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St Mary The Virgin Old Church
Preston Candover, Hampshire

Ground Penetrating Radar Survey Report

Ref: 111230.01
November 2015

geoservices

St Mary The Virgin Old Church
Preston Candover, Hampshire

Ground Penetrating Radar Survey Report

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Summary

Ground Penetrating Radar survey was conducted around the tower of St Mary the Virgin Old Church, Preston Candover, Hampshire with Ground Penetrating Radar (centred on NGR 460780, 118220). The project was commissioned by the Churches Conservation Trust (CCT) with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features in particular the footprint of the church structure and any associated graves and crypts.

The site comprises a graveyard that is also used for sheep grazing that surrounds the remaining church structure. The geophysical survey was undertaken during the 6th-7th October 2015.

The ground penetrating radar survey in has demonstrated the presence of a number of responses of potential archaeological interest. The responses identified are primarily linear features associated with the church structure in particular on the north side of the church a series of linear responses that may be associated with a porch and several rectangular responses that are likely to be graves.

Due to obstacles and inclement weather the survey area was limited to *c.* 0.05 ha of a possible 0.3ha.

St Mary The Virgin Old Church
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Acknowledgements

Wessex Archaeology would like to thank the Churches Conservation Trust for commissioning the geophysical survey. The assistance of Dr Neil Rushton is gratefully acknowledged in this regard.

The fieldwork was undertaken by Lizzie Richley, Alistair Salisbury and Jennifer Smith. Lizzie Richley processed and interpreted the geophysical data and wrote the report. The geophysical work was quality controlled by Dr Paul Baggaley. Illustrations were prepared by Lizzie Richley. The project was managed on behalf of Wessex Archaeology by Dr Paul Baggaley.

St Mary The Virgin Old Church
Preston Candover, Hampshire

Ground Penetrating Radar Survey Report

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology was commissioned by the Churches Conservation Trust to carry out geophysical survey at St Mary the Virgin Old Church, Preston Candover, Hampshire (hereafter "the Site", centred on NGR 460350, 141400). Ground Penetrating Radar (GPR) was undertaken over all accessible parts of the Site (**Figure 1**).

1.1.2 The aim of the geophysical survey was to establish the presence/absence, extent and character of detectable archaeological remains within the survey area. In particular the GPR survey was sought to ascertain the location and extent of a crypt to the west of the current church and to get an idea of the original church plan.

1.1.3 This report presents a brief description of the methodology followed, the detailed survey results and the archaeological interpretation of the geophysical data.

1.2 Site location and topography

1.2.1 The Site is located in the village of Preston Candover approximately 11.5km south of the centre of Basingstoke and 11.5km east of Alton in the district of Basingstoke and Deane.

1.2.2 The Site of the church is located on the western edge of the village of Preston Candover, and is bounded an unnamed road to the north and east and hedgerow boundaries to the south and west. The Church is surrounded on the south and northwest by private properties and by agricultural land to the southwest, north and east.

1.2.3 The Site is on a lower-lying flat area of land approximately 100m above Ordnance Datum (aOD).Within the Site extent there were several obstacles in the form of gravestones and stone tombs alongside a fenced off area immediately adjacent to the remaining church structure.

1.3 Soils and geology

1.3.1 The solid geology at the Site is Chalk of the Seaford Chalk Formation in the north and Chalk of the Newhaven Chalk formation; sedimentary bedrock formed approximately 71-89 million years ago with superficial deposits of Head 1 comprising of Clay, Silt and Gravel (BGS 2015).

1.3.2 The soils underlying the Site are likely to consist of Chromic Luvisols soils of the 571m (Charity 2) association (SSEW SE Sheet 6 1983) which are largely characterised as well drained flinty calcareous fine silty soils found in valley bottoms. Soils derived from such geological parent material have been shown to produce contrasts acceptable for the detection of archaeological remains through ground penetrating radar survey.

1.4 Archaeological background

1.4.1 The following information is summarised from the Heritage Gateway website (www.heritagegateway.org.uk). A search was performed for all heritage assets within a mile radius of the Site in order to ascertain the archaeological potential of the Site.

Previous investigations

1.4.2 Very little previous archaeological investigation is recorded in the vicinity of the Site. Excavations during the 19th century were focused on the barrow and long barrow monuments to the south of the Site.

Designated heritage assets

1.4.3 Two scheduled monuments are located within a kilometre radius of the Site. A round barrow is located *c.* 460m South west of the Site (Historic England list entry 1001858) and was opened in 1870 when interments were discovered. It was likely constructed during the Bronze Age and is surmised that secondary Saxon interments may have been observed during excavation however there is no evidence to confirm the conjecture (HE Pastscape). A long Barrow is located *c.* 1km south-south east of the Site (Historic England list entry 1013009). This was likely to have been constructed during the Neolithic period (-4000—2200 BC) and was excavated in 1893 when human remains and a possible antler pick were found. Similarly to the round barrow the long barrow has a secondary early medieval inhumation (410-649 AC)

1.4.4 The remains of St Mary the Virgin St Mary Old Church is a Grade II* Listed building (Historic England list entry 1092852) with aspects from the original 12th Century Chancel and alterations from *c.* 1700.

1.4.5 South Hall, which lies *c.* 50 m south-east of the church is Grade II* Listed (Historic England list entry 1092849).

1.4.6 The post-medieval church of St Mary the Virgin located to the north east of the Site is Grade ll* listed.

1.4.7 A large number of the buildings in the village of Preston Candover are Grade II Listed, however these are not directly relevant to this investigation.

Archaeological and historical context

1.4.8 Prehistoric, medieval and post-medieval monuments and find spots are recorded by the National Record of Historic Environment (NRHE) within a mile radius of the Site.

1.4.9 A Lower Palaeolithic hand axe was found on the surface at Chapell Field within 50m of the Site (Monument No: SU 64 SW 27).

1.4.10 The earliest details for St Mary the Virgin Old Church date to 1101. The medieval church was burned in a fire in 1681 and the repaired building appears to have been a long single cell with transepts added during restoration. The Church was demolished in 1883 and only the 12th century chancel remains, the church was altered circa 1700 and in the late 19th century. A new church was erected on another site, and the original chancel converted into a mortuary chapel. The building that remains is an almost square structure with a plain tiled roof. The walls are of flint with stone dressings and brick quoins and buttresses

of the later period. The west wall is of late 19th century date; it is built of rubble and has around arched doorway.

1.4.11 Online historic OS mapping sources were consulted, which indicate that the Site of St Mary the Virgin Old Church has not altered in use since the late 18th century to present (Old-Maps.co.uk, 2015). It is unclear when sheep were first allowed to graze within the Site.

2 METHODOLOGY

2.1 Introduction

2.1.1 The ground penetrating radar survey at St Mary the Virgin Old Church, Preston Candover was undertaken in accordance with the English Heritage guidelines (2008) for each technique employed. The data were collected in zigzag method.

2.1.2 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team on the 6th and 7th October 2015. Field conditions at the time of the survey were reasonable with clear ground however heavy rainfall on the first day of the survey may result in varying amplitude responses between the two days of survey. Due to the inclement weather, obstacles within the Site and time constraints a total of 0.05ha of a possible 0.1 hectares were collected.

2.1.3 Due to insufficient satellite and cell coverage at the Site survey grid nodes were established around the church using hand tapes and later surveyed in with a Leica Viva RTK GNSS instrument using Post Processed Kinematic (PPK) set up which is precise to approximately 0.02m and therefore exceeds English Heritage recommendations (2008).

2.2 Ground Penetrating Radar Survey

2.2.1 Ground penetrating radar survey was conducted within the church yard of St Mary the Virgin Old Church (**Figure 1** & **2**). Due to the impediments discussed earlier a reduced area was surveyed, with GPR data recorded within the fenced area lying to the west of the remaining church structure, to the north of the church and to the northwest beyond a line of gravestones.

2.2.2 The ground penetrating radar survey was conducted using a GSSI SIR 3000 with 400 MHz antenna on a sledge with survey wheel to record horizontal distances. Data were collected at 60scans per unit (1 unit = 1 meter) along traverses spaced 0.25m apart with an effective time window of 100ns The GPR survey was undertaken in accordance with English Heritage guidelines (2008) and data were collected in the zigzag method.

2.2.3 The approximate depth conversion for the 400 MHz antenna is shown in Table 1 assuming the GPR pulse through the ground is 0.123m/ns. It is possible to determine more precisely the average velocity of the GPR pulse through the ground if excavated features at a known depth can be identified in the data. Radargrams were analysed for suitable hyperbolic reflections, which can be used to determine the velocity of the GPR pulse through the subsurface deposits.

2.2.4 The Relative Dielectric Permittivity (RDP) of the bulk structure can be calculated using $K = \left(\frac{V_c}{V_r}\right)^2$ where K is the RDP, Vc speed of light in a vacuum and Vr the GPR pulse velocity.

2.2.5 Data from the survey was subject to common radar correction processes. These comprise amplitude and wobble correction of the radar profile to correct for variance in temperature and soil moisture content, background and band pass filtering to remove noise in the data from the surrounding area and XYZ mean line to correct for mosaic effects from variance in the day to day conditions during survey. These steps were applied on the both datasets collected at the Site.

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

2.2.7

Table 1 - Relative velocity to depth conversion based on a dielectric constant of 5.96 for the 400 MHz Antenna

Time Slice	Time (ns)	Depth (cm)
1	0-5.47	0-27
2	4.48-9.95	22-50
3	8.96-14.43	45-72
4	13.45-18.92	67-95
5	17.93-23.4	90-117
6	22.41-27.88	112-139
7	26.89-32.36	134-162
8	31.38-36.85	157-184
9	35.86-41.33	179-207
10	40.34-45.81	202-229
11	44.82-50.29	224-251
12	49.31-54.78	247-274
13	53.79-59-26	269-296
14	58.27-63.74	291-319
15	62.75-68.22	314-341
16	67.24-72.71	336-364
17	71.72-77.19	359-386
18	76.20-81.67	381-408
19	80.68-86.15	403-431
20	85.17-89.65	426-448

2.2.8 4Further details of the geophysical and survey equipment, methods and processing are described in **Appendix 1**.

3 GEOPHYSICAL SURVEY RESULTS AND INTERPRETATION

3.1 Introduction

3.1.1 The ground penetrating radar survey has identified several point reflectors and linear responses across the Site along with anomalous areas of high and low amplitude reflections. Results are presented as a series of greyscale timeslices, archaeological interpretations at a scale of 1:500 and radargrams (**Figures 3** to **5**) with black representing high amplitude responses and white relating to low amplitude responses.

3.1.2 The interpretation of the ground penetrating radar data highlights the presence of potential archaeological features, possible archaeological features and high amplitude responses alongside a series of linear trends (**Figure 4**). Full definitions of the interpretation terms used in this report are provided in **Appendix 2**.

3.1.3 It should be noted that small features and water logged features may produce responses that are below the detection threshold of the GPR antenna. Excess disturbance in the form of excavation and demolition can also impede the ability of geophysical techniques to detect archaeology. It may therefore be the case that more archaeological features may be present than have been identified through geophysical survey.

3.2 Ground Penetrating Radar 400 MHz results and interpretation

3.2.1 The 400MHz antenna shows a number of responses of potential archaeological interest (**Figures 3** and **4**). This antenna has the potential of detecting features to a depth of 4m in good conditions. Timeslices have been grouped together for ease of interpretation with each interpretation image detailing the results in *c.* 75cm thick sections.

3.2.2 Timeslices 1-3 (**Figure 4**), detailing responses from the ground surface to a depth of approximately 72cm, shown a range of responses of potential archaeological interest. North-west of the remaining church structure and abutting the fenced off area are a series of high amplitude responses **4000** that form a square alignment. This response is clearly visible as a strong reflection in the radargrams (**Figure 5**, transects prescan41 and prescan 45). These are considered to be of definite archaeological origin and may represent a transept structure. Within the area of that these cordon off **4001** shows a linear arrangement of weaker high amplitude responses that lie on an east-west alignment (indicated by a trend line). It is likely these are related to the church structure put due to their broken form and lack of firm alignment these are interpreted as probable archaeology. Further high amplitude responses within this area are considered to be probable archaeology given the context in which they are found.

3.2.3 Immediately west of the remaining church structure and within the fenced off area, several high amplitude responses have been detected by the radar survey. In particular **4002** and **4003** indicated two rectangular responses measuring some 1.4m x 1.9m and 2.3m x 0.7m respectively. The location of these two responses, the context in which they are found (what would once have been within the church) and their east-west alignments which are consistent with Christian burial traditions, suggests these may be tombs or crypts. **4003**, in particular can be seen clearly in the radargrams (**Figure 5**, transect prescan109). These responses coincide with stone slabs visible above ground.

3.2.4 South of **4003**, **4004** details a further strong high amplitude linear response on a north-south alignment. West of this, **4005**, details three further strong high amplitude responses, a linear that runs parallel to **4004**, but further south, and two rectangular responses these lies on the same alignment as the south wall of the current church structure, suggesting

that they may relate to the south wall of the old church structure. However this interpretation is tentative as these responses appear to continue beyond the survey extent (in particular the north-south linear) so the full size and shape of these features is unknown. Within the southernmost extent of the fenced area a number of tombs are visible above surface indicated how this area has been altered since the church was demolished in the 1700s, this level of disturbance can inhibit the ability of the radar of detecting earlier features.

3.2.5 Further features within this area of the Site show further high amplitude anomalies on a roughly east-west alignment. **4006**, shows a crude rectangular high amplitude response. It is possible that these responses indicate a crypt. This is corroborated in the radar grams (**Figure 5**; transects prescan105, prescan109 and prescan111) where strong reflections may be caused by the ceiling of a crypt. There is no evidence above ground of these responses unlike responses at **4004** and **4005**.

3.2.6 Potential evidence for the north wall of the church can be seen at **4007**, where a strong high amplitude linear response can be seen in the radar results. This feature lies on the same alignment as the extant church structure.

3.2.7 To the northwest of the remaining church structure **4008** shows two parallel linear high amplitude responses. These are immediately adjacent to a line of gravestones and are as such considered to be tombs. North of these two responses, **4009**, indicates a further two high amplitude responses. These are again roughly rectangular but their apparent alignment is not consistent with Christian burial traditions. It is possible that disturbance to the top soil as distorted the responses and that their true shape and alignment may differ. Within the individual radargrams (**Figure 5** transects prescan135 and prescan139) the reflection profile of this feature is clearly defined similarly to those seen in the radargrams over the potential transept structure suggesting it is a substantial feature and perhaps a grave.

3.2.8 Across the Site several high amplitude responses and linear trends are visible in the data. Strong readings are considered to be related to graves however the shape and form of these responses make them difficult to securely interpret. Linear trends are thought to be modern in provenance.

3.2.9 At a depth between *c.*67-139cm (timeslices 4-6) the linear trends **4000** and **4001** are no longer as clearly defined. **4010** indicates at weak high amplitude trend with a series of high amplitude point reflectors that define the position of the potential transept feature of the church. Immediately east of these features, **4011** identifies a high amplitude response, similarly to high amplitude responses detected in the earlier timeslices, this response has no clearly defined east-west alignment and as such leaves a solid interpretation difficult. The proximity of **4011** to the extant structure suggests a tentative relationship.

3.2.10 Within the fenced area, **4012**, **4013**, and **4014** show continuation of the high amplitude responses identified in the preceding timeslices, however with much diminished size, the feature at **4003** is represented by a small high amplitude response whilst **4002** (**4012**), and **4005** (**4013**) have respective measurements of *c.*1.1m x 0.9m and 0.9m x 0.5m. Feature **4015** is a continuance of **4007** (**Figure 4**), and shows a much wider feature that appears to angle to the south at the western end. This perhaps signifies the western extent of the earlier church structure. High amplitude responses at **4016** are consistent with the high amplitude anomalies in the preceding timeslice and are considered to be related to a grave.

3.2.11 Lastly at this depth **4017** and **4018** denote high amplitude responses dispersed in the north western area of the Site. Responses at **4017** are considered to be probable archaeology as their shape and size is consistent with known grave cuts however the apparent alignment contradicts Christian burial tradition; seeming to lie on a southwest-northeast alignment. Whereas responses at **4018** are interpreted as possible archaeology as their shapes and sizes are inconsistent.

3.2.12 Timeslices 7-9 show responses from a depth of *c.* 134-207cm, within these slices traces of the potential transept structure are still evident. **4019** and **4020** show weak, high amplitude forms that match the form of **4000**, **4001** and **4010**. It is likely that these responses are as a result of compacted earth from the weight of the previous structure. **4021** shows a continuation of **4011**, the size and form of this feature is little changed from the preceding timeslices allowing no further intimation of its origin.

3.2.13 A series of weak, high amplitude responses have been identified at **4023**, these lie on a roughly northwest-southeast alignment which is inconsistent with Christian burial tradition and are therefore difficult to interpret given their distance from the church structure. These could be nature in origin or as a result of disturbance caused during the excavation for burials.

3.2.14 Large areas of low amplitude responses **4024** and **4025** are present in these time slices, it is likely these are a result of the rainfall with the increased moisture content in the top soil causing increased variation in attenuation of the radar wave through consecutive depths.

3.2.15 Timeslices 10-12 (*c.* 202-274cm depth) show continuance of previously discussed responses. In particular a high amplitude response **4026** has been present in the results from the shallowest timeslices (**4000**; timeslices 1-3). It is likely this is a consequence of the material this feature is constructed from resulting in nearly all the radar energy being reflected and blocking any features beneath from being detected. **4027**, and **4028**, likewise are continuations of already identified features. The shape of **4028** is noticeably changed from the earlier timeslices (**4011** and **4021**) and has a much more rectangular form at this depth with a distinct east-west alignment. It measures approximately 0.5m x 1m.

3.2.16 The north west of the Site several high amplitude responses are considered to be off possible archaeological origin. **4029**, indicates the continuation of an earlier feature (**4017**). The shape and form of **4029** reveals little more about the provenance of this feature and it can only be assumed that it relates to a burial given the size, context and strength of the response. North and east of **4029**, **4030** and **4031** respectively show high amplitude responses which follow the edge of the survey area. These are interpreted as possible archaeology but due to being truncated by the survey extent their provenance is uncertain.

3.2.17 Many of the features shown in the last three interpretation images; timeslices 13-15 (269-341cm), timeslices 16-18 (336-408cm) and timeslices 19-20 (403-448cm) show the continuance of features previously discussed. In timeslices 16-18 a grouping of high amplitude responses is apparent in the northern part of the Site. These responses continue in to timeslices 19-20 (representing the deepest extent of the 400MHz radar survey). It is unclear what these are but due to their depth and form it is likely these are natural in origin and may be related to tree roots.

3.3 Modern Services

3.3.1 No modern services have been detected within the survey extent. This report and accompanying illustrations should not be used as the sole source for service locations and appropriate equipment (e.g. CAT and Genny) should be used to confirm the location of buried services before any trenches are opened on Site.

4 CONCLUSION

4.1.1 The ground penetrating radar survey has been successful in detecting anomalies of archaeological interest relating to the structure of the church.

4.1.2 The anomalies of archaeological interest are primarily those immediately to the west and northwest of the extant church structure. In particular clear structural remains are present at **4000**-**4001** within the first 75cm of the soil. These correspond with the shape of a transept that is found on the north side of many Norman churches. Within this structure further high amplitude responses may relate to interments or structural aspects of the church.

4.1.3 Potential evidence for the northern wall of the earlier church structure has been identified at **4007** which continues in proceeding timeslices at **4015** and in deeper timeslices. The shape of this response suggests that it angles to the south and may, as a result, define the western end of the earlier structure. However the restriction of the survey extent at this point means this is a tentative suggestion and further work would be needed to clarify it.

4.1.4 One aim of this survey was to identify the shape and extent of a known crypt to the west of the present church structure. Timeslices 1-3, **figure 3**, show a high amplitude response in in the centre of the fenced off area (**4006**). The GPR transects that cross this feature (**Figure 5,** Transects prescan105, 109 and 111) show a clear reflection from a buried feature that may represent a ceiling. This feature has a roughly rectangular structure however it is distorted perhaps as result of the fire that destroyed the Norman Church (Heritage Gateway 2015) or the process of demolition of the 18th Century during the 19th century (Heritage Gateway 2015).

4.1.5 A number of rectangular high amplitude responses across the Site are suggestive of graves many coincide with headstones (such as **4002**, **4003** and **4008**) but there are others which may be indicative of previous burials that have no surface marker such as **4006** and **4009**.

4.1.6 Christian burial traditional meant that the north side of the church was largely clear of gravestones, as this area was traditionally for “outcasts” of society, that is until space requirements necessitated he use of it. As such the response first noted in timeslices 4-6 at **4011** may be a burial however it is unclear based upon the GPR results alone.

4.1.7 At a depth of approximately 202cm-274cm the number of high amplitude anomalies is decreased corroborating interpretations of shallower features as being tombs or wall structures. Burials range in depth however most modern burials are done to a maximum of 6-7 foot (1-2m) depth to allow for a secondary burial at later dates as such simple interments are unlikely to be deeper than two meters unless there is a crypt which would necessitate increased depths. As such the lack of high amplitude features within the deep timeslices is unsurprising within a graveyard.

4.1.8 The survey has revealed several potential structural and funeral features of varying sizes and form. No further clear crypt features have been identified however the lack of substantial evidence from the radar survey may not exclude the potential presence of crypts, particularly considering the limitations on survey extent due to graves, fences and the weather. The radar survey has been successful in identifying evidence of previous phases of the church with the earlier Norman north walls and south walls clearly visible in the data collected within and immediately adjacent to the fenced area within the Site.

5 REFERENCES

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Heritage Gateway, http://www.heritagegateway.org.uk [accessed October 2015]

APPENDIX 1: SURVEY EQUIPMENT AND DATA PROCESSING

Survey Methods and Equipment – Ground Penetrating Radar

The ground penetrating radar (GPR) data were collected using a cart-based shielded antennae with central frequencies suitable for the types of target being investigated. Lower frequency antennae are able to acquire data from deeper below the surface, whereas higher frequencies allow high resolution imaging of near-surface targets at the expense of deep penetration. The exact make and model of equipment varies.

The depth of penetration of GPR systems is determined by the central frequency of the antenna and the relative dielectric permittivity (RDP) of the material through which the GPR signal passes. In general, soils in floodplain settings may have a wide range of RDPs, although around 8 may be considered average, resulting in a maximum depth of penetration c. 2.5m with the GPR signal having a velocity of approximately 0.1m/ns.

The GPR beam is conical in shape, however, and whilst most of the energy is concentrated in the centre of the cone, the GPR signal illuminates a horizontal footprint which becomes wider with increasing depth. At the maximum depth of the antenna, it becomes impossible to resolve any feature smaller than the horizontal footprint for the corresponding depth. The size of the footprint is dependent upon central frequency, and its size increases as the central frequency decreases.

The vertical resolution is similarly dependent upon the central frequency; for the 300MHz antenna, features of the order of 0.05m may be resolved vertically. Antennae with lower frequencies can therefore penetrate more deeply but are less resolute in both horizontal and vertical directions. Choice of antenna frequency is guided largely by the anticipated depth to the target and the required resolution.

GPR data for detailed surveys are collected along traverses of varying length separated by 0.5m with cross lines collected running perpendicular to these traverses at wider separations. The data sampling resolution is governed by the data logger and a minimum separation of 0.05m between traces is collected for all surveys.

Post-Processing

The radar data collected during the detail survey are downloaded from the GPR system for processing and analysis using commercial software (GPR Slice). This software allows for both the data and the images to be processed in order 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:

- Gain – Amplifies GPR data based upon its position in the profile, which boosts the contrast between anomalies and background. A wobble correction is also applied during this step;
- Background Filter - is used to remove banding noises that are seen across the radargrams
- Bandpass – Removes GPR data lying outside a specified range, which removes high- and low-frequency noise.

Typical displays of the data used during processing and analysis:

- Timeslice – Presents the data as a series of successive plan views of the variation of reflector energy from the surface to the deepest recorded response. The variation in amplitude is represented using a colour scale with red indicating high amplitude and blue indicating low amplitude responses.

- Radargram – Presents each radar profile in a vertical view with distance along the profile expressed along the x axis and depth along the y axis. The amplitude variation is expressed using a greyscale.

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.
- Probable archaeology – used for features which give a clear response but which form incomplete patterns.
- 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:

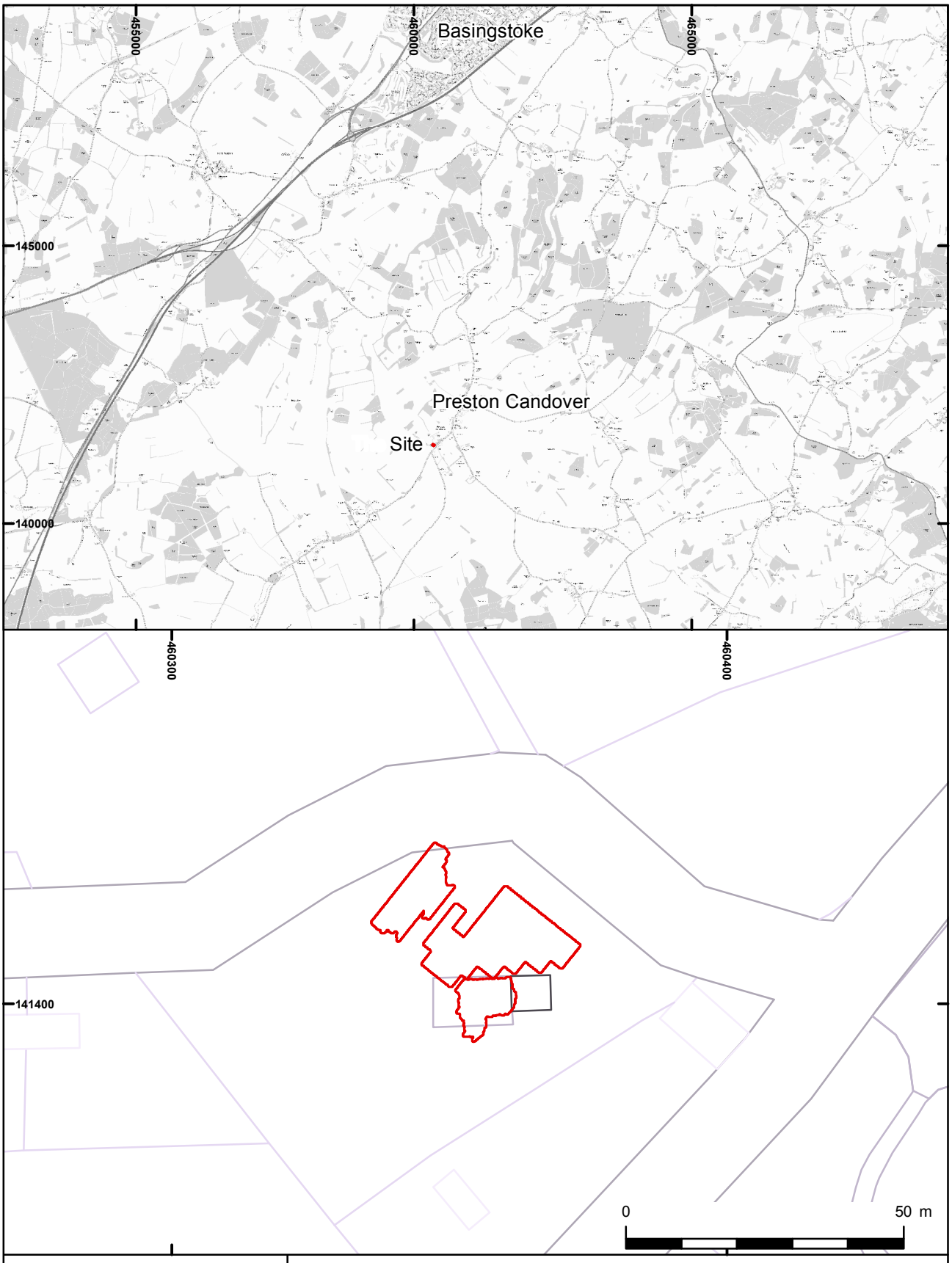
- High Ampitude Response – used for responses caused by buried material. These anomalies are of unknown modern origin.
- Modern service – used for responses considered relating to cables and pipes; most are composed of ferrous/ceramic material although services made from non-magnetic material can sometimes 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 as a series of repeating bipolar (black and white) responses.

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. They can be distinguished as areas of positive, negative or broad bipolar (positive and negative) anomalies.



GPR Detailed Extents

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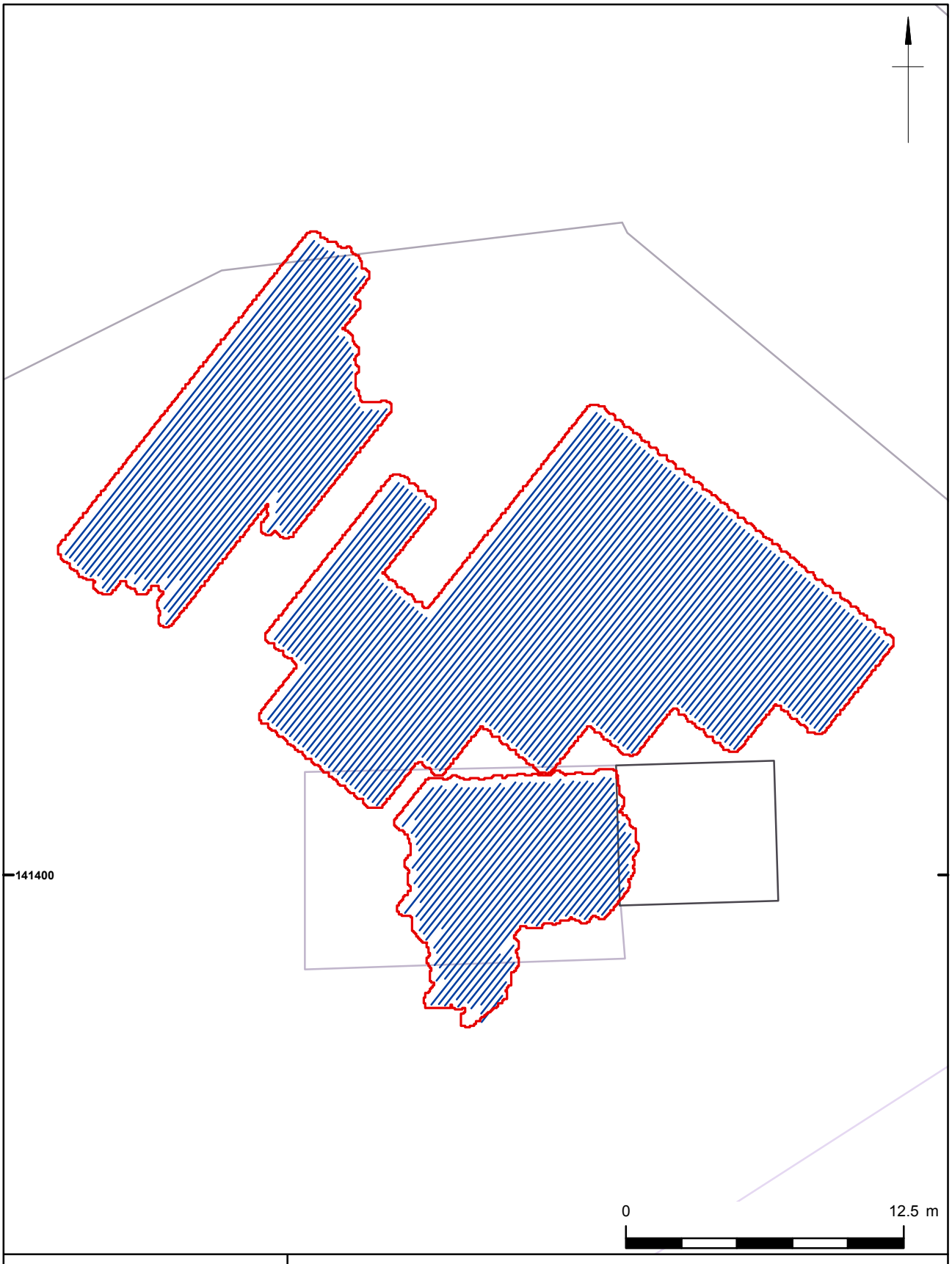
Site Location and Detailed Survey Extents

Figure 1



GPR Transects

GPR Detailed Extents

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GPR Transects

Figure 2

Timeslices 1-3

Timeslices 4-6

Timeslices 7-9

Timeslices 10-12

Timeslices 13-15

Timeslices 16-18

Timeslices 19-20

460350

141400

High Amplitude

Low Amplitude

GPR Detailed Extents

0 20 m

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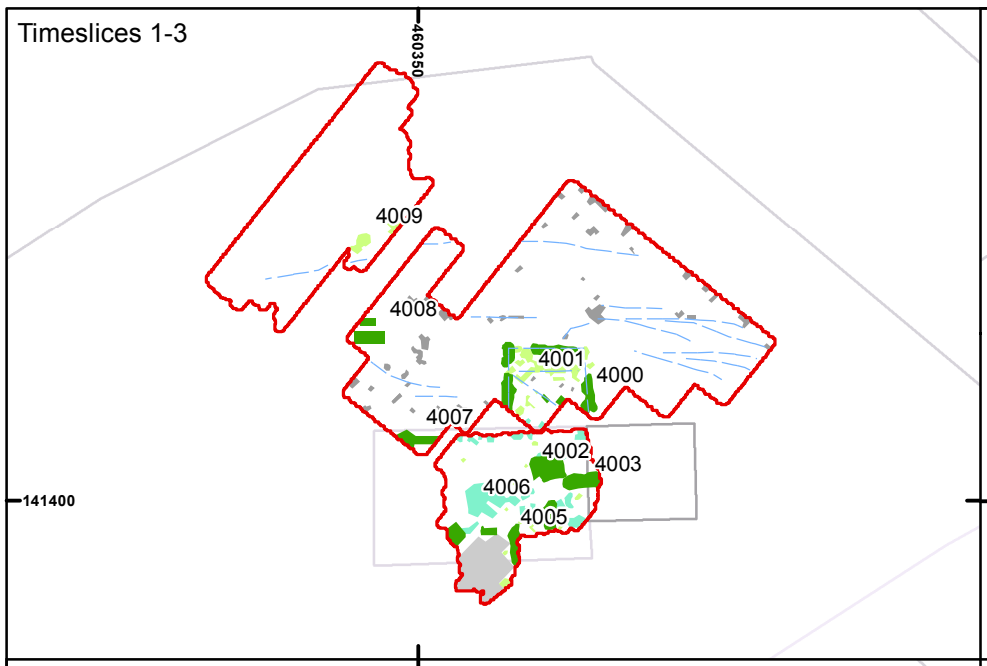
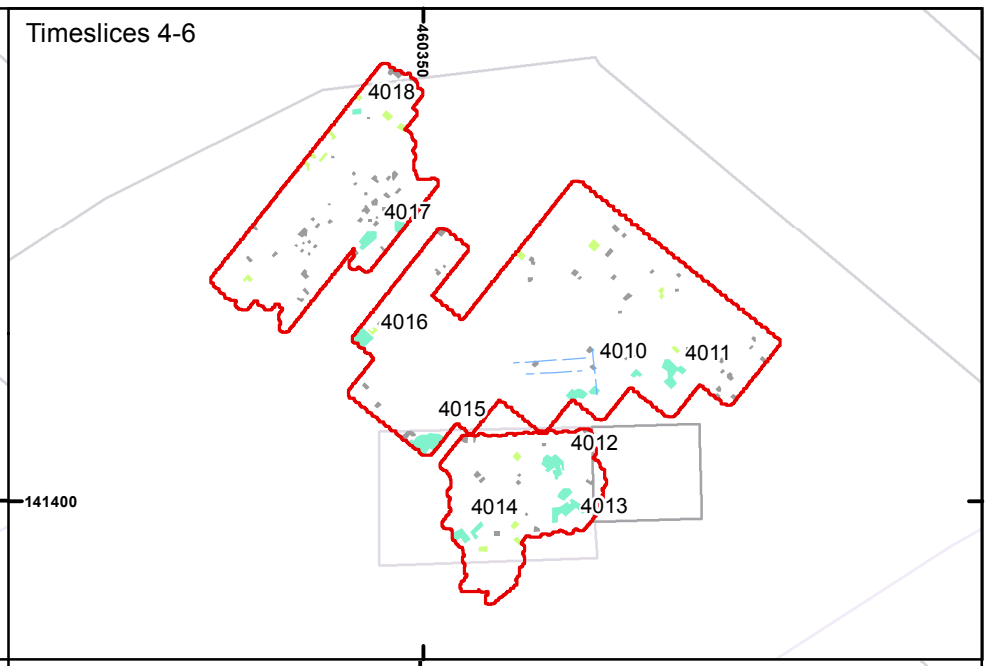
Ground Penetrating Radar results

Figure 3

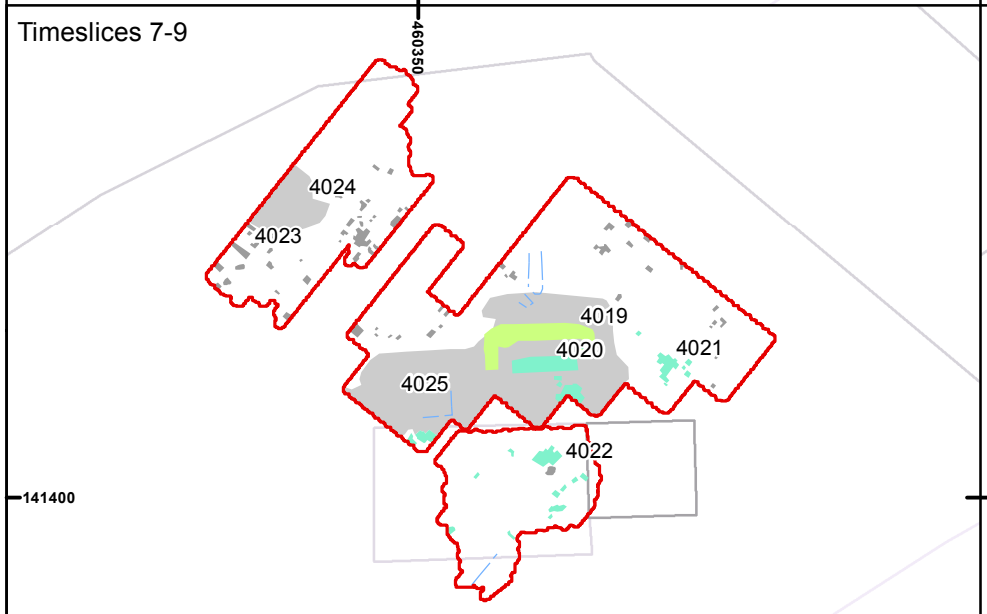
Timeslices 1-3



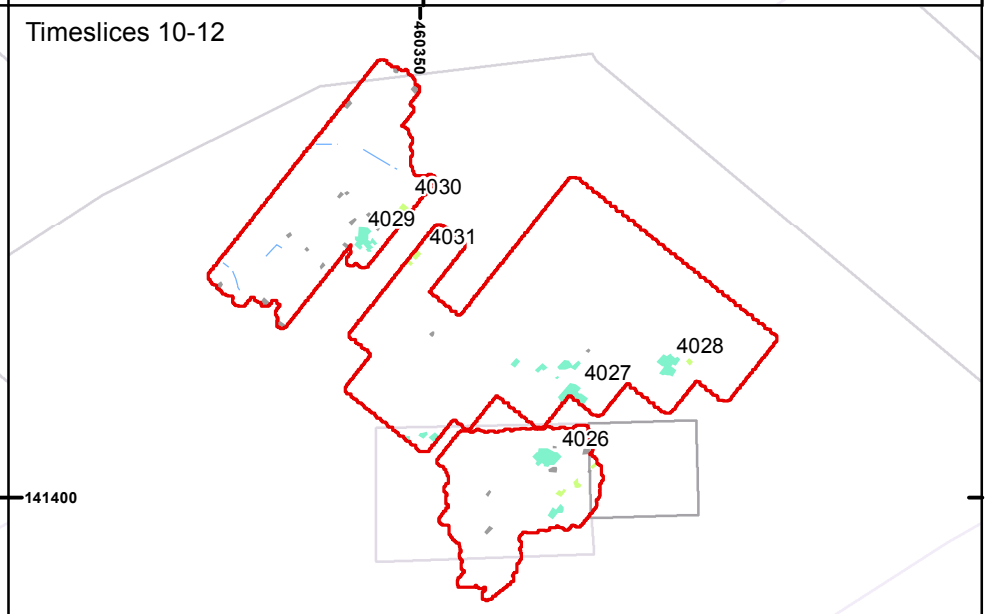
Timeslices 4-6



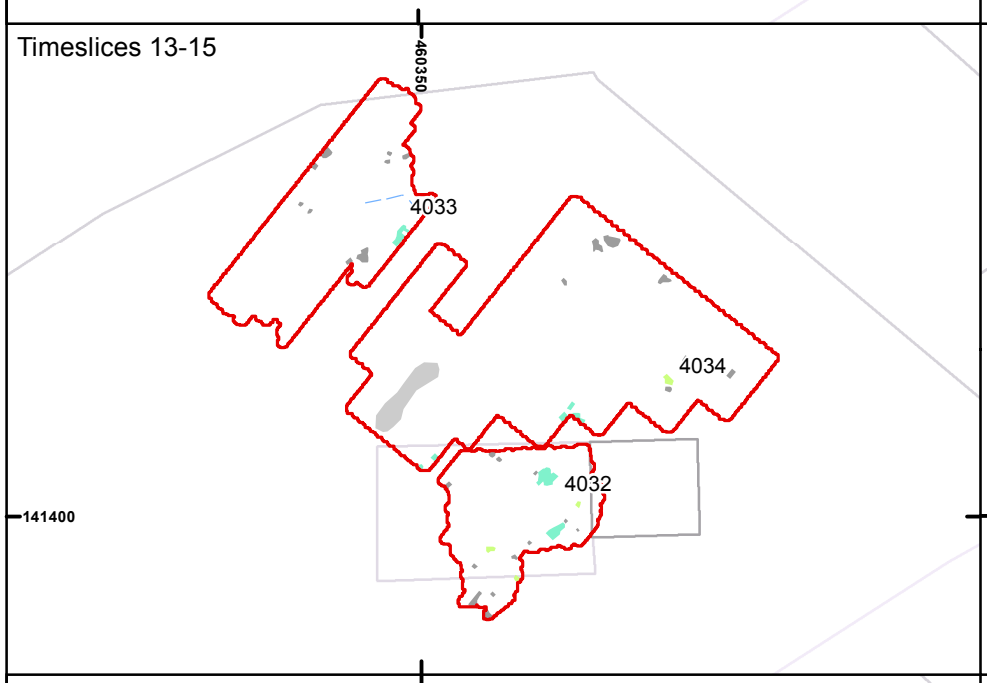
Timeslices 7-9



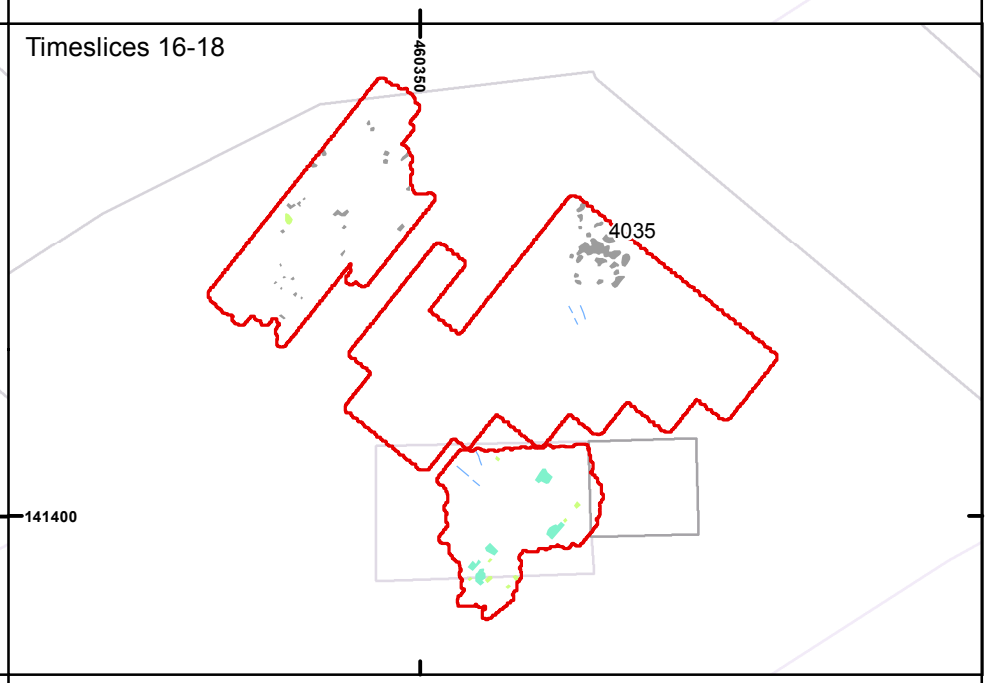
Timeslices 10-12



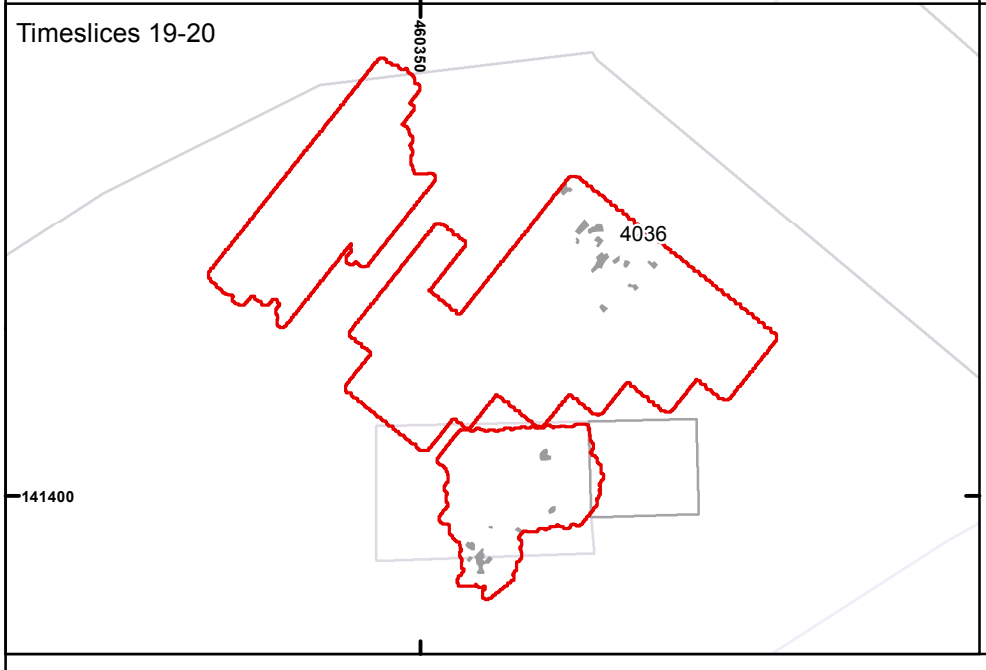
Timeslices 13-15



Timeslices 16-18



Timeslices 19-20



GPR Detailed Survey Extents

Trend

Archaeology

Probable Archaeology

Possible Archaeology

High Amplitude Response

Low Amplitude

0 20 m

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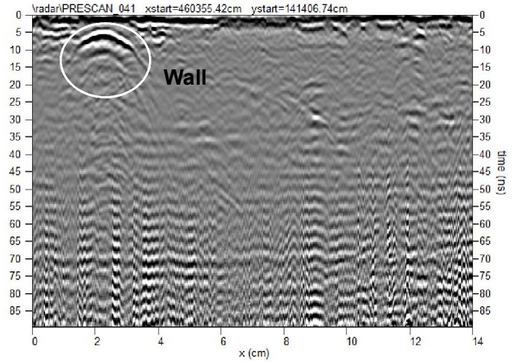
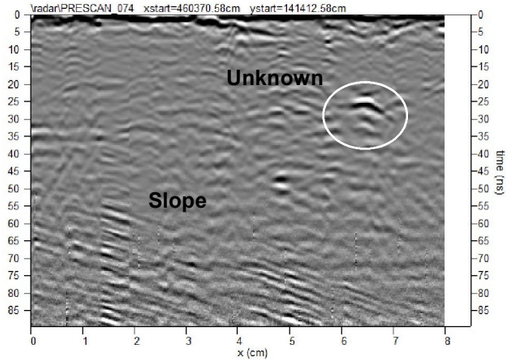
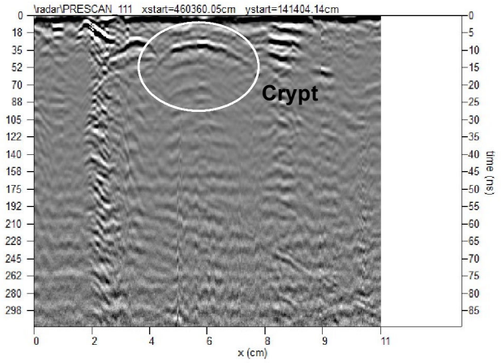
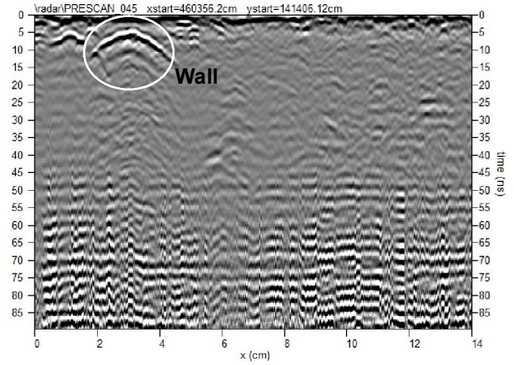
Ground Penetrating Radar Interpretation

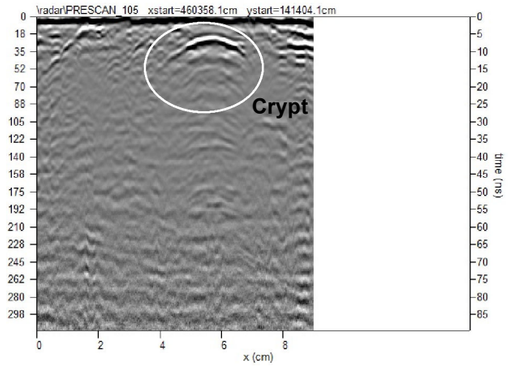
Figure 4

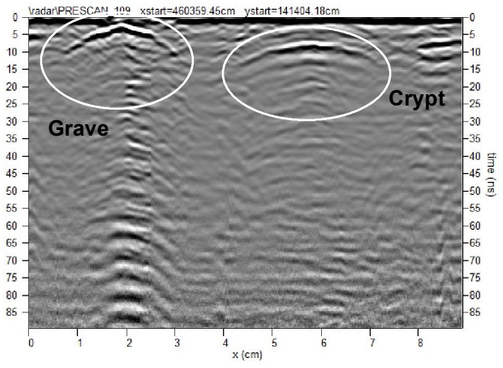


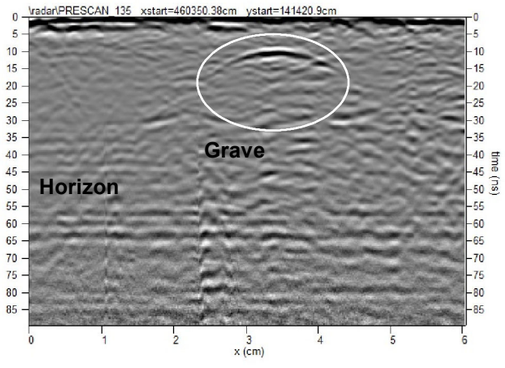


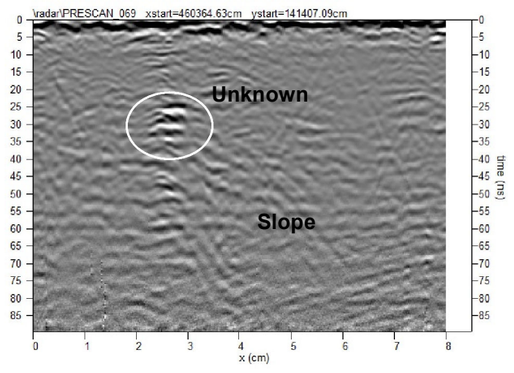


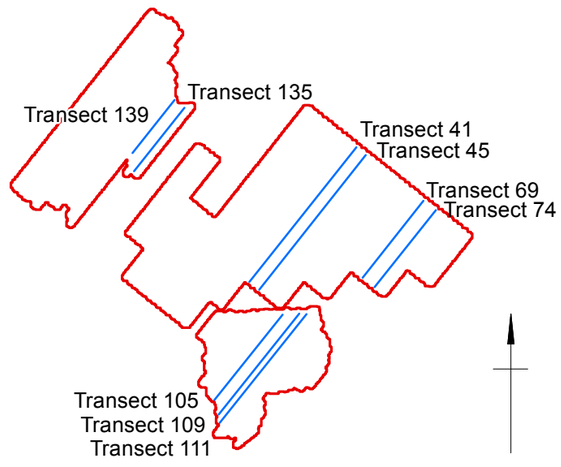


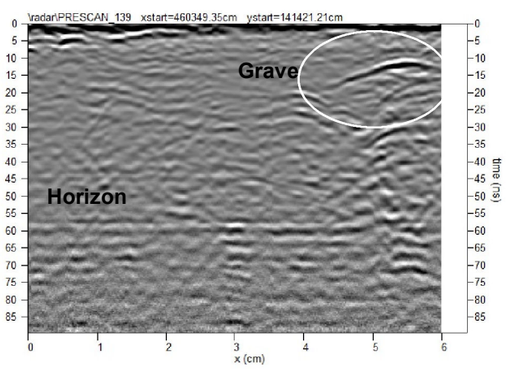












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GPR Selected Radargrams

Figure 5

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