Egley Road, Woking, Surrey

Unmanned Aerial Vehicle LiDAR Survey Report

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Quality Assurance

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Summary

Wessex Archaeology were commissioned by CALA Homes (Thames) Ltd to undertake an Unmanned Aerial Vehicle based LiDAR survey of land at Egley Road, Woking, Surrey (NGR 499570, 156882) as part of the archaeological works recommended by Surrey County Council in response to a planning application for a proposed residential development within the site.

The UAV LiDAR survey of the site, comprised of a single grassy field approximately 4.3 hectares in size, was undertaken on 27 March 2023. Post processing was undertaken in ArcGIS and Relief Visualisation Toolbox where in various visualisations of both the digital terrain model (DTM) and digital surface model (DSM) were produced for analysis.

The results of the analysis of the visualisations indicate the presence of multiple phases of ridge and furrow within the field. Two examples of narrow ridge and furrow are present towards the south of the site and potential broad ridge can be seen to the north, however all features appear to have been heavily degraded by later use of the field and now only exist as very slight topographical expressions, no longer visible at ground level.

Acknowledgements

Wessex Archaeology would like to thank CALA Homes (Thames) Ltd, for commissioning the UAV LiDAR Survey. Wessex Archaeology is also grateful for the advice of Archaeological Officer Nigel Randall, who monitored the project for surrey County Council.

The UAV LiDAR survey was completed by Anthony Russell with the assistance of Emily Troake. Production and analysis of the visualisations was completed by Kimberley Colman. The project was managed on behalf of Wessex Archaeology by Tori Wilkinson.

Egley Road, Woking, Surrey

Unmanned Aerial Vehicle LiDAR Survey

1 INTRODUCTION

1.1 Project and planning background

1.1.1 Wessex Archaeology was commissioned CALA Homes (Thames) Ltd (the client), to undertake an Unmanned Aerial Vehicle (UAV) Light Detection and Ranging (LiDAR) survey of land at Egley Road, Woking, Surrey (hereafter 'the Site,' **Figure 1**), centred on NGR 499570, 156882.

1.1.2 This survey is part of a programme of archaeological works recommended by the Archaeological Officer at Surrey Country Council (SCC) in a formal consultation response (1 August 2022) to the planning application (ref 2022/0694) for a proposed residential development within the Site, submitted to Woking Borough Council on 22 July 2022. An archaeological evaluation phase will follow the UAV LiDAR survey, for which a separate Written Scheme of Investigation (WSI) will be produced.

1.1.3 All works were undertaken in accordance with a written scheme of investigation (WSI) which detailed the aims, methodologies, and standards to be employed in order to undertake the survey (Wessex Archaeology 2023). The Archaeological Officer at Surrey County Council approved the WSI, on behalf of the Local Planning Authority (LPA), prior to fieldwork commencing.

1.1.4 The survey was undertaken on 27 March 2023.

1.2 Scope of the report

1.2.1 The purpose of this report is to provide a detailed description of the results of the UAV LiDAR Survey, to interpret these results and assess whether the aims of the survey have been met.

1.2.2 The presented results will provide further information on the archaeological resource within the project area that may be impacted by the proposed development and facilitate an informed decision regarding the requirement for, and methods of, any further archaeological mitigation.

1.3 Location, topography and geology

1.3.1 The Site comprises an irregular trapezoidal field with a small spur in its south-western corner covering a total area of approximately 4.3 hectares (ha). The Site is located at the southern edge of Woking, between the settlements of Hooks Heath and Mayford (**Figure 1**).

1.3.2 The Site is currently an open grassy area consisting of a single field, enclosed on all sides by mature hedgerows, and containing several mature trees within its interior.

1.3.3 A twentieth-century residential development borders the Site to the north along the road Hillside, while the Portsmouth Direct Line railway forms the Site's western boundary. Hoe

Valley School and Woking Sportbox bound the southern aspect of the Site, whilst Egley Road (A320) defines the Sites eastern boundary.

1.3.4 The Site is situated within a relatively flat area of land at an elevation of approximately 25 - 45 m above Ordnance Datum (aOD). Local topography falls gently to the south-east towards the valley of the Hoe Stream which flows approximately 300 m east of the Site.

1.3.5 The underlying bedrock geology throughout the Site is mapped as the Bagshot Formation Sand whilst no superficial deposits are noted within the Site boundaries (British Geological Survey, Geology of Britain Viewer).

1.3.6 The Site is located within the Thames Basin Heath Natural Character Area (NCA), characterised by heathland, woodland.

2 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

2.1 Introduction

2.1.1 The archaeological and historical background of the site and surrounding area was assessed in a prior Desk-Based Assessment (DBA: Wessex Archaeology 2022) and subsequently summarised in the WSI (Wessex Archaeology 2023).

2.2 Summary of Archaeological Desk Based Assessment

2.2.1 The archaeological and historical background was assessed in a prior desk-based assessment (DBA: Wessex Archaeology 2022), which considered the known historic environment resource within a 1 km study area of the site perimeter. The DBA concluded that there was potential for the presence of buried archaeological remains, in particular relating to the prehistoric period and medieval period.

2.2.2 The DBA included an assessment of available Environmental Agency 1 m LiDAR dataset. This indicated possible medieval ridge and furrow within the northern section of the Site. These remnants of arable cultivation may be associated with the former Egley Farm which had its origins in the 14th century.

2.2.3 Previous investigations in the immediate vicinity of the Site undertaken at Hoe Valley School and Woking Sportbox encountered evidence of past occupation and land use, with finds dated to prehistory and the medieval period and a pit and ditch of unknown date. In addition, in a Mesolithic Axe, was unearthed in 1957 at location recorded on the SHER as within 5 m of the Site's northern boundary although the accuracy of the location of this find is uncertain.

2.2.4 The Site is also located adjacent to the former Egley Farm, which has probable medieval origins, therefore there is a moderate potential for archaeological remains relating to the medieval period, particularly in the Site's north-east extent, closest to the location of the former Egley Farm. The LiDAR imagery reviewed in the previous DBA may suggest that features relating to the ridge and furrow agricultural regime during the medieval and post-medieval periods could exist within the Site. However, these could represent later ploughing activities within the Site in the 19th and 20th centuries. No extant ridge and furrow earthworks were visible during the site visit.

2.2.5 Evidence from the wider study area also indicates a possibility of encountering archaeological remains relating to other periods such as the Romano-British and post-medieval periods, although the lack of evidence from the immediate vicinity of the Site regarding these periods suggests the potential for such remains is low.

2.2.6 During the post-medieval period and 19th century mapping evidence indicates the Site was used as farmland and subsequently an arboricultural nursery, with any remains present from these periods most probably agricultural in nature. There is considered to be moderate potential for agricultural features from these periods, which would be of limited archaeological significance.

2.2.7 More recent mapping evidence and the results of the evaluation at the neighbouring Hoe Valley School suggest that in the Modern period this agricultural land use has continued with the Site being used as pasture/grassland following the closure of the arboricultural nursery (Wessex Archaeology 2022).

3 AIMS AND METHODS

3.1 Project aims

3.1.1 With due regard to the CIfA *Standard and guidance for archaeological field evaluation* (CIfA 2014a), the general aims of the survey, as stated in the WSI (Wessex Archaeology 2023) were to:

3.2 General aims

3.2.1 The general aims (or purpose) of the UAV LiDAR survey are:

- To provide information about the archaeological potential of the site; and
- To inform either the scope and nature of any further archaeological work that may be required; or the formation of a mitigation strategy (to offset the impact of the development on the archaeological resource); or a management strategy.

3.3 General objectives

3.3.1 In order to achieve the above aims, the general objectives of the UAV LiDAR survey are:

- To establish, within the constraints of the UAV LiDAR survey, the extent, character, condition, and quality of any surviving archaeological remains within the specified area;
- To place any identified archaeological remains within a wider historical and archaeological context in order to assess their significance; and
- To make available information about the archaeological resource within the site by reporting on the results of the UAV LiDAR survey.

3.4 Methods

Introduction

3.4.1 All works were undertaken in accordance with the detailed methodology set out within the WSI (Wessex Archaeology 2023) and in general compliance with the standards outlined in CIfA (CIfA 2014a) and Historic England (Historic England 2015) guidance. The methods employed are summarised below.

Fieldwork methods

3.4.2 The survey was conducted using a Da-Jiang Innovations (DJI) Matrice 300 UAV equipped with a DJI L1 LiDAR sensor.

3.4.3 The DJI L1 records up to 240,000 3D points per second and up to 480,000 when set to record multiple returns. The L1 also comes equipped with a 20-megapixel CMOS camera sensor for capturing RGB imagery for colourisation of the point cloud.

3.4.4 Two pre-programmed flights were undertaken at a height of 50m AGL (above ground level), at a speed of 5 meters per second and with a swath (or flight line) overlap of 50%, resulting in an average point density of 680 points per square meter per flight. The flights were conducted to create swaths perpendicular to each other, in a grid pattern, to survey the site from opposing angles and thereby ensure greater chance of collecting ground level data through the vegetation.

3.4.5 Survey control was established using a Leica Captivate NetRover Global Navigation Satellite System (GNSS) achieving a three-dimensional accuracy of 3 cm or better.

3.4.6 Control consisted of 6 temporary ground control points (GCPs), which were distributed around the site prior to the flights being conducted. The position of each GCP was recorded using the Leica GNSS with a real time kinematic (RTK) link to the Ordnance Survey Active GNSS Network.

3.4.7 All data is presented in Ordnance Survey Grid and Datum.

Data sources

3.4.8 Other sources were consulted during the analysis to aid interpretation of anomalies detected within the topographic visualisations created, this included:

- Satellite Imagery such as Google Earth and Bing.
- Historic mapping (if available).

Data Processing

3.4.9 Digital Terrain Model (DTM) and Digital Surface Model (DSM) datasets in tiff format were created with an overall survey accuracy of 0.20 m from the point cloud captured by UAV based LiDAR. The raster files were processed in RVT (Relief Visualisation Toolbox) (Kokalj and Somrak, 2019; Zaksek *et al*, 2011), creating the following topographic visualisations:

- Shaded relief topographic visualisation (Hillshade).
- 32 Multi-directional Hillshade, which produces multiple shaded reliefs, illuminating a surface from multiple directions to enhance slighter topographic features.
- Slope Severity, producing a visualisation that conveys the maximum rate of change in height between neighbouring cells in the DTM and DSM.
- Sky View Factor (SVF), producing a visualisation that identifies light on any upstanding topographic feature and depressions that receive less light.
- Local Relief Model (LRM), producing a visualisation that enhances small scale topographic features and removes larger features such as valleys and landforms.
- Principle Component Analysis (PCA), producing a visualisation to emphasize variation and patterns in the data.

3.4.10 The intensity surface was created using ArcPro 3.1 using the 'LAS to Raster' function on the last pulse intensity return. Intensity is collected using a near-infrared wavelength (*c.* 947nm), measuring the reflection to absorption ratio of surface materials (Challis *et al.* 2011).

3.4.11 ArcPro 3.1 was used to both display and analyse the topographic visualisations and to digitise features of archaeological and historical interest. For digitisation, visualisations were routinely displayed to standard deviations of the display window, enhancing the ability to detect subtle features. Archaeological features identified were recorded as polygons in shapefile format. Each polygon represents the full extent of the recorded feature (English Heritage, 2010b).

3.4.12 The DTM was classified to 0.20 m interval in ArcPro 3.1 to highlight the topographic gradient across the site.

3.4.13 Transects were created across ridge and furrow to capture the profiles of the earthworks. Points were created at 0.20 m intervals across the transect and the height values were extracted across the DTM.

3.5 Identification and Recording

3.5.1 Archaeological features identified were recorded as polygons within shapefile format. Each polygon represents the full extent of the recorded feature (English Heritage, 2010b). The features were mapped in accordance with guidance developed by the *Historic England Aerial Investigation & Mapping (AI&M, formerly National Mapping Programme) Standards Technical Review* (Historic England, 2019); *National Mapping Programme Draft Monument Recording Guidelines* (English Heritage, 2010a); *National Mapping Programme Draft Transcription Guidelines* (English Heritage, 2010b) and *NMP Database Recording Guidelines* (English Heritage, 2010c).

3.5.2 Attributes for the digitised features were created and can be found in the gazetteer (Tables 1 & 2) in the appendix below. Attribute information included:

- Broad Type (in accordance to HE FISH thesaurus).
- Narrow Type (in accordance to HE FISH thesaurus).
- Comments
- LiDAR detection (which visualisations the feature was detected from).
- Level of confidence.
- Area and shape.

4 LIMITATIONS

4.1 Data Limitations

4.1.1 Although the LiDAR was captured at a survey accuracy of 0.20 m, there are several limitations within the visualisations produced that may have affected the detection, identification, and interpretation of archaeological features during the analysis.

4.1.2 Features were identified and interpreted in the absence of ground level observations. This can result in interpretation errors where localised variations in ground profile that are of very recent or natural origin, resemble archaeological features. This issue was partially alleviated by comparing the LiDAR images against conventional satellite imagery and British Geological Survey mapping.

4.1.3 There are also certain methodological limitations which are inherent to the remote sensing techniques employed during the assessment. For example, linear features or those that run parallel may not be detected in the multi-directional hillshade visualisation, as direct light can restrict the image in dark shade and bright lit areas, meaning little detail can be perceived. When a single light beams on features that run parallel, it can cause problems identifying the linear structures (Devereux *et al,* 2008).

4.1.4 The survey area lies within an area that was previously farmland and subsequently an arboricultural nursery and may have been subject to intensive agricultural techniques (Wessex Archaeology 2022). As a result, the topographic expression of archaeological features may have been greatly reduced by ploughing or similar across large parts of the survey area. This may result in a difference in the topographic detection rate of archaeological features between fields which have been intensively ploughed, and areas which have not, such as within parks (unless extensively landscaped) or land which has predominantly been under pasture.

4.1.5 There is a limitation to using DSMs when identifying archaeological features. DSMs depict the elevation of the top of reflective surfaces, capturing vegetation which can mask archaeological features.

5 ARCHAEOLOGICAL RESULTS

5.1 Initial Processing

Survey Control

5.1.1 A minimum of four observations were recorded for each GCP. Observations were then brought into Microsoft Excel and checked for outliers, such as those with values with standard deviations outside of the expected tolerances of the equipment used. The observations were then averaged, and all differences were found to be within equipment tolerances. The standard deviations of the easting, northing and heights of the averaged observations can be found below in Table 1.

Table 1 Standard Deviations of Ground Control GNSS Observations

Ground Control Point (GCP)	Standard Deviations (mm)		
	σ **Easting**	σ **Northing**	σ **Elevation**
GCP1	0.010	0.005	0.014
GCP2	0.003	0.005	0.010
GCP3	0.008	0.009	0.017
GCP4	0.009	0.013	0.015
GCP5	0.004	0.012	0.007
GCP6	0.005	0.005	0.013

Initial LiDAR Processing

5.1.2 The strip adjustment module within TerraMatch software was used to align the LiDAR data. The average 3D mismatch per strip was found to be 0.003 m following adjustment.

Following adjustment, the data was then 'cleaned' to remove noise and duplicate points before export as a LAS file for further processing in ArcGIS.

5.2 Results

5.2.1 The purpose of the archaeological analysis of airborne LiDAR was to record and establish the extent of topographic archaeological features within the defined area of the site boundary at Egley Rd. The identified features consisted of banks and ditches (ridge and furrow) indicative of medieval to post-medieval agricultural activity.

5.2.2 The LiDAR intensity identified no archaeological features and DSM visualisations identified some archaeological features, but there was less clarity and definition than using the DTM visualisations. Overall, the DTM visualisations captured the most archaeological features, fifty-nine in total. The DSM visualisations captured 42 of the 59 features, all of which were captured in the DTM visualisations to a greater extent (appendix 1 gazetteer).

5.2.3 Separate phases of ridge and furrow were identified in the LRM. To the south of the site narrow ridge and furrow, identifiable by the relatively narrow width as well as the regularity or straightness of the features, can be seen running on an east-west orientation. Further narrow ridge and furrow can be seen to the south and centre of the site, running southwest to northeast. To the north possible broad ridge and furrow, also running east-west, can be seen however these features have been heavily degraded by later activity.

5.2.4 Cross sections revealed the ridge and furrow is very shallow/faint. The site visit undertaken as part of the desk-based assessment also noted that no extant earthworks were visible at the time (Wessex Archaeology 2022).

6 CONCLUSIONS

6.1 Concluding Comments

6.1.1 The Local Relief Model visualisation produced from the DTM identified the most archaeological features. The Multi-Directional, Analytical hillshade, Sky View Factor and Slope Severity visualisations identified some topographic features, but there was less clarity and definition than using the Local Relief Model. The Local Relief Model can be found in **Figure 3** and in **Figure 4** with interpretation.

6.1.2 The profiles of the transects show that the ridges have a maximum height of 3 cm and the furrows have a maximum depth of 5cm. The locations of the transects can be seen in **Figure 5** and the profiles in **Figure 6**.

7 ARCHIVE STORAGE AND CURATION

7.1 OASIS

7.1.1 An OASIS online record (http://oasis.ac.uk/pages/wiki/Main) has been initiated, and key fields completed on Details, Location and Creators Forms. All appropriate parts of the OASIS online form will be completed for submission and will include an uploaded .pdf version of the final report. Subject to any contractual requirements on confidentiality, copies of the OASIS record will be integrated into the relevant local and national records and published through the Archaeology Data Service ArchSearch catalogue.

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REFERENCES

British Geological Survey online viewer http://mapapps.bgs.ac.uk/geologyofbritain/home.html (April 2023)

Challis, K, Carey, C, Kincey, M and Howard, A.J 2011 Assessing the preservation potential of temperate, lowland alluvial sediment using airborne lidar intensity. *Journal of Archaeological Science 38*: 301-311.

Chartered Institute for Archaeologists [CIfA] 2014a *Standard and guidance for archaeological field evaluation*. Reading, CIfA

CIfA 2014b *Standard and guidance for the creation, compilation, transfer, and deposition of archaeological archives*. Reading, CIfA

CIfA 2014c *Code of Conduct*. Reading, CIfA

CIfA 2014d *Regulations for Professional Conduct*. Reading, CIfA

Devereux, B J, Amable, G S and Crow, P 2008 Visualisation of LiDAR terrain models for archaeological feature detection. *Antiquity 82*(316): 470-479.

English Heritage 2010a *National Mapping Programme Draft Monument Recording Guidelines*. Swindon: English Heritage.

English Heritage 2010b *National Mapping Programme Draft Transcription Guidelines*. English Heritage: Swindon: English Heritage.

English Heritage 2010c *NMP Database Recording Guidelines*. Swindon: English Heritage.

Historic England 2015 *Metric Survey Specifications for Cultural Heritage.* Swindon, Historic England

Historic England 2019 *Historic England Aerial Investigation & Mapping (formerly National Mapping Programme) Standards Technical Review.*

Kokalj, Ž, Somrak, M 2019 Why Not a Single Image? Combining Visualizations to Facilitate Fieldwork and On-Screen Mapping. *Remote Sensing 11*(7): 747

Wessex Archaeology 2022 *Egley Road, Woking, Surrey, Archaeological Desk-Based Assessment*

Wessex Archaeology 2023 *Egley Road, Woking, Surrey WSI*

Zakšek, K, Oštir, K, Kokalj, Ž 2011 Sky-View Factor as a Relief Visualization Technique. *Remote Sensing 3*(2): 398-41

APPENDICES

8.3 Appendix 1

Table 2 Results Gazetteer

Broad Type	Narrow Type	Comments	DTM Analytical Hillshade	DTM Multi-directional Hillshade	DTM Slope Severity	DTM Local Relief Model	DTM Sky View Factor	DTM Principal Component Analysis	Level of Confidence	Shape Length (m)	Shape Area (m^2)
Ridge and Furrow	Narrow Ridge and Furrow	Furrow	Visible	Not visible	Visible	Visible	Visible	Visible	High	153.332241	192.19721
Ridge and Furrow	Narrow Ridge and Furrow	Furrow	Visible	Visible	Visible	Visible	Visible	Visible	High	113.777143	145.081456
Ridge and Furrow	Narrow Ridge and Furrow	Furrow	Visible	Visible	Visible	Visible	Visible	Visible	High	118.978491	152.870259
Ridge and Furrow	Narrow Ridge and Furrow	Furrow	Visible	Visible	Visible	Visible	Visible	Visible	High	208.386778	302.239149
Ridge and Furrow	Narrow Ridge and Furrow	Furrow	Visible	Visible	Visible	Visible	Visible	Visible	High	108.927954	123.270369
Ridge and Furrow	Narrow Ridge and Furrow	Furrow	Visible	Visible	Not visible	Visible	Visible	Visible	Medium	89.1345089	104.847717
Ridge and Furrow	Narrow Ridge and Furrow	Furrow	Not visible	Visible	Not visible	Visible	Not visible	Visible	Medium	104.97593	177.069093
Ridge and Furrow	Narrow Ridge and Furrow	Furrow	Visible	Visible	Not visible	Visible	Not visible	Visible	Medium	60.0796331	108.435597

Ridge and Furrow	Narrow Ridge and Furrow	Furrow	Visible	Visible	Visible	Visible	Visible	Visible	High	107.993778	175.129967
Ridge and Furrow	Narrow Ridge and Furrow	Furrow	Visible	Visible	Visible	Visible	Visible	Visible	High	86.1910431	147.03472
Earthwork	Bank	Bank	Not visible	Visible	Not visible	Visible	Not visible	Visible	Medium	299.735983	652.584371
Earthwork	Bank	Bank	Not visible	Visible	Not visible	Visible	Visible	Visible	Medium	45.070289	78.1916079
Ridge and Furrow		Furrow	Visible	Visible	Visible	Visible	Not visible	Visible	High	35.3966526	50.4509736
Ridge and Furrow		Furrow	Visible	Visible	Visible	Visible	Not visible	Visible	High	203.497651	398.107637
Ridge and Furrow		Furrow	Visible	Visible	Visible	Visible	Not visible	Visible	High	46.0832633	79.2650243
Ridge and Furrow		Furrow	Visible	Visible	Not visible	Visible	Not visible	Visible	High	44.2501333	96.5000876
Ridge and Furrow		Ridge	Visible	Visible	Not visible	Visible	Not visible	Visible	High	155.674769	235.943865
Ridge and Furrow		Ridge	Visible	Visible	Not visible	Visible	Visible	Visible	High	58.0103303	121.733407
Ridge and Furrow		Ridge	Visible	Visible	Not visible	Visible	Visible	Visible	High	49.6656202	80.2337945
Ridge and Furrow	Narrow Ridge and Furrow	Ridge	Visible	Visible	Not visible	Visible	Visible	Visible	High	147.719392	200.412973
Ridge and Furrow	Narrow Ridge and Furrow	Ridge	Visible	Visible	Not visible	Visible	Visible	Visible	High	118.000402	206.774476

Earthwork	Ditch	Ditch, possible ridge and furrow	Not visible	Not visible	Not visible	Visible	Not visible	Visible	Low	38.5870093	48.2996195
Ridge and Furrow		Ridge	Visible	Visible	Not visible	Visible	Visible	Visible	High	67.3442553	107.010546
Ridge and Furrow		Furrow	Visible	Visible	Visible	Visible	Not visible	Visible	High	172.073526	269.880221
Ridge and Furrow		Furrow	Visible	Visible	Not visible	Visible	Not visible	Visible	High	48.392083	63.9477786
Ridge and Furrow		Furrow	Visible	Visible	Not visible	Visible	Not visible	Visible	High	72.178466	95.7322309
Ridge and Furrow		Furrow	Visible	Visible	Visible	Visible	Not visible	Visible	High	37.6904787	45.8294611
Ridge and Furrow		Ridge	Visible	Visible	Visible	Visible	Not visible	Visible	High	94.4878934	206.162198
Ridge and Furrow		Ridge	Visible	Visible	Visible	Visible	Not visible	Visible	High	92.5147002	205.793319
Ridge and Furrow		Furrow	Visible	Visible	Not visible	Visible	Not visible	Visible	High	369.761384	740.865428
Ridge and Furrow		Ridge	Not visible	Visible	Not visible	Visible	Not visible	Visible	Low	54.3403357	78.4943113
Ridge and Furrow		Furrow	Visible	Visible	Not visible	Visible	Not visible	Visible	High	145.794769	250.957003
Ridge and Furrow		Furrow	Visible	Visible	Visible	Visible	Not visible	Visible	High	31.9286638	38.467594
Ridge and Furrow		Furrow	Visible	Visible	Not visible	Visible	Not visible	Visible	High	35.3045342	31.6579468

Ridge and Furrow		Ridge	Visible	Visible	Visible	Visible	Not visible	Visible	High	139.851123	285.566007
Ridge and Furrow		Ridge	Visible	Visible	Visible	Visible	Not visible	Visible	High	55.3656734	103.400556
Ridge and Furrow		Ridge	Visible	Visible	Visible	Visible	Not visible	Visible	High	52.3514904	113.77457
Ridge and Furrow		Ridge	Visible	Visible	Visible	Visible	Not visible	Visible	High	53.7642216	133.781536
Earthwork	Ditch	Ditch	Visible	Visible	Not visible	Visible	Not visible	Visible	Medium	399.638768	949.964971
Ridge and Furrow		Ridge	Visible	Visible	Visible	Visible	Not visible	Visible	High	143.31592	311.515689
Ridge and Furrow		Furrow	Not visible	Not visible	Not visible	Visible	Not visible	Visible	Medium	144.177257	198.700084
Earthwork	Ditch	Ditch	Not visible	Visible	Not visible	Visible	Not visible	Visible	Medium	46.630468	31.5464878
Earthwork	Ditch	Ditch	Not visible	Not visible	Not visible	Visible	Not visible	Visible	Medium	18.1316363	11.9754403
Ridge and Furrow		Furrow	Visible	Visible	Not visible	Visible	Not visible	Visible	Medium	108.069668	159.193706
Ridge and Furrow		Ridge	Visible	Visible	Not visible	Visible	Not visible	Visible	High	137.674924	380.634602
Ridge and Furrow		Ridge	Not visible	Not visible	Not visible	Visible	Not visible	Visible	Low	34.3713584	48.6845878
Earthwork	Ditch	Ditch	Not visible	Visible	Not visible	Visible	Not visible	Visible	Low	39.8066111	28.4380807
Earthwork	Ditch	Ditch	Not visible	Visible	Not visible	Visible	Visible	Visible	Low	66.4235535	41.6315993

Earthwork	Ditch	Ditch	Not visible	Visible	Not visible	Visible	Visible	Visible	Low	191.751895	193.210432
Ridge and Furrow		Ridge	Visible	Visible	Not visible	Visible	Not visible	Visible	Low	47.2325184	91.6935492
Earthwork	Ditch	Ditch, possible ridge and furrow	Not visible	Visible	Not visible	Visible	Not visible	Visible	Medium	32.0701086	26.6168898
Ridge and Furrow		Furrow	Visible	Visible	Not visible	Visible	Not visible	Visible	High	44.2713294	51.8904349
Ridge and Furrow		Furrow	Not visible	Not visible	Not visible	Visible	Not visible	Visible	Low	117.685535	209.168554
Ridge and Furrow		Furrow	Not visible	Visible	Not visible	Visible	Not visible	Visible	Low	56.7439172	73.7435817
Ridge and Furrow		Ridge	Not visible	Not visible	Not visible	Visible	Not visible	Visible	Low	46.6013532	76.7129145
Ridge and Furrow		Ridge	Not visible	Not visible	Not visible	Visible	Not visible	Visible	Low	106.920814	182.17137
Ridge and Furrow		Ridge	Visible	Not visible	Not visible	Visible	Not visible	Visible	Medium	31.8214921	38.5203749
Ridge and Furrow		Furrow	Not visible	Not visible	Not visible	Visible	Not visible	Visible	Low	77.7907741	144.627003
Ridge and Furrow		Ridge	Visible	Visible	Not visible	Visible	Not visible	Visible	Low	132.072572	331.19029

Table 3

Table 4 DSM Gazetteer

Broad Type	Narrow Type	Comments	DSM Analytical Hillshade	DSM Multi-directional Hillshade	DSM Slope Severity	DSM Local Relief Model	DSM Sky View Factor	DSM Principal Component Analysis	Level of Confidence	Shape Length (m)	Shape Area (m^2)
Ridge and Furrow	Narrow Ridge and Furrow	Furrow	Visible	Visible	Not visible	Visible	Visible	Not visible	High	153.332241	192.19721
Ridge and Furrow	Narrow Ridge and Furrow	Furrow	Visible	Visible	Not visible	Visible	Visible	Visible	High	113.777143	145.081456
Ridge and Furrow	Narrow Ridge and Furrow	Furrow	Visible	Visible	Not visible	Visible	Visible	Visible	High	118.978491	152.870259
Ridge and Furrow	Narrow Ridge and Furrow	Furrow	Visible	Visible	Not visible	Visible	Visible	Visible	High	208.386778	302.239149
Ridge and Furrow	Narrow Ridge and Furrow	Furrow	Visible	Not visible	Not visible	Visible	Visible	Visible	High	108.927954	123.270369
Ridge and Furrow	Narrow Ridge and Furrow	Furrow	Not visible	Visible	Not visible	Not visible	Not visible	Visible	Medium	89.1345089	104.847717
Ridge and Furrow	Narrow Ridge and Furrow	Furrow	Not visible	Not visible	Not visible	Not visible	Not visible	Visible	Medium	104.97593	177.069093
Ridge and Furrow	Narrow Ridge and Furrow	Furrow	Visible	Visible	Not visible	Visible	Not visible	Visible	Medium	60.0796331	108.435597

Ridge and Furrow	Narrow Ridge and Furrow	Furrow	Visible	Not visible	Not visible	Visible	Visible	Visible	High	107.993778	175.129967
Ridge and Furrow	Narrow Ridge and Furrow	Furrow	Not visible	Not visible	Not visible	Visible	Visible	Visible	High	86.1910431	147.03472
Earthwork	Bank	Bank	Not visible	Visible	Not visible	Not visible	Not visible	Visible	Medium	299.735983	652.584371
Earthwork	Bank	Bank	Not visible	Visible	Not visible	Not visible	Not visible	Visible	Medium	45.070289	78.1916079
Ridge and Furrow		Furrow	Not visible	Not visible	Not visible	Not visible	Not visible	Visible	High	35.3966526	50.4509736
Ridge and Furrow		Furrow	Visible	Visible	Not visible	Visible	Visible	Visible	High	203.497651	398.107637
Ridge and Furrow		Furrow	Visible	Visible	Not visible	Visible	Not visible	Visible	High	46.0832633	79.2650243
Ridge and Furrow		Furrow	Not visible	Visible	Not visible	Visible	Not visible	Visible	High	44.2501333	96.5000876
Ridge and Furrow		Ridge	Visible	Not visible	Not visible	Visible	Not visible	Visible	High	155.674769	235.943865
Ridge and Furrow		Ridge	Visible	Not visible	Not visible	Visible	Visible	Visible	High	58.0103303	121.733407
Ridge and Furrow		Ridge	Visible	Not visible	Not visible	Visible	Visible	Not visible	High	49.6656202	80.2337945
Ridge and Furrow	Narrow Ridge and Furrow	Ridge	Visible	Visible	Not visible	Visible	Visible	Visible	High	147.719392	200.412973
Ridge and Furrow	Narrow Ridge and Furrow	Ridge	Visible	Visible	Not visible	Visible	Visible	Visible	High	118.000402	206.774476

Earthwork	Ditch	Ditch, possible ridge and furrow	Not visible	Not visible	Not visible	Not visible	Not visible	Not visible	Low	38.5870093	48.2996195
Ridge and Furrow		Ridge	Visible	Not visible	Not visible	Visible	Visible	Visible	High	67.3442553	107.010546
Ridge and Furrow		Furrow	Visible	Visible	Not visible	Visible	Visible	Visible	High	172.073526	269.880221
Ridge and Furrow		Furrow	Not visible	Visible	Not visible	Not visible	Not visible	Visible	High	48.392083	63.9477786
Ridge and Furrow		Furrow	Not visible	Visible	Not visible	Not visible	Not visible	Visible	High	72.178466	95.7322309
Ridge and Furrow		Furrow	Not visible	Visible	Not visible	Visible	Not visible	Visible	High	37.6904787	45.8294611
Ridge and Furrow		Ridge	Visible	Visible	Not visible	Not visible	Not visible	Visible	High	94.4878934	206.162198
Ridge and Furrow		Ridge	Visible	Visible	Not visible	Not visible	Not visible	Visible	High	92.5147002	205.793319
Ridge and Furrow		Furrow	Visible	Visible	Not visible	Visible	Visible	Visible	High	369.761384	740.865428
Ridge and Furrow		Ridge	Not visible	Not visible	Not visible	Not visible	Not visible	Not visible	Low	54.3403357	78.4943113
Ridge and Furrow		Furrow	Not visible	Not visible	Not visible	Not visible	Not visible	Visible	High	145.794769	250.957003
Ridge and Furrow		Furrow	Not visible	Visible	Not visible	Visible	Not visible	Visible	High	31.9286638	38.467594
Ridge and Furrow		Furrow	Not visible	Visible	Not visible	Visible	Not visible	Visible	High	35.3045342	31.6579468

Ridge and Furrow		Ridge	Visible	Visible	Not visible	Not visible	Visible	Visible	High	139.851123	285.566007
Ridge and Furrow		Ridge	Visible	Visible	Not visible	Not visible	Not visible	Visible	High	55.3656734	103.400556
Ridge and Furrow		Ridge	Not visible	Visible	Not visible	Not visible	Not visible	Visible	High	52.3514904	113.77457
Ridge and Furrow		Ridge	Not visible	Visible	Not visible	Not visible	Not visible	Visible	High	53.7642216	133.781536
Earthwork	Ditch	Ditch	Not visible	Visible	Not visible	Not visible	Not visible	Visible	Medium	399.638768	949.964971
Ridge and Furrow		Ridge	Not visible	Visible	Not visible	Not visible	Visible	Visible	High	143.31592	311.515689
Ridge and Furrow		Furrow	Not visible	Not visible	Not visible	Not visible	Not visible	Not visible	Medium	144.177257	198.700084
Earthwork	Ditch	Ditch	Not visible	Not visible	Not visible	Not visible	Not visible	Not visible	Medium	46.630468	31.5464878
Earthwork	Ditch	Ditch	Not visible	Not visible	Not visible	Not visible	Not visible	Not visible	Medium	18.1316363	11.9754403
Ridge and Furrow		Furrow	Not visible	Not visible	Not visible	Not visible	Not visible	Not visible	Medium	108.069668	159.193706
Ridge and Furrow		Ridge	Visible	Visible	Not visible	Not visible	Visible	Not visible	High	137.674924	380.634602
Ridge and Furrow		Ridge	Not visible	Not visible	Not visible	Not visible	Not visible	Visible	Low	34.3713584	48.6845878
Earthwork	Ditch	Ditch	Not visible	Not visible	Not visible	Not visible	Not visible	Not visible	Low	39.8066111	28.4380807
Earthwork	Ditch	Ditch	Not visible	Visible	Not visible	Visible	Visible	Visible	Low	66.4235535	41.6315993

Earthwork	Ditch	Ditch	Not visible	Visible	Not visible	Visible	Visible	Visible	Low	191.751895	193.210432
Ridge and Furrow		Ridge	Not visible	Visible	Not visible	Not visible	Not visible	Not visible	Low	47.2325184	91.6935492
Earthwork	Ditch	Ditch, possible ridge and furrow	Not visible	Not visible	Not visible	Not visible	Not visible	Not visible	Medium	32.0701086	26.6168898
Ridge and Furrow		Furrow	Not visible	Not visible	Not visible	Not visible	Not visible	Visible	High	44.2713294	51.8904349
Ridge and Furrow		Furrow	Not visible	Not visible	Not visible	Not visible	Not visible	Not visible	Low	117.685535	209.168554
Ridge and Furrow		Furrow	Not visible	Not visible	Not visible	Not visible	Not visible	Not visible	Low	56.7439172	73.7435817
Ridge and Furrow		Ridge	Not visible	Not visible	Not visible	Not visible	Not visible	Not visible	Low	46.6013532	76.7129145
Ridge and Furrow		Ridge	Not visible	Visible	Not visible	Not visible	Not visible	Not visible	Low	106.920814	182.17137
Ridge and Furrow		Ridge	Not visible	Not visible	Not visible	Not visible	Not visible	Not visible	Medium	31.8214921	38.5203749
Ridge and Furrow		Furrow	Not visible	Not visible	Not visible	Not visible	Not visible	Not visible	Low	77.7907741	144.627003
Ridge and Furrow		Ridge	Not visible	Visible	Not visible	Not visible	Not visible	Not visible	Low	132.072572	331.19029

Site
Surrey
Woking
A324
Hook Heath
Site
B380
B380
B380
Pyle Hill
Sutton Green
499500
157000
Hillside
Hillside
A320
Lilac Ave
Hawthorn Rd
Almond Ave
Barnsbury Primary School
Egley Road
Egley Road
0
100 m
Site

Coordinate system: OSGB 1936 British National Grid

Date: 12/04/2023	Created by: KC	Revision: 0	Scale: 1:2,500 at A3

Figure 1: Site location

X:\Projects\257351\GIS_ArcPro\257351_LiDAR_Interpretation.aprx

X:\Projects\2573511\GIS_ArcPro\2573511_LiDAR_Interpretation.aprx

499400 499500 499600 499700

156900 156800

40 38 36 34 32 30 28 26

Site
Contour
Digital Terrain Model
40.92
25.64

0 50 m

Date: 12/04/2023 | Created by: KC

Scale: 1:1,000 at A3 | Revision: 0

Figure 2: Contours created from 20cm Digital Terrain Model

X:\Projects\2573511\GIS_ArcPro\2573511_LiDAR_Interpretation.aprx

499400
499500
499600
499700
156900
156800
A320
Egley Road

Site
Local Relief Model
1.19
-0.74

0
50 m

Date: 12/04/2023 | Created by: KC
Scale: 1:1,000 at A3 | Revision: 0

Figure 3: Local Relief model created from a 20cm Digital Terrain Model

X:\Projects\2573511\GIS_ArcPro\2573511_LiDAR_Interpretation.aprx

499400 499500 499600 499700

156900 156800

A320 Egley Road

Egley Road A320 Egley Road

Site

Lidar Interpretation

Bank

Ditch

Furrow

Ridge

Local Relief Model

1.19243

-0.744826

0 50 m

Date: 12/04/2023 | Created by: KC

Scale: 1:1,000 at A3 | Revision: 0

Figure 4: LiDAR interpretation

X:\Projects\2573511\GIS_ArcPro\2573511_LiDAR_Interpretation.aprx

499400 499500 499600 499700

156900 156800

Transect A
Transect B
Transect C

A320 Egley Road

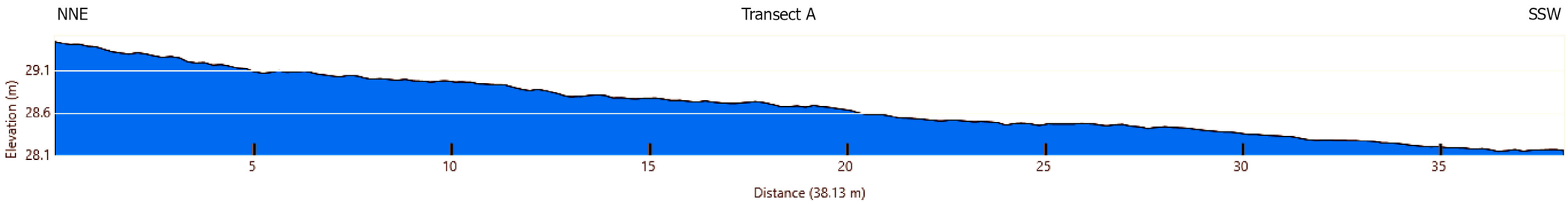
Site
Transects
Lidar Interpretation
Bank
Ditch
Furrow
Ridge
Local Relief Model
1.19243
-0.744826

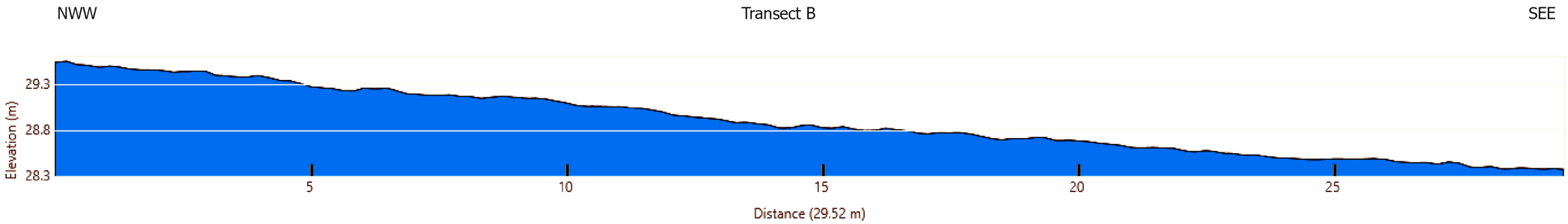
0 50 m

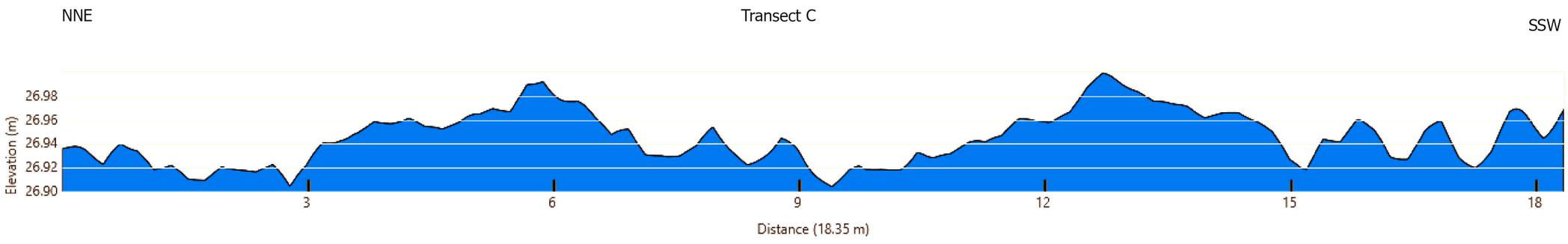
Date: 12/04/2023 | Created by: KC
Scale: 1:1,000 at A3 | Revision: 0

Figure 5: Location of transects

X:\Projects\2573511GIS_ArcPro\2573511_LiDAR_Interpretation.aprx







Date: 13/04/2023	Created by: KC	Revision: 0	Scale: 1:4,000 at A3

Figure 6: Profiles of transects

C:\Users\a.russell\Documents\ArcGIS\Projects\MyProject2\MyProject2.aprx

499400
499500
499600
499700
156900
156800
A320
Egley Road
A320
Egley Road
Egley Road

Site

0
50 m

Date: 16/04/2023	Created by: AR	
Scale: 1:1,000 at A3	Revision: 0	

Figure 7: Colorized point cloud

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