of a magnetic survey is also dependant on the site-specific conditions. It is not possible to guarantee that a magnetic survey will identify all sub-surface features. A magnetic survey is often most-effective at identifying sub-surface features when used in conjunction with other complementary geophysical techniques.

The Archaeological Practice Ltd.

Westmorland House, Elswick East Terrace,
Newcastle upon Tyne, NE4 7LJ
Tel: 0191 273 0777; Fax: 0191 273 1777
Email: info@archaeologicalpractice.co.uk
Web: www.archaeologicalpractice.co.uk