

Note: Outline Planning Application (OPA) Site Boundary

The following report was produced prior to the finalisation of the application site boundary. The final application site boundary is shown on Figure 1.1 in ES Appendix 1.1. Therefore, references within the report to the site boundary do not reflect the site area and site boundary submitted with the OPA.

The reports were correct at the time of preparation, and all information within the Environmental Statement assessment reflects the latest relevant information.



Otterpool Park Roman Villa Resistance Survey Folkestone and Hythe, Kent

Detailed Earth Resistance Survey Report



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Summary

A earth resistance survey was conducted over land at Otterpool Park, Roman Villa Resistance Survey, Folkestone and Hythe, Kent (centred on NGR: 611734 136635). The project was commissioned by Arcadis LLP with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features in support of a planning application for the development of 585 ha of land in the vicinity of Otterpool Park into a new garden town. The development will include up to 8,500 residential dwellings, and other uses including commercial, retail, education, health, community and leisure facilities, parking, landscaping, and public open space.

The site comprises two pasture and arable fields located on land directly south of Ashford Road (A20), north-east of the village of Lympne and 5 km west of the town of Hythe, in the county of Kent, covering an area of 2.5 ha. The geophysical survey was undertaken on 8 – 12 March 2021. The earth resistance survey has been successful in detecting anomalies of archaeological origin throughout the survey area.

In the north-west of the survey area the remains of rectangular room known to contain a hypocaust have been identified. The location of these remains coincides with anomalies detected during previous gradiometer surveys. Subsequent excavations of these anomalies revealed walls and remains of a Roman hypocaust system utilised to heat the Roman villa.

Throughout the survey area numerous ditches have been identified in the resistance data. The majority of these anomalies either correspond with ditches identified in the previous gradiometer survey or archaeological excavations. The majority of these indicate enclosure ditches delineating the Roman settlement at the site.

In the centre of the survey area two broad areas of high resistance are noted which are aligned in the same direction as the majority of the structural remains of the villa and supposed associated structures. Unfortunately, the resistance survey has not provided any greater clarity in terms of floor plans of these structures in this area.

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The fieldwork was undertaken by Brett Howard and Davor Cakanic. Patricia Voke processed and interpreted the geophysical data. Patricia Voke wrote the report. The geophysical work was quality controlled by Tom Richardson. Illustrations were prepared by Patricia Voke. The project was managed on behalf of Wessex Archaeology by Tom Richardson.



Otterpool Park, Roman Villa Resistance Survey Folkestone & Hythe Kent

Earth Resistance Survey Report

1 INTRODUCTION

1.1 Project background

- 1.1.1 Wessex Archaeology was commissioned by Arcadis LLP to carry out a geophysical survey at land directly south of Ashford Road (A20), Lympne, Folkestone and Hythe, (centred on NGR 611734 136635) (**Figure 1**).
- 1.1.2 A planning application (Y19/0257/FH) was submitted to Folkestone & Hythe District Council in 2019.
- 1.1.3 The application comprises the development of 585 ha of land in the vicinity of Otterpool Park into a new garden town. The development will include up to 8,500 residential dwellings, and other uses including commercial, retail, education, health, community and leisure facilities, parking, landscaping, and public open space.
- 1.1.4 This geophysical survey is part of staged approach in determining the archaeological potential of the site, and follows other non-intrusive archaeological work including a Cultural Heritage Desk Based Assessment (DBA) (Arcadis 2018), six phases of geophysical surveys (Headland Archaeology 2018a-b; Sumo 2018a-c; Magnitude 2018; Wessex Archaeology 2020), and a geoarchaeological DBA (Oxford Archaeology 2018a). Intrusive work has been carried out, including a watching brief on ground investigations (Wessex Archaeology 2018) and two phases of trial trenching evaluations (Oxford Archaeology 2018b; Wessex Archaeology 2021a). An environmental impact assessment has also been undertaken for the whole development site (Arcadis 2019).

1.2 Scope of document

- 1.2.1 This report presents a brief description of the methodology followed by the detailed survey results and the archaeological interpretation of the geophysical data.

1.3 The site

- 1.3.1 The site is located on land directly south of Ashford Road (A20), north-east of the village of Lympne and 5 km west of the town of Hythe, in the county of Kent.
- 1.3.2 Survey Area 1 comprises 2.5 ha of arable agricultural land currently sown with a bean crop. The site is bound by Ashford Road (A20) to the north and agricultural land on all other sides.
- 1.3.3 The survey area is relatively flat with a slight incline from 71 m above Ordnance Datum (aOD) at the northern edge to 74 m aOD at the southern edge.
- 1.3.4 The solid geology underlying the area comprises sandstone and limestone of the Hythe Formation in the north with no superficial geological deposits recorded. The solid geology in the south-west of the area consists of Sandstone, Siltstone, and Mudstone of the Sandgate Formation with overlying superficial geological deposits of Alluvium (clay, silt,



sand, and gravel). The solid geology in the south-east consists of Sandstone, Siltstone, and Mudstone of the Sandgate Formation with overlying superficial geological deposits of Head (clay and silt) (BGS 2021).

- 1.3.5 The soils underlying the north of the site are likely to consist of typical argillic brown earths of the 571c (Malling) association. The soils underlying the south of the site are likely to consist of typical argillic gley soils of the 841e (Park Gate) association (SSEW SE Sheet 6 1983).

2 ARCHAEOLOGICAL BACKGROUND

2.1 Introduction

- 2.1.1 The archaeological and historical background was assessed in a prior DBA (Arcadis 2018), which considered the recorded historic environment resource within a 1 km study area of the 709 ha proposed development. The DBA used information from the Kent Historic Environment Record (KHER) and the National Heritage List for England (NHLE). Additional sources of information are referenced, as appropriate. While not exhaustive, a summary of the findings of the DBA are summarised below.

2.2 Summary of archaeological and historical context

- 2.2.1 There are 41 listed buildings, 2 registered parks and gardens, and 7 scheduled monuments within 1 km of the site. There are also 4 military crash sites, 47 non-designated built heritage assets, and 121 non-designated archaeological assets recorded within 500 m of the site.
- 2.2.2 They key assets within the development site include Bronze Age barrows, a Roman villa, and the scheduled monument of Westenhanger Castle (NHLE 1020761). This includes landscape features associated with Westenhanger Castle, such as the walled garden and deer park. Airfield defences such as Picket Hamilton fort and the Battle HQ RAF Lympne represent some of the more modern assets.

2.3 Archaeological and historical context

- 2.3.1 There is one scheduled monument, Westenhanger Castle (NHLE 1020761), in the north of the development site. It is situated at the edge of the floodplain of the River East Stour. The castle is bounded on its northern edge by a railway line (CTRL/HS1) and the M20. The monument is described as a 14th century fortified house with associated structures and landscaping which remain both above and below ground. It comprises both the earthwork and structural remains of the moated inner court, a 16th century barn and stable, the buried remains of the outer court, and the buried remains of the church, medieval hall, walled garden and cemetery. The site is also associated with surrounding landscape features including a deer park and water control system, and was possibly the site of two manors, Westenhanger and Ostenhanger (Easternhanger), which were reunited in the 16th century. However, there is currently little evidence of two manors and the difference in place names might actually indicate a single manor known under two names.

Palaeolithic and Mesolithic

- 2.3.2 The evaluation undertaken over the former racecourse in 1969 retrieved some waste and worked flints of possible Upper Palaeolithic or Mesolithic date (Oxford Archaeology 2018a).

Later Prehistoric

- 2.3.3 Within the study area 17 monuments are listed on the KHER as dating to the prehistoric period. Of these, 7 have been found within the proposed development area, and 10 within



500 m of the site. Most of these assets are find-spots are listed as flint and pottery finds. Of the remaining assets, six indicate occupation activity within the prehistoric period, including evidence of Bronze Age occupation within the proposed development area. The seventh is a paleo-channel close to Barrow Hill.

- 2.3.4 1.3 km to the north of the occupation site are two possible Bronze Age barrows which lie close to the East Stour River, at least one of which is marked on the first edition OS map. Beyond this site the evidence of occupation is limited to some Bronze Age ditches to the north of Westenhanger, 50 m north of the site, which are associated with finds of Neolithic or Bronze Age worked flint and a buried soil-horizon as well as a possible ring-ditch which lies within Sandling Park, 500 m to the east of the site.
- 2.3.5 Three find spots from the Iron Age have been recorded in the proposed development area. Two Iron Age occupation sites have been recorded within the study area to the north of Westenhanger.

Romano-British

- 2.3.6 The KHER records 13 assets as dating from the Iron Age or Romano-British to early medieval period. Nine of these are find spots, two are roads, and two are occupation evidence.

Stone Street Roman Road runs north – south from Canterbury to Lympne for 16 miles (Margary 1955) and passes through the north-eastern corner of the proposed development area, through the village of Westenhanger. The route of the road then either follows the line of the boundary of the proposed development area from Newingreen down to Lympne, and the Roman fort beyond, or diverges to head for West Hythe and the Roman port of *Portus Lemanis*.

Early medieval

- 2.3.7 16 assets are listed on the KHER within the study area with 8 of these listed as being within the proposed development area.
- 2.3.8 Within the area there is one asset that is recorded as ‘occupation’ for the early medieval period. This is based on cropmark evidence and is thought to be an Anglo-Saxon palace within the former Folkestone Racecourse. The cropmarks are described as six or seven ‘boat-shaped’ features which may represent the earliest site of Westenhanger Manor, 200 m to the north-west. However, it remains possible that it instead relates to installations and activity during World War Two.
- 2.3.9 Within the study area early medieval occupation evidence is shown through features to the north of Westenhanger Manor and two burial sites. The first of these lies 465 m south-east of the site at the cross-roads of Stone Street and Aldington Road and is a possible Anglo-Saxon cemetery. The second lies 155 m to the south of the site within the land around Port Lympne Park and is recorded as a Flemish inhumation cemetery. Other assets within the study area are isolated find-spots.

Medieval

- 2.3.10 Activity in the medieval landscape is demonstrated on the KHER through six find spots, comprised of coins, a figurine, a brooch, a ring, and a pottery scatter. There are also 14 recorded HER monuments.



- 2.3.11 Seven of the HER monuments are within the proposed development area. Four of these are located within the scheduled monument at Westenhanger Manor. Two are described as the deserted medieval sites of Westenhanger and Easternhanger, however, it is noted that deserted medieval villages (DMV) are virtually unproven in Kent.
- 2.3.12 To the west of Westenhanger are cropmarks of a trackway and field system which may have been associated with the manor. Close to the manor house at Westenhanger is the site of St Mary's Church which was demolished around 1701.

Post-medieval

- 2.3.13 Seven assets are recorded on the KHER within the study area, of which one lies outside the development area. Within the site, there are two find spots described as 'gold jewellery' on the KHER.
- 2.3.14 The majority of the other assets from the post-medieval period are located to the east of the development area close to Stone Street, between Westenhanger and Newingreen. At Newingreen two assets are described as the location of the former Royal Oak Motel and features found during excavations at the hotel. A ditch runs parallel to Stone Street where it passes through Westenhanger. Features were discovered on either side of Stone Street during the CTRL construction work, which were assessed to have been of post-medieval date. However, during the excavations a buried soil horizon was also discovered which could have origins in the Roman or Late prehistoric period.
- 2.3.15 Assets from the post-medieval period within the study area are limited which may correlate with cartographic evidence that there has been little change in the area until the modern period.

Modern

- 2.3.16 All modern assets listed on the KHER within the study area are of a military nature and are probably associated with the former airfield at Lypne. There are 23 assets of this nature within the study area and only 3 of these are outside the boundary of the development area.
- 2.3.17 Lypne airfield covered the area to the north of the Aldington Road between Otterpool Lane and Stone Street with some activity to the west of Otterpool Lane and was an emergency landing ground for home defence aircraft which was established in 1916.
- 2.3.18 Much of the airfield has now been replaced by an industrial estate and to the east only a small portion of the runway has survived. Additional assets which are listed at the site include an auxiliary operational unit base, a battle headquarters, two aircraft dispersal pens, a gas decontamination building, air raid shelters, Picket Hamilton fort, trenches, a former barracks hut, an over blister hanger and trackway, a machine gun testing range, a bulk fuel installation, a concrete base of unknown use, and a gun emplacement.
- 2.3.19 Four military crash sites are recorded in the KHER within the study area, and of these, two are located within the proposed development site.

2.4 Previous investigations related to the proposed development

Geophysical survey

- 2.4.1 Several phases of detailed gradiometer survey (Wessex Archaeology 2020; Headland Archaeology 2018a-b; Sumo 2018a-c; Magnitude 2018) and a geoarchaeological DBA (Oxford Archaeology 2018a) have been undertaken within the wider development site. The



geophysical surveys were successful in identifying anomalies of archaeological interest as well as a large number of coherent ferrous responses. The results pertinent to the current survey of the villa are briefly summarised below.

- 2.4.2 Wessex Archaeology (2020) undertook detailed gradiometer, ground penetrating radar (GPR) and electromagnetic (EM) survey at eight locations within the proposed development area. The gradiometer survey was successful in detecting numerous anomalies of archaeological origin. This included a number of ditch-like features, some of which may have formed a series of land divisions and enclosures potentially associated with settlement activity at the nearby Westenhanger Castle. Those located further away are more likely associated with Romano-British settlement in the area which is likely centred around the Roman villa located within the current survey area (Sumo 2018a-c; Magnitude 2018). A small number of potential structural features were also located in areas west of Westenhanger Castle and to the north of the Roman villa, but the interpretation of these features is less clear. They could also be related to Romano-British occupation as limestone structures were identified at the site of the Roman villa identified within the current survey area but may relate to an alternative phase of activity. Numerous pits were also identified as a result of the gradiometer survey however the majority of these are thought to relate to former quarrying.
- 2.4.3 The EM survey was undertaken in an area directly east of the survey area with the aim to investigate whether any significant archaeological remains were located below alluvial material adjacent to the River East Stour that might be an attributable activity associated with the Romano-British villa. Although areas of lower conductivity and higher magnetic susceptibility were detected, it is not possible to ascribe this to evidence for specific archaeological activity. Given the small scale of the survey, it is more likely that these relate to very localised variations in the underlying superficial and bedrock geology.
- 2.4.4 Approximately 200 ha of detailed gradiometer survey was undertaken over several land parcels within the development site (Sumo 2018a). Four previously recorded ring-ditch features were identified along with three previously unrecorded ring-ditches from this phase of geophysical survey. Numerous ditched enclosures, tracks, and extensive field systems associated with small settlements were identified. The settlements are interpreted as possibly Iron Age or earlier farmsteads. The gradiometer survey was also carried out over the current survey area and recorded a variety of rectilinear anomalies, possible trackways or boundary ditches and associated linear features. All of these anomalies were suggested to represent a Roman villa.
- 2.4.5 Following the extensive results of the gradiometer survey over the area of the supposed Roman villa a GPR survey was carried out (Magnitude 2018). The GPR survey successfully detected structural remains and occupation evidence pertaining to the Romano-British period. Agricultural trends relating to modern ploughing and a number of uncertain anomalies were also detected during the GPR survey.

Archaeological Evaluation

- 2.4.6 Oxford Archaeology (2018) carried out a number of archaeological evaluative trenches over the area of the proposed Roman Villa. Within the current survey area, a Roman villa was found in the northern part of the field. This included the foundation and lowest course of limestone walls, primarily found in the northern trenches, as well as associated stone spreads and ground surfaces in varying states of preservation. Two structural phases could be recognised on numerous buildings. The stone buildings included a hypocaust, the infilling of which included painted wall plaster. Other structures included a possible malting oven, a substantial boundary ditch and associated wall, and a large posthole possibly

indicating a timber building. Other features that were identified include a probable road, linear ditches, and pits. The predominant orientation of the ditches and the buildings was north-west to south-east and north-east to south-west. The southern extent of the complex was approximately defined, although the full extent of the villa was not confirmed in all directions. Recovered artefactual remains indicate the villa complex was in use during most of the Roman period. Waterlogged ditches contained preserved items and environmental material with the potential to produce not only rarely preserved artefacts but also valuable information about the contemporary environment.

- 2.4.7 An archaeological evaluation trenches and excavation was undertaken by Wessex Archaeology (2021a) in 2020. The work comprised 354 trial trenches, 3 geoarchaeological trial trenches, and 3 mini-excavation areas, which expanded on 3 former trial trenches carried out by Oxford Archaeology (2018b).
- 2.4.8 Numerous archaeological features were recorded in the excavated trenches with archaeological remains consisting of ditches and termini, pits, postholes, trackways, quarry pits, and a brick wall and former rail spur for RAF Lympne. The majority of ditches were attributed either the prehistoric or Romano-British period. In addition, features potentially associated with the Westenhanger Castle were identified.
- 2.4.9 Following previous trial trench evaluation undertaken by Oxford Archaeology, three trenches were expanded to identify a proposed Neolithic causewayed enclosure. Although these excavations identified a number of ditches which could indicate a causewayed enclosure it is unclear whether these ditches form one feature. Sparse dating evidence was recorded within the excavated slots during the current phase of excavation works, and all that could be determined with any degree of confidence is that the feature is Bronze Age or earlier, as it was truncated by a later Bronze Age feature. The three excavation trenches identified a further nine ditches, one ditch terminus, and two pits, with only a single dated feature comprising a slightly curvilinear Bronze Age ditch that truncated the curvilinear enclosure. The limited nature of the excavation trenches restricted the potential for assessing the purpose of the recorded features.

3 METHODOLOGY

3.1 Introduction

- 3.1.1 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team between 8 – 12 March 2021. Field conditions at the time of the survey were snowy and wet throughout the period of survey. An overall coverage of 1.6 ha was achieved. Overgrown vegetation and areas of standing water meant the full extent of the survey area was not surveyed.
- 3.1.2 The methods and standards employed throughout the geophysical survey conform to that set out in the Written Scheme of Investigation (WSI) (Wessex archaeology 2021b), as well as to current best practice, and guidance outlined by the Chartered Institute for Archaeologists' (CIfA 2014) and European Archaeologiae Consilium (Schmidt *et al.* 2015).

3.2 Aims and objectives

- 3.2.1 The aims of the survey comprise the following:
- To determine, as far as is reasonably possible, the nature of the detectable archaeological resource within a specified area using appropriate methods and practices; 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.

3.2.2 In order to achieve the above aims, the objectives of the geophysical survey are:

- To conduct a geophysical survey covering as much of the specified area as possible, allowing for on-site obstructions;
- To clarify the presence/absence of anomalies of archaeological potential; and
- Where possible, to determine the general nature of any anomalies of archaeological potential.

3.3 Fieldwork methodology

3.3.1 Stakeout data was prepared in Ordnance Survey (OS) National Grid coordinates prior to the survey using AutoCAD, and the survey data was georeferenced accordingly. Individual survey grid nodes were established at 30 m x 30 m intervals using a Leica Captivate RTK GNSS instrument which is precise to approximately 0.02 m and therefore exceeds European Archaeologiae Consilium recommendations (Schmidt *et al.* 2015). The full extent of the surveyed areas was located using a Leica Captivate RTK GNSS instrument.

3.3.2 The detailed earth resistance survey was undertaken using a Geoscan Research MSP25 earth resistance cart based system paired with a Geoscan Research RM85 data logger. Resistivity data was collected at 0.25 m intervals along transects 1 m apart. The data has been collected in accordance with European Archaeologiae Consilium recommendations (Schmidt *et al.* 2015). Data will be collected using a square array in the zigzag fashion.

3.4 Data processing

3.4.1 Data from the survey were subjected to minimal correction processes. These comprise a 'Despike' function, applied to filter isolated data points that have exceeded the mean by a specified amount to reduce the appearance of dominant anomalous readings, a 'Destripe' function (± 5 nT thresholds), applied to correct for any variation between the probes, and a 'Low Pass Filter' to smooth the data without losing the detail of the anomalies.

3.4.2 Further details of the geophysical and survey equipment, methods and processing are described in **Appendix 1**.

4 GEOPHYSICAL SURVEY RESULTS AND INTERPRETATION

4.1 Introduction

4.1.1 The earth resistance survey has identified low and high resistance anomalies across the site. Results are presented as a single of greyscale plot, and archaeological interpretation at a scale of 1:800 (**Figures 2 to 3**). The data are displayed at -7Ω (white) to $+5\Omega$ (black) for the greyscale image. Archaeological interpretation of the earth resistance data combined with previous geophysical survey interpretations (SUMO: Magnetic survey 2017 and Magnitude: GPR survey 2018) and archaeological evaluation interpretative phasing and trench locations (Oxford Archaeology 2018) at a scale of 1:800 (**Figure 4 to 5**).

4.1.2 The interpretation of the datasets highlights the presence of potential archaeological anomalies and high and low resistance responses (**Figure 3**). Full definitions of the interpretation terms used in this report are provided in **Appendix 2**.



4.1.3 It should be noted that small, low resistance features may produce responses that are below the detection threshold of the resistance meter. It may therefore be the case that more archaeological features may be present than have been identified through geophysical survey.

4.2 Earth resistance survey results and interpretation

4.2.1 The geophysical survey has identified a number of features that are likely to be associated with archaeological remains. These are predominantly located in the centre of the site and are associated with linear and curvilinear ditch features as well as structural remains in the north of the site associated with traditional features of a Roman villa.

4.2.2 In the north-west of the site is a rectilinear high resistance anomaly at **4000**. It measures 18 X 6 m and is broadly orientated on a NNW to SSE axis. Due to its high resistance response, it is likely that this anomaly reflects a stone or structural feature. The rectilinear feature identified at **4000** also corresponds with a similar shaped positive magnetic anomaly identified in the gradiometer survey carried out by SUMO in 2017. Subsequent archaeological evaluation of this feature carried out by Oxford Archaeology in 2018 (TR243) identified a series of walls or wall foundations which were interpreted as a room with a hypocaust dated to the Middle Roman period. Therefore, the rectilinear feature identified at **4000** is likely associated with the remains of this room.

4.2.3 In the west of the survey a linear high resistance anomaly has been detected at **4001**. It is broadly aligned on a north-west to south-east axis measuring 29 m long and 3 m wide. Due to the shape of this anomaly, it likely indicates a ditch or bank of material potentially forming a boundary marker. This is further corroborated by archaeological evaluation from 2018 where a trench (TR246) was excavated at the north-west end of this anomaly. Excavations revealed a large enclosure ditch that was 4.32 m wide and at least 1.6 m deep although the base was not reached. Finds recovered from the fills of the ditch indicate that the ditch was constructed in the 1st century and remained at least as a depression throughout most of the Roman period. It more than likely that the ditch identified at **4001** is a continuation of the enclosure ditch identified through excavation. This ditch has not been detected in the previous gradiometer or GPR survey.

4.2.4 In the south of the site a curvilinear high resistance anomaly has been identified at **4002**. It is broadly aligned on a north-east to south-west axis. It is 57 m long, curving at the southern end towards the north for a further 17 m with an overall width of 2 m. The majority of this anomaly corresponds with a positive magnetic anomaly identified in the gradiometer survey which has been interpreted as a ditch feature. Archaeological evaluations carried out in 2018 identified parallel ditches in TR250 which contained Roman ceramic material and wattle and daub impressions in this area. It is likely that anomaly **4002** indicates a curving ditch which the results of the resistance survey has been able to define with greater clarity than previous geophysical surveys.

4.2.5 In the east of the site is a further linear high resistance anomaly at **4003**. This anomaly is on an north-west to south-east alignment, measuring 17 m long and 1.3 m wide. Due to its shape and similarity in response to the anomalies at **4001** – **4002** it likely indicates a ditch. GPR results from Magnitudes 2018 survey identified a similar shaped anomaly that was identified as probable archaeology in this location. Interpretive phasing as a result of archaeological investigations carried out by Oxford Archaeology in 2018 have dated this feature as early Roman.

4.2.6 A number of less well defined high and low resistance anomalies have been identified in the west of the site. At **4004** a linear high resistance anomaly has been identified which is aligned on an north-west to south-east axis measuring 60 m long. At the south-east end, the anomaly abruptly turns to the north-east for 11 m with an overall width of 2 m for the



entire anomaly. Whilst this anomaly does not correspond with anything identified in the previous gradiometer and GPR surveys it has been interpreted as a ditch of possible archaeological origin. Archaeological evaluations in 2018 excavated a trench (TR247) through the centre of anomaly **4004**. This trench was positioned in order to investigate a rectangular feature 60 – 70 m long and over 10 m wide which was shown on historical maps and visible on 20th century aerial photographs and LiDAR surveys. A steep sided and flat bottomed feature was identified throughout the course of excavations with date and function not established. Therefore, it is still unclear what this feature relates to and although it reflects anthropogenic activity further interpretation is not possible.

- 4.2.7 To the north of anomaly **4004** is a further high resistance anomaly at **4005**. This extends on a northerly trajectory towards the hypocaust at **4000**. This anomaly is 36 m long but curves at the northern end towards the west and has a width of 1.6 m. This anomaly does not directly correspond with any archaeological remains identified in the previous geophysical surveys or archaeological evaluations. It is however likely that this indicates a possible archaeological feature such as a ditch or bank feature due to the linear shape of the anomaly. Further investigation would be advantageous to clarify the nature of this feature.
- 4.2.8 In the centre of the survey area, at **4006**, is a small broad curvilinear anomaly. It is characterised as a high resistance response measuring 9 m x 2 m on an north-west to south-east alignment. The north-west end of the anomaly has previously been investigated with archaeological evaluations where a ditch that was 1.05 m wide and 0.35 m deep was identified containing Roman pottery and mortar. The orientation of this ditch corresponds with anomaly **4006** and it has been interpreted as the continuation of this ditch.
- 4.2.9 Two linear high resistance anomalies have been identified in the south of the survey area at **4007**. These anomalies are both broadly aligned east – west measuring 31 m and 16 m by 2 m wide, respectively. Whilst a archaeological evaluation trench was excavated through the centre of the larger of these anomalies and Roman tile was found on the surface, only a small pit was identified to the south of these features. However, the gradiometer results identified a number of linear anomalies of possible archaeological origin that correspond with the shape and orientation of those identified in the resistance data. Therefore, these anomalies have been interpreted possible archaeology. They may relate to further ditches associated with the Roman villa.
- 4.2.10 In the north of the survey area a broad and somewhat diffuse anomaly of high resistance has been recorded at **4008**. It is arranged on an north-west to south-east alignment and corresponds with the alignment of the structural remains of the villa. It is 68 m long and 5.5 m wide. However, there is little clarity within this broad anomaly. The anomaly does however correspond with a possible archaeological spread of material identified in the 2018 GPR survey. A trench (TR244) excavated on a north – south axis through the centre of this anomaly in 2018 identified a large ditch on a similar alignment to the anomaly at **4008**. Adjacent to the ditch was a possible road surface which consisted of a compacted limestone surface set in clay with possible wheel ruts on the same alignment. Therefore, it is likely that **4008** indicates numerous archaeological features such as a ditch, possible road surface, and wheel ruts. However, the lack of contrasting materials used to construct these features has made it impossible to define them with greater clarity within the resistance survey results.
- 4.2.11 In the east of the site a linear low resistance anomaly has been detected at **4009**. It is aligned north – south, measuring 30 m by 2.6 m. It is clear that this anomaly extends beyond the northern and southern boundary of the resistance survey. This is corroborated as it aligns with a sinuous positive magnetic anomaly identified in the gradiometer data. Archaeological excavations of a trench (TR245) through this feature identified a north – south aligned ditch 3.56 m wide and 0.8 m deep. This ditch contained waterlogged fills and



Roman artefacts including pottery, CBM and faunal remains. However due to its waterlogged conditions, sinuous nature, and parallel alignment to the adjacent River East Stour, it may have once been a former course of the river utilised during the Roman settlement of the villa.

- 4.2.12 In the west of the site at **4010** a broad, amorphous area of low resistance has been identified covering an area 41 x 27 m. On its north-west edge there is a possible curving linear of higher resistance that corresponds with a linear positive anomaly identified in the gradiometer data, which would indicate a ditch-like feature. Subsequent archaeological trenching (TR246) of this feature identified a broad ditch measuring 3.75 m wide but was left unexcavated as it was considered to be the same as a ditch to the south-west which was dated to the early/middle Roman period. Whilst there is little clarity in the area of low resistance at **4010** it is likely that the resistance survey has detected the remains of this ditch as well as further archaeological remains.
- 4.2.13 Two broad areas of high resistance have been identified in the centre of the survey area at **4011** and **4012**. They are aligned on a north-west to south-east axis and indicate archaeological remains. Despite the lack of distinguishable archaeological features within these areas their alignment and location correspond with numerous archaeological features identified in the previous gradiometer and GPR surveys. Furthermore, a trench (TR244) excavated in the northern end of anomaly (**4012**) recorded numerous features including a possible road surface bounded by a middle Roman boundary ditch, structural remains of walls, and stone platforms. It is likely that the high resistance response at **4011** and **4012** reflects stone structures of the villa and potential spreads of material, such as rubble, representing higher concentrations of building material in these areas. Artefactual evidence recovered from this area of the site indicate a date between the second half of the 1st and first half of the 3rd century BC.
- 4.2.14 The remaining anomalies of note are characterised as low resistance linear and curvilinear features. Directly south of the spread of high resistance anomaly (**4012**) are two narrow curving linear anomalies at **4013**. They cover an area of 15 x 15 m and are each 1.2 m wide. They appear to intersect each other at their eastern end and correspond with a positive magnetic anomaly identified as a ditch during the previous gradiometer survey. Archaeological trenching (TR250) carried out at the eastern end of anomaly **4013** identified parallel ditches that were not excavated. Therefore, these curving linear features indicate further ditches likely associated with the Roman villa. In the north of the site at **4014** a final east – west aligned linear low resistance anomaly has been located. It measures 50 m in length and 2.5 m in width. On a similar alignment the gradiometer survey identified a positive magnetic anomaly adjacent to anomaly **4014**. This was excavated in 2018 (TR244) and a possible road surface formed of compacted limestone set in clay was recorded with an adjacent ditch. Therefore, the linear feature (**4014**) may form part of this road surface or ditch.

5 DISCUSSION

- 5.1.1 The earth resistance survey has been successful in detecting anomalies of archaeological origin throughout the survey area.
- 5.1.2 In the north-west of the survey area the remains of rectangular room known to contain a hypocaust have been identified. The location of these remains coincides with anomalies detected during previous gradiometer surveys. Subsequent excavations of these anomalies revealed walls and remains of a Roman hypocaust system utilised to heat the Roman villa.
- 5.1.3 Throughout the survey area numerous ditches have been identified in the resistance data. The majority of these anomalies either correspond with ditches identified in the previous gradiometer survey or archaeological excavations carried out in 2017 and 2018. However



a number of ditches are visible with greater clarity in the resistance data set. The majority of these indicate enclosure ditches delineating the Roman settlement at the site.

- 5.1.4 In the centre of the survey area two broad areas of high resistance are noted which are aligned in the same direction as the majority of the structural remains of the villa and supposed associated structures. Unfortunately the resistance survey has not provided any greater clarity in terms of floor plans of these structures in this area. It is possible that the alluvial deposits throughout the site that may have retained more water from the preceding wet weather and may have produced conditions that reduced the effectiveness of the survey.



REFERENCES

Bibliography

- ADS 2015 Guidelines for Depositors, [http://archaeologydataservice.ac.uk/advice/FilelevelMetadata.xhtml#Geophysics and Remote Sensing](http://archaeologydataservice.ac.uk/advice/FilelevelMetadata.xhtml#Geophysics_and_Remote_Sensing) (accessed 04/03/2021)
- ARCADIS 2019 Otterpool Park. *Environmental Statement Volume 2*
- ARCADIS 2018 Cultural Heritage Desk Based Assessment 2016 and Addendum 20180 in *Otterpool Park Environmental Statement*. Appendix 9.2
- Archaeology South East 1998 (Revised 2001) *Selective archaeological recording and excavation at Westenhanger Castle*. ASE ref 909.
- British Geological Survey online viewer <http://mapapps.bgs.ac.uk/geologyofbritain/home.html> (accessed 04/03/2021)
- Chartered Institute for Archaeologists [ClfA] 2014a *Standards and guidance for archaeological geophysical survey*. Reading, ClfA
- ClfA 2014b *Code of Conduct*. Reading, ClfA
- ClfA 2014c *Regulations for Professional Conduct*. Reading, ClfA
- English Heritage 2013 *English Heritage Thesauri*, http://thesaurus.historicengland.org.uk/thes_splash.htm (accessed 04/03/2021)
- Hasted, E 1797 – 1801 (reproduced 1972) *The History and Topographical Survey of the County of Kent*
- Headland Archaeology 2018a *Otterpool Park, Kent, Geophysical Survey*
- Headland Archaeology 2018b *Westenhanger Castle, Lympne, Kent, Geophysical Survey*
- Historic England 2015 *Management of Research Projects in the Historic Environment: The MoRPHE Project Manager's Guide. Version 1.0*
- Magnitude Surveys 2018 *Ground Penetrating Radar and Magnetometry Survey of the Roman Villa at Otterpool, near Hythe, Kent*. Unpublished report: MStR375
- Martin and Martin 2017 *Westenhanger Castle – A Revised Interpretation*. Kent Archaeological Society
- Oxford Archaeology 2018a *Otterpool Park, Sellindge, Kent. Desk-based Geoarchaeological Assessment of Pleistocene and Early Holocene Stratigraphy*. Unpublished report: 6784
- Oxford Archaeology 2018b *Otterpool Park Archaeological Trial Trenching Report, Fields 1 to 10*
- Schmidt, A and Ernenwein, E 2001 *Guide to Good Practice: Geophysical Data in Archaeology* http://guides.archaeologydataservice.ac.uk/g2gp.pdf?page=Geophysics_Toc&xsl=test.xsl&ext=.pdf



Schmidt, A, Linford, P, Linford, N, David, A, Gaffney, C, Sarris, A and Fassbinder, J. 2015 *Guidelines for the use of geophysics in archaeology: questions to ask and points to consider*. EAC Guidelines 2, Belgium: European Archaeological Council.

Soil Survey of England and Wales 1983 *Sheet 6, Soils of South-East England*. Ordnance Survey, Southampton

Sumo 2018a *Otterpool Kent, Geophysical Survey Report*. Unpublished report 11903

Sumo 2018b *Former Lympe Airfield, Otterpool Park, Kent, Geophysical Survey Report*. Unpublished report 12992

Sumo 2018c *East of Lympe Industrial Estate, Otterpool, Kent, Geophysical Survey Report*. Unpublished report 12993

Wessex Archaeology 2021a *Otterpool Park, Lympe, Kent: Archaeological Evaluation*. Unpublished report 227400.03

Wessex Archaeology 2021b *Otterpool Park, Roman Villa Resistance Survey, Folkestone & Hythe, Kent: Written Scheme of Investigation for an Archaeological Geophysical Survey*. Unpublished report 227401.04

Wessex Archaeology 2020a *Otterpool Park, Folkestone & Hythe, Kent: Detailed Gradiometer, Ground Penetrating Radar and Electromagnetic Survey Report*. Unpublished report 227401.03

Wessex Archaeology 2020b *Otterpool Park, Folkestone & Hythe, Kent: Written Scheme of Investigation for an Archaeological Geophysical Survey*. Unpublished report: 227401.01

Wessex Archaeology 2018 *Otterpool Park, Lympe, Kent: Archaeological Watching Brief*. Unpublished report: 211110.03

Cartographic and documentary sources

Ordnance Survey 1983 *Soil Survey of England and Wales Sheet 6, Soils of South East England*. Southampton.

Online resources

British Geological Survey Geology of Britain Viewer (accessed May 2021) <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

Old Maps (accessed May 2021) <https://www.old-maps.co.uk>



APPENDICES

Appendix 1: Survey equipment and data processing

CART BASED RESISTIVITY SURVEY

The data for this project will be acquired using a Geoscan Research MSP25 Mobile Sensor Platform earth resistance cart based system paired with a Geoscan Research RM85 data logger. The MSP25 comprises a wheeled resistance square array. The platform comprises four dog-tooth plated wheels set 0.75 m apart on a rugged aluminium and stainless steel frame. A Geoscan Research ADVANCED RM85 Resistance meter and Expansion Port Interface Box 1 (EPIB1) are mounted centrally. The platform pivots around its centre allowing the wheels to maintain contact with undulating ground. A pair of quick-release/ latch handles allow steering along traverse lines and data is collected in a zigzag pattern. The RM85 can collect single or multiplexed Square array data: alpha, beta and gamma resistance measurements (alpha and beta data can provide important directional information)

The resistivity metres have a range of 20470 ohms to 0.0005 ohms and an effective depth of 0.5m - 0.75m. All of the data are stored on an integrated data logger for subsequent post-processing and analysis.

Resistivity surveys undertaken by Wessex Archaeology depend upon the establishment of an accurate 50 m site grid, which is achieved using a Leica Captivate RTK GNSS instrument. The Leica Viva system receives corrections from a network of reference stations operated by the Ordnance Survey and Leica Geosystems, allowing positions to be determined with a precision of 0.02m in real-time and therefore exceed the level of accuracy recommended by European Archaeologiae Consilium (Schmidt *et al.* 2015) for geophysical surveys.

Resistivity survey data will be collected in a 50 m grid at 0.25 m intervals along traverses spaced 1m, giving a reading interval of 0.25 m x 1 m. This strategy adheres to the recommended methodology for archaeological surveys of this type (Schmidt *et al.* 2015).

Data may be collected with a higher sample density where complex archaeological anomalies are encountered, to aid the detection and characterisation of small and ephemeral features.

Post-processing

The data collected during the detailed resistivity survey are downloaded from the Geoscan Research RM85 system for processing and analysis using both commercial and in-house software. This software allows for both the data and the images to be processed to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies.

Typical data and image processing steps may include:

- Destripe – Applying a zero mean traverse to remove differences caused by directional effects inherent in the magnetometer;
- Destagger – Shifting each traverse longitudinally by a number of readings. This corrects for operator errors and is used to enhance linear features;
- Despike – Filtering isolated data points that exceed the mean by a specified amount to reduce the appearance of dominant anomalous readings.

Typical displays of the data used during processing and analysis:



- XY Plot – Presents the data as a trace or graph line for each traverse. Each traverse is displaced down the image to produce a stacked profile effect. This type of image is useful as it shows the full range of individual anomalies.
- Greyscale – Presents the data in plan view using a greyscale to indicate the relative strength of the signal at each measurement point. These plots can be produced in colour to highlight certain features but generally greyscale plots are used during analysis of the data.



APPENDIX 2: GEOPHYSICAL INTERPRETATION

The interpretation methodology used by Wessex Archaeology separates the anomalies into four main categories: archaeological, modern, agricultural, and uncertain origin/geological.

The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided into three groups, implying a decreasing level of confidence:

- Archaeology – used when there is a clear geophysical response and anthropogenic pattern.
- Possible archaeology – used for features which give a response, but which form no discernible pattern or trend.

The modern category is used for anomalies that are presumed to be relatively modern in date:

- Modern service – used for responses considered relating to cables and pipes; most are composed of metallic/ceramic material although services made from non-magnetic material can sometimes be observed.

The agricultural category is used for the following:

- Former field boundaries – used for ditch sections that correspond to the position of boundaries marked on earlier mapping.
- Agricultural ditches – used for ditch sections that are aligned parallel to existing boundaries and former field boundaries that are not considered to be of archaeological significance.
- Ridge and furrow – used for broad and diffuse linear anomalies that are considered to indicate areas of former ridge and furrow.
- Ploughing – used for well-defined narrow linear responses, usually aligned parallel to existing field boundaries.
- Drainage – used to define the course of ceramic field drains that are visible in the data.

The uncertain origin/geological category is used for features when the form, nature and pattern of the anomaly are not sufficient to warrant a classification as an archaeological feature. This category is further sub-divided into:

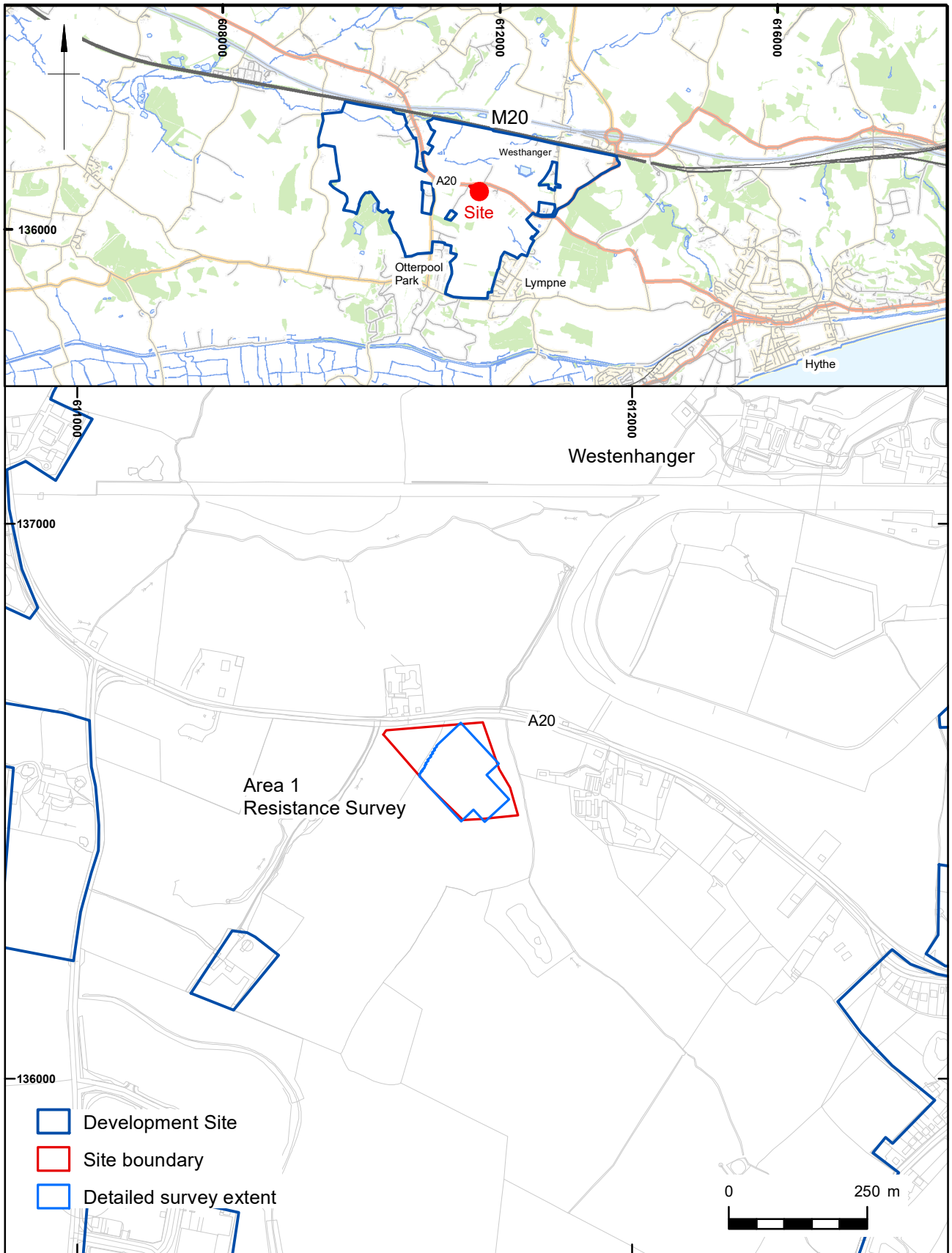
- Trend – used for low amplitude or indistinct linear anomalies.
- Superficial geology – used for diffuse edged spreads considered to relate to shallow geological deposits.




Appendix 3: OASIS form

Project Details:

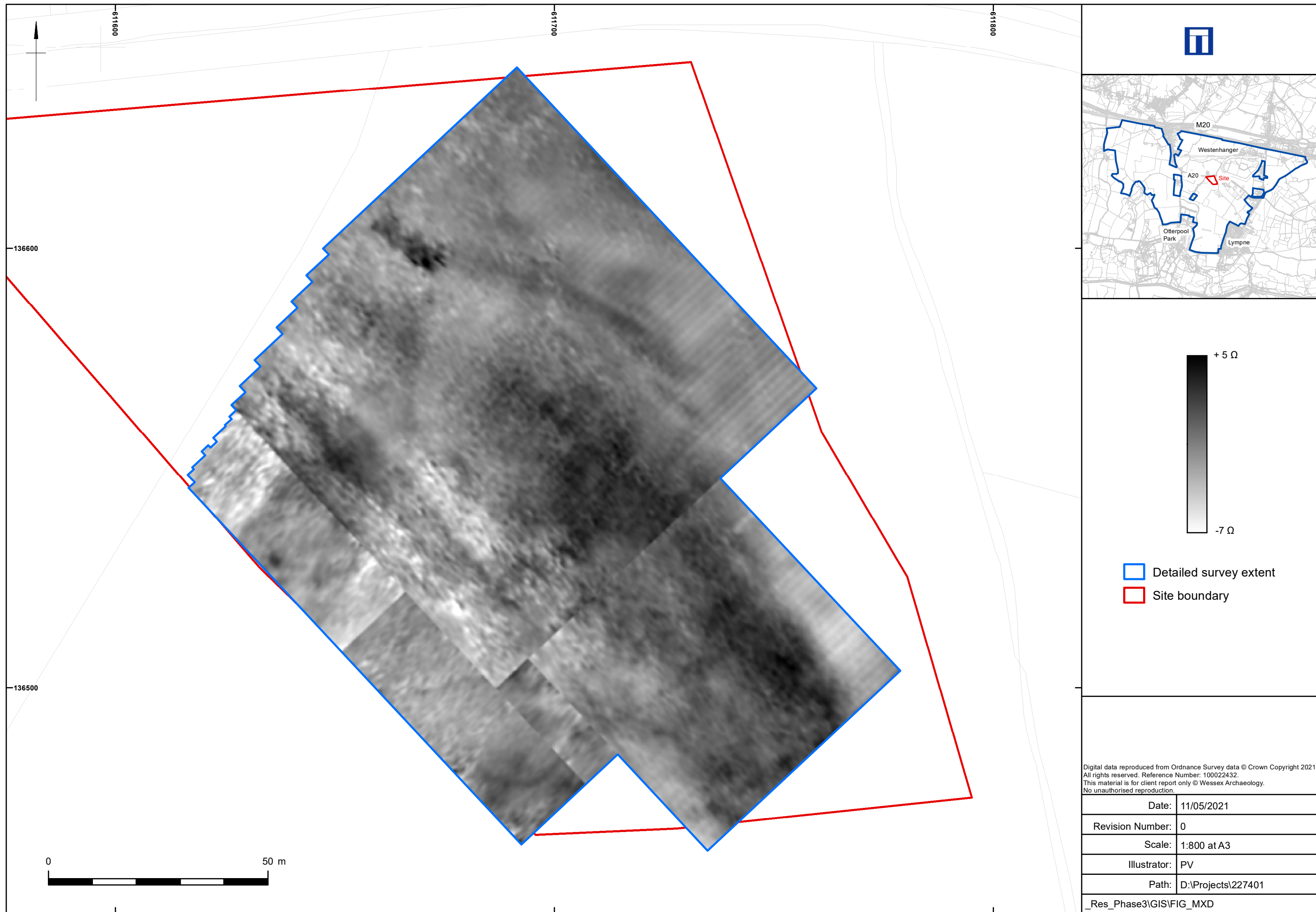
Project name		Otterpool Park, Roman Villa Resistance Survey, Folkstone and Hythe, Kent			
Type of project		Detailed earth resistance survey (Field evaluation)			
Project description		A detailed earth resistance survey was conducted over land at Otterpool Park, Roman Villa Resistance Survey, Folkestone and Hythe, Kent. The site comprises two fields of pasture and arable crop located on land directly south of the Ashford Road (A20), covering an area of 2.5 ha. The detailed earth resistance survey has been successful in detecting anomalies of archaeological origin in throughout the survey area. In the north-west of the survey area rectangular, structural remains that indicate a hypocausted room have been identified. The location of these remains coincides with anomalies detected during previous gradiometer results which indicated archaeological features. Subsequent excavations of these anomalies revealed walls and remains of a Roman hypocaust system utilised to heat the Roman villa. Throughout, the survey area numerous ditches were also identified in the resistance data. The majority of these anomalies either correspond with ditches identified in the previous gradiometer survey and archaeological excavations carried out in 2017 and 2018. However, a number of ditches are visible with greater clarity in the resistance data set. The majority of these feature indicate enclosure ditches delineating the Roman settlement at the site. In the centre of the survey area two broad areas of high resistance are noted which are aligned in the same direction as the majority of the structural remains of the villa and supposed associated structures. Unfortunately the resistance survey has not provided any greater clarity in terms of floor plans of these structures in this area. It is possible due to alluvial deposits throughout the site that may have retained more water and the wet weather proceeding the period of survey may have produced conditions that reduced the effectiveness of the survey.			
Project dates		Start: 08-03-2021		End: 12-03-2021	
Previous work		DBA, EIA, Geophysical survey, Evaluative Trenching			
Future work		Trial trenching/excavation			
Project Code:	227401	HER event no.	If relevant	OASIS form ID:	wessexar1-421993
		NMR no.	N/A		
		SM no.	N/A		
Planning Application Ref.		Y19/0257/FH			
Site Status		None			
Land use		Cultivated Land 3			
Monument type		Villa	Period	Roman (43 to 410)	
Project Location:					
Site Address	Land south of A20, Lympe, Folkestone and Hythe			Postcode	CT21 4JD
County	Kent	District	Ashford	Parish	Aldington
Study Area	2.5 ha	Height OD	71 – 74 m aOD	NGR	TR 11734 36635
Project Creators:					
Name of Organisation		Wessex Archaeology			
Project brief originator		Arcadis LLP	Project design originator		Wessex Archaeology
Project Manager		Patricia Voke	Project Supervisor		Brett Howard
Sponsor or funding body		Arcadis LLP	Type of Sponsor		Developer
Project Archive and Bibliography:					
Physical archive	N/A	Digital Archive	Geophysical survey and report	Paper Archive	N/A
Report title	Otterpool Park, Roman Villa Resistance Survey, Folkstone and Hythe, Kent Survey Report			Date	2021
Author	Wessex Archaeology	Description	Unpublished report	Report ref.	227401.05



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Site location and detailed survey extents

Figure 1



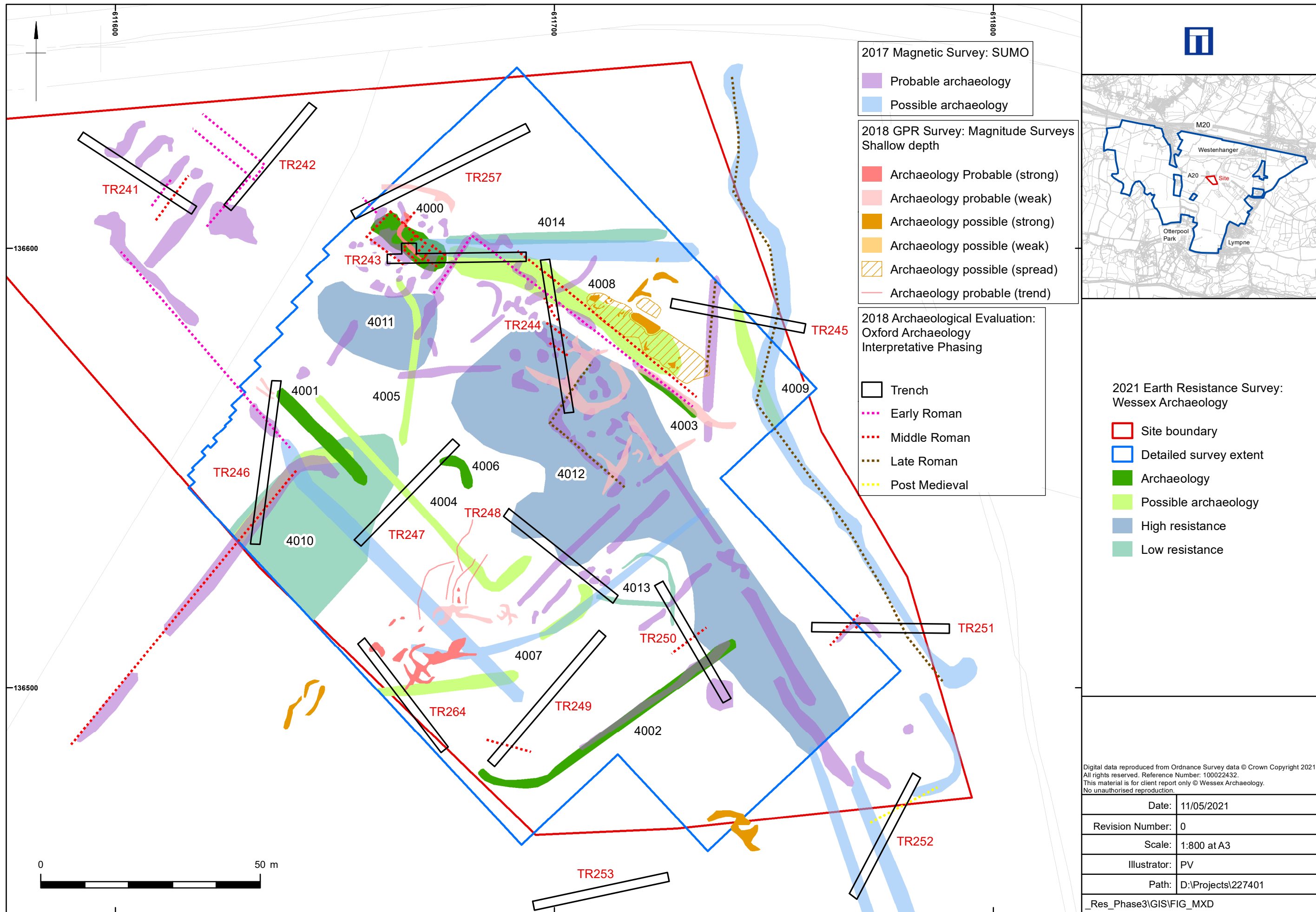
Detailed earth resistance results: Greyscale plot (Area 1)

Figure 2



Detailed earth resistance results: Interpretation (Area 1)

Figure 3

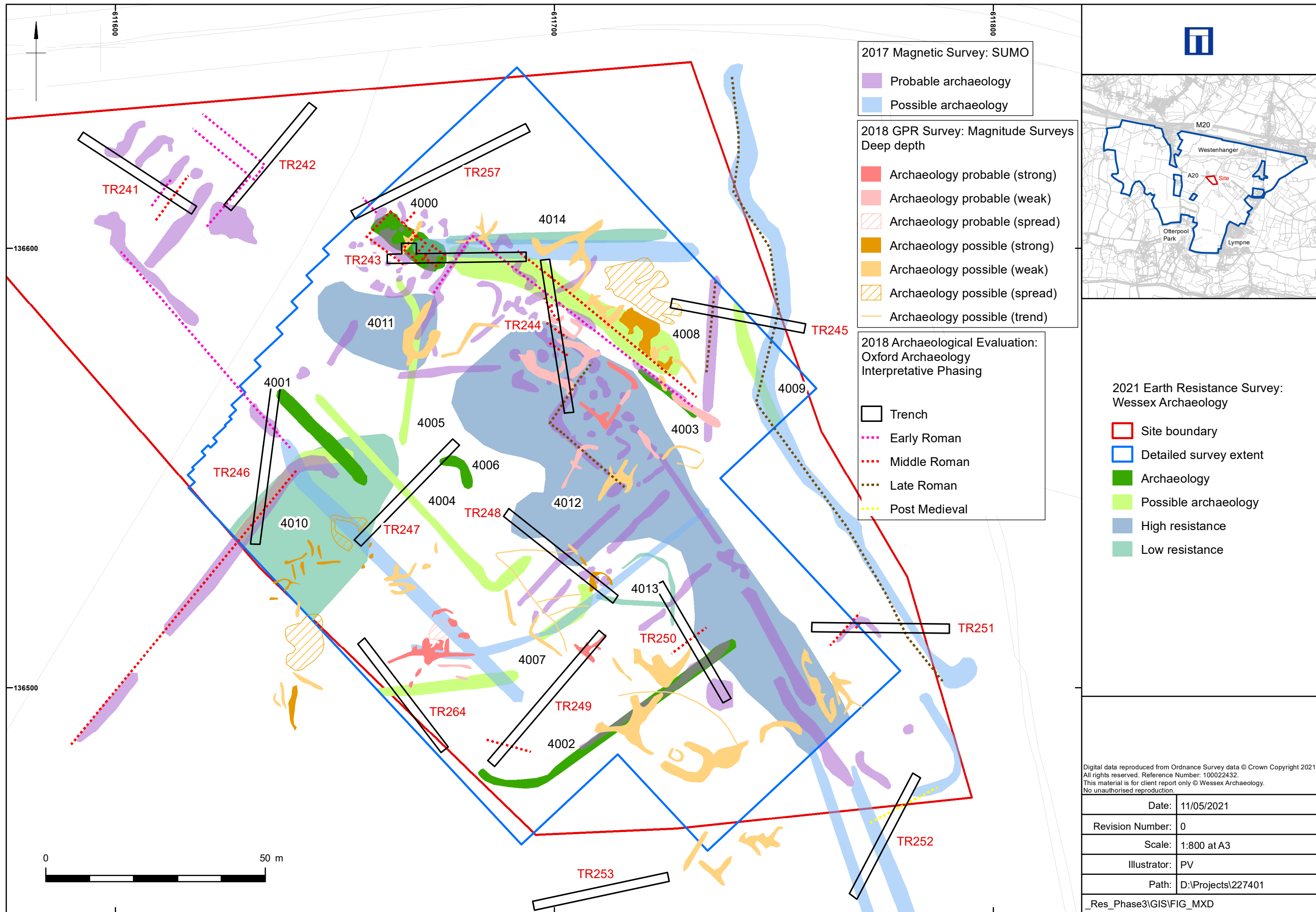


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Otterpool Park: Combined interpretation of Magnetic, GPR shallow depth, Earth Resistance and Archaeological Evaluation of Roman Villa

Figure 4



Otterpool Park: Combined interpretation of Magnetic, GPR deep depth, Earth Resistance and Archaeological Evaluation of Roman Villa



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