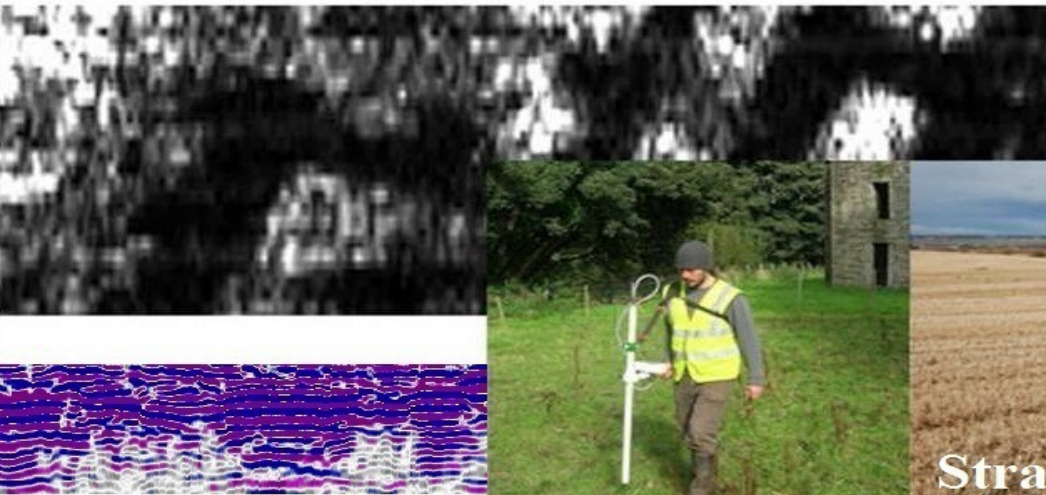


King's Knot, Stirling

**Geophysical Services in Archaeology
Supplied throughout the UK**



**Strategically located for
North-East Scotland**

Data Structure Report Radar Profile Survey

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August 2012

REPORT INFORMATION SHEET

<i>National Grid Reference</i>	NS 78896 93646
<i>Address</i>	King's Knot Park, Stirling
<i>Parish</i>	Stirling
<i>Council</i>	Stirling
<i>NMRS</i>	NS79SE 7 (earthwork, gardens)
<i>Client</i>	University of Glasgow
<i>Project Manager</i>	Dr Oliver J T O'Grady
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<i>Illustrations</i>	Dr Oliver J T O'Grady
<i>Fieldwork</i>	Dr Oliver J T O'Grady Stephen Digney, Dr Richard Jones
<i>Schedule</i>	
<i>Fieldwork</i>	June 2012
<i>Report</i>	August 2012

Checked by:

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1.0 Introduction

A radar profile survey was commissioned by Stephen Digney (Independent Researcher) and Dr Richard Jones (University of Glasgow) at King's Knot Park on the site of a multi-vallate enclosure identified by aerial photographic reconnaissance. The survey was intended to enhance interpretation of geophysical survey data already recorded at the site, in particular to improve characterisation of the profile and extent of a ditch system.

2.0 Location

King's Knot park is located directly adjacent the south-west side of Stirling Castle rock, in Stirling Council, Scotland at NS 78896 93646.

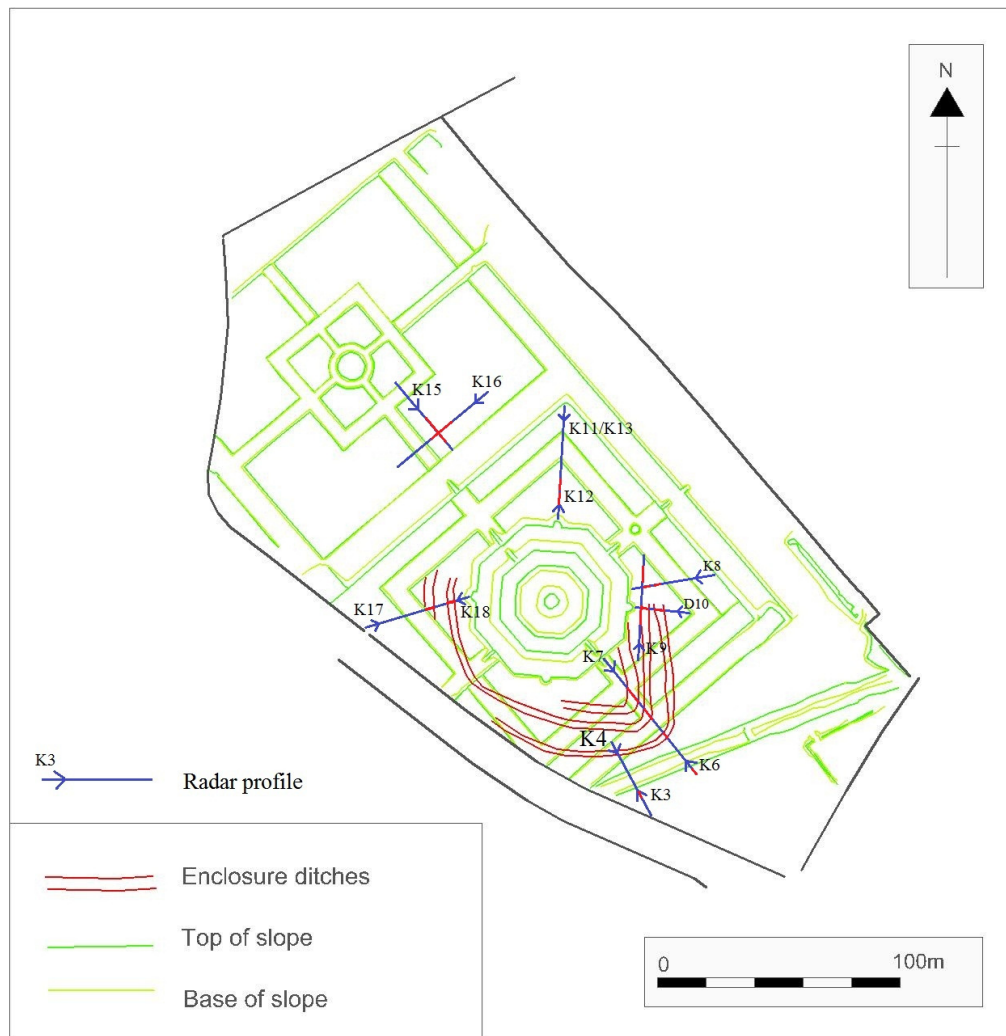


Figure: King's Knot Park showing location of profiles (Background map courtesy Stephen Digney).

3.0 Archaeological Background

3.1 Description

King's Knot formed part of a royal deer park and designed formal gardens from at least 12th to 17th centuries AD. The large geometric earthwork visible today represents remains of the post-medieval landscape. A large ditch crossing the S of the parkland is thought to be remains of a medieval boundary ditch, which formed part of the deer park pale and protecting the royal gardens. Aerial photographic survey in 1983 revealed the existence of a multi-vallate ditch system beneath and around the designed earthworks. Only the S side of the ditches were evident, but these appeared to indicate the presence of three ditches in an ovoid plan.

3.2 Geology

The bedrock is a limestone coal formation, part of the Clackmannan Group Type. The drift is raised marine deposits, Devensian, composed of mixed clay, silt, sand and gravel.

4.0 Methodology

A single channel radar device was utilised with a central frequency 400MHz antenna and dedicated data logger supplied by Utsi Electronics Ltd. Data was recorded using 60-100ns Tsweep and readings were taken every 14.75mm. Eighteen single radar profiles were recorded around the perimeter of the central earthwork to sample and prospect the ditch system, and also investigate the site of a garden pond to the N. Four profiles were deleted due to standard data and machine errors. Processing was undertaken using Reflex and involved standard background removal, application of linear gain function to enhance signals at depth and bandpass butterworth smoothing. Calibration was achieved using curve fitting for a mean ν of 0.1ms. A total station was used to record the profile locations. The fieldwork was undertaken in overcast and wet conditions on Thursday 21st July 2012.

5.0 Results

5.1 Profile K3 & K4

Profile K3 and K4 were located at the SE of the park to investigate the interior of large open ditch that bisects this area and the relatively level area to the SE as context for the feature. The profiles were aligned SSE to NNW from the park boundary wall to the outer edge of the landscaped garden earthworks.

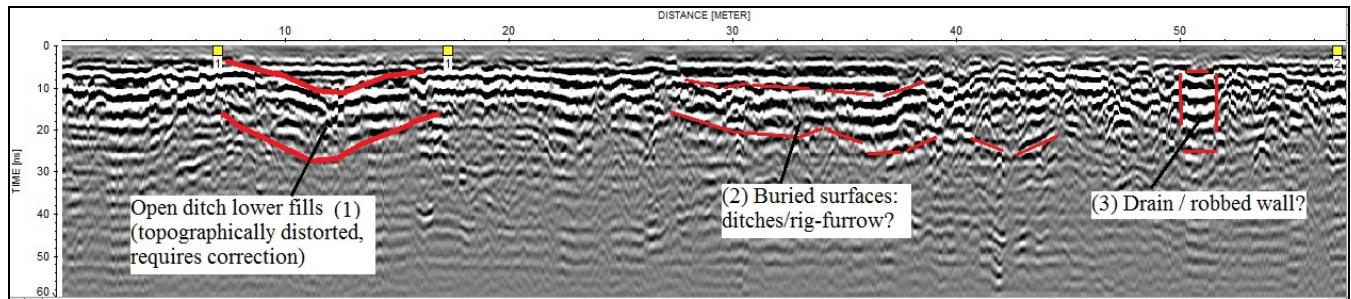


Figure: Profile K3 (60ns, SSE right, Mk 1 indicate edge of open ditch. Mk 2 at park boundary wall)

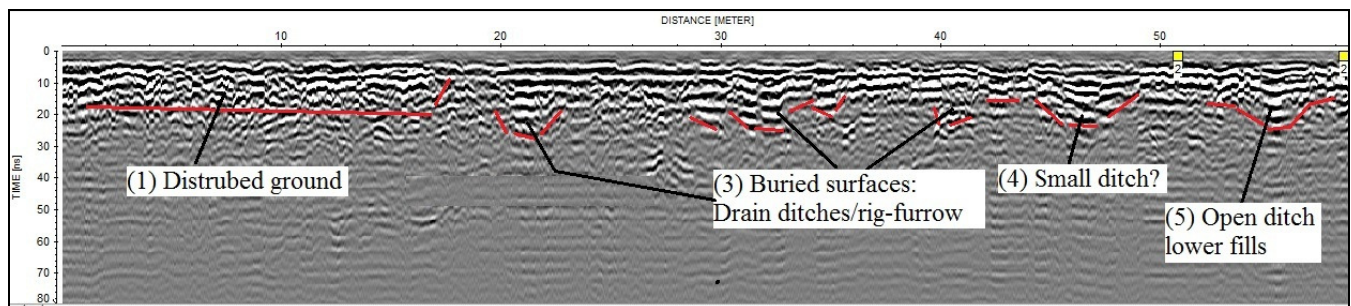


Figure: Profile K4 (80ns, NNW right, Mk 2 indicate edge of open ditch)

K3 and K4 indicate that the open ditch contains approximately 0.5m of *in-situ* fill deposits (K3: 1, K4: 5). Topographic adjustment is required to clarify this. To the SSE of the open ditch several undulating buried surfaces indicate the possible existence of buried drainage or rig-furrow remains (K3: 2, K4: 3). A possible small ditch is also apparent approximately 1.5-2m from the SE edge of the open ditch (K4: 4, also evident in profile K3 but not annotated here). This is apparently between 3-4m wide and 1-0.75m deep. The ditch may have formed part of the park pale, which has been filled in. At the SSE end of the profiles was an area of disturbed ground, seemingly associated with soils containing high stone content, possible material associated with the adjacent wall, old tree line and proximity to the public road (K3: 3, K4: 1).

5.2 Profile K6 & K7

Profile K6 and K7 were located to examine the SE ditch complex identified on the aerial photographs and aligned NW to SE.

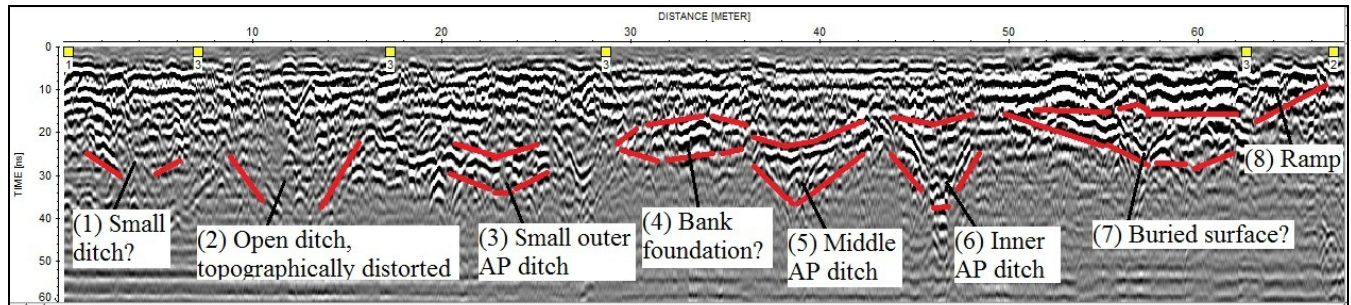


Figure: Profile K6 (60ns, NW to right, Mk3 = open ditch edge and start of landscape earthwork)

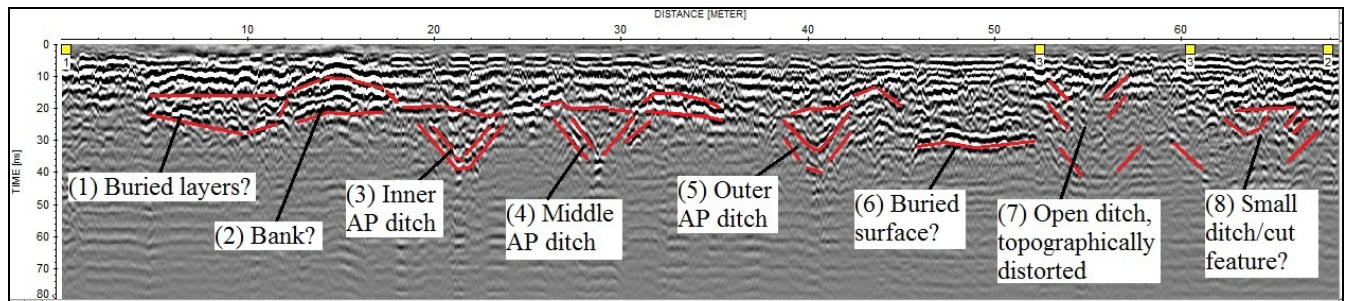


Figure: Profile K7 (80ns, SE to right, Mk3 = open ditch edge)

These profiles indicated a potential cut feature SE of the open ditch (K6:1, K7:8). The open ditch was again shown to contain *in-situ* fills, but pending topographic adjustment is required to accurately plot the extent and depth of these layers. The outer ditch of the cropmark features was located 38-40m from the edge of the central garden earthwork platform (K6:3, K7:5). This was shown to be approximately 4m in width, a U-shaped profile, approximately 1m deep and under 1m overburden. Remains of an up-cast bank were also suggested by profile K7(5).

The middle ditch was also located (K6:5, K7:4). This appeared to be 5-6m wide, may have been recut on at least one occasion and a relatively sharply angled base, despite gradually sloping sides. The ditch appeared to be over 1m deep under approximately 1m overburden. Remains of a bank at the SE side also appeared evident, possibly associated with this ditch (K6:4).

The inner ditch appeared 4.5m wide, with steeply sloping sides and a possible sharply angled base; over 1m deep under 1m overburden (K6:6, K7:3/2). A possible inner bank was mainly evident on profile K7(2), but is close to an area of possible landscaping and unclear buried surfaces (K6:7/8, K7:1), which could be from excavations associated with the main garden landscape earthwork.

5.3 Profile K8, K9 & K10

Profiles K8, 9 and 10 were recorded to the east of the central landscaped earthwork in order to assess the continuation of the cropmark ditches and presence of an entrance in this area. K8 and K10 were taken E to W, and K9 perpendicular to these from S to N.

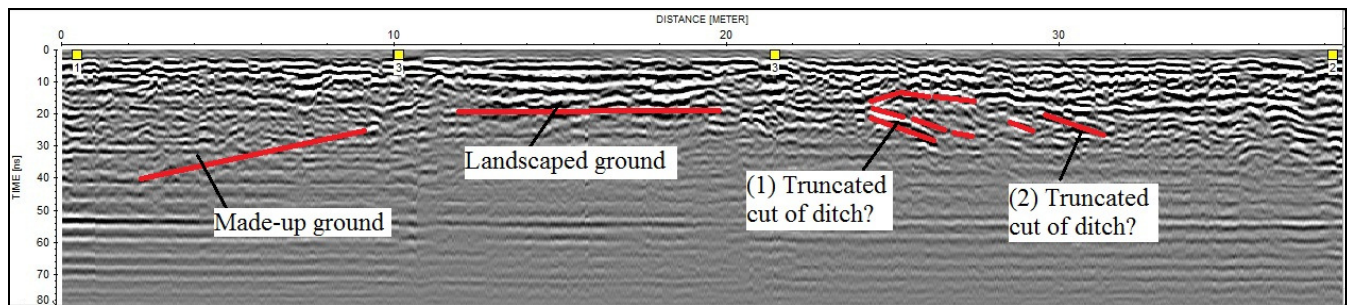


Figure: Profile K8 (80ns, W to right, Mk 3 edge of landscaped earthwork/path)

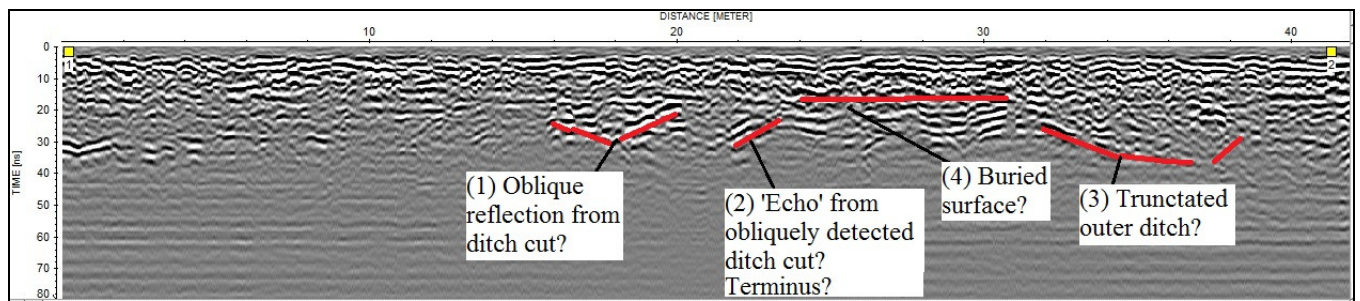


Figure: Profile K9 (80ns, N to right)

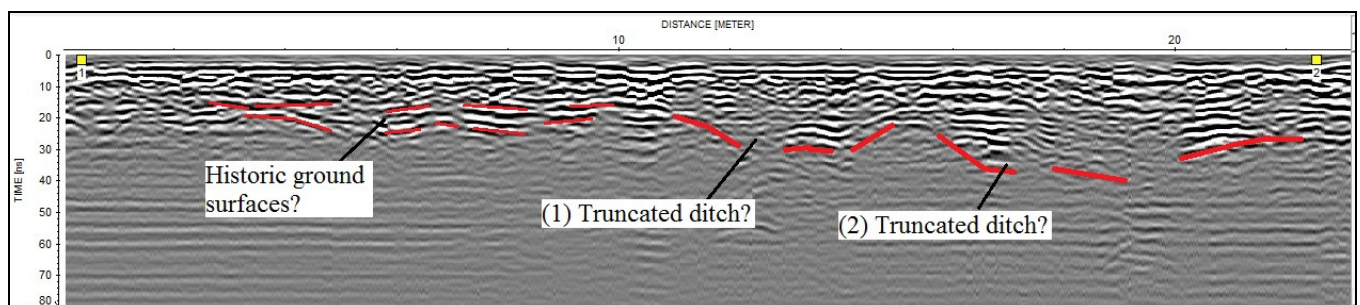


Figure: Profile K10 (80ns, W to right)

These profiles indicated limited evidence for the continuation of the outer and middle ditches adjacent the E side of the central landscaped earthwork. Where readings indicative of possible ditches where the cropmarks suggest these, the readings are insubstantial and shallow. This appears to indicate that the ditches are truncated in this area, possibly 0.5-0.75m depth under a comparable depth of compacted overburden (K8:1/2, K9:1/2/3, K10:1/2). The profiles also suggest the bases of the ditches may be more rounded and flatter than suggested by profiles K6 and K7 because of the small horizontal distance displayed on the plots. Profile 9 was taken roughly parallel to the line of the middle ditch, which may account for a possible echo or repeated reflection from the ditch cut (K9:1/2).

Significantly K9 also suggested an area of a substantial buried surface between the ditches, which may be man-made and possibly indicative of a break in the ditch system (K9:4). However, as the radar signal appears to be reflected obliquely from the ditches in this area, further interpretation is problematic. Overall profiles K8-K10 indicate truncation of the archaeology toward the north, which may account for the discontinuous character of the cropmarks from this area to the north.

5.4 Profile K11, K12 & K13

These profiles were located to assess the presence of ditches to the north of the central earthwork. A variable T-sweep (60-100ns) setting was utilised to maximise effectiveness of the prospection survey.

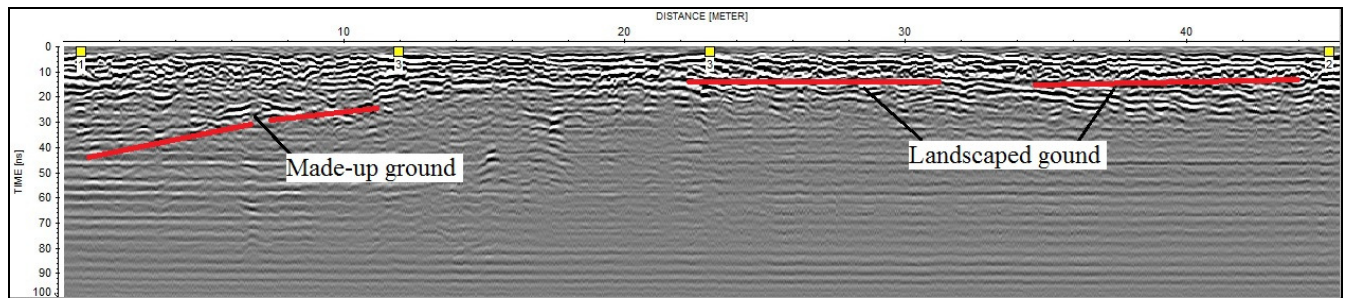


Figure: Profile K11 (100ns, S to right, Mk3 = edge of landscape earthwork drop in height)

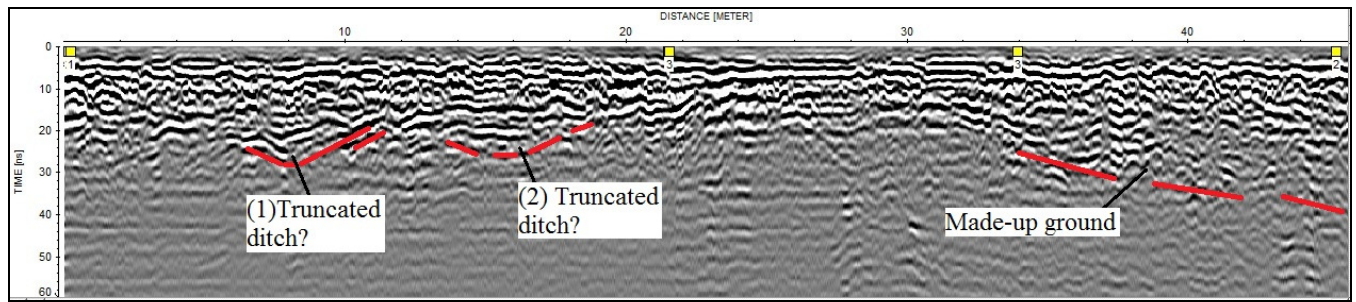


Figure: Profile K12 (60ns, N to right, Mk3 = edge of landscaped earthwork)

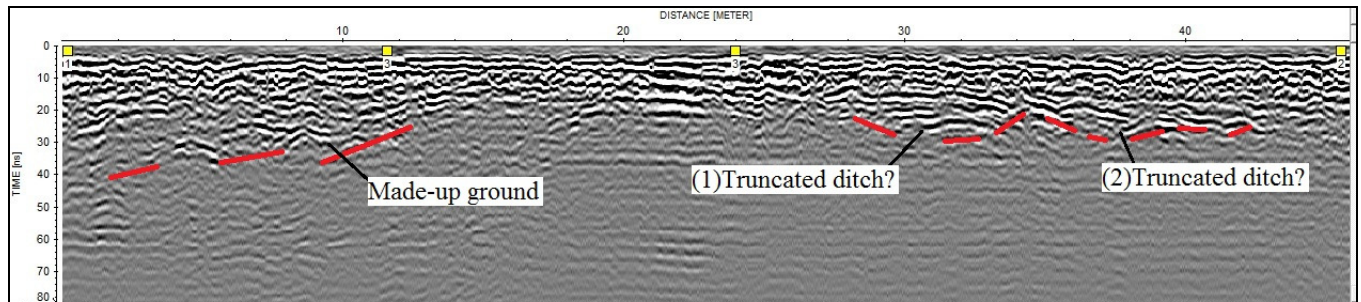


Figure: Profile K13 (80ns, S to right, Mk3 = edge of landscaped earthwork)

K11 was recorded at 100ns, which proved too large scale date to locate subtle features, but characterised the general landscape deposits in this area, suggesting the N edge of the area has been substantially elevated with made-up ground. Profiles K12 and K13 proved more successful, partially resolving readings from two slight possible cut features 5-6m from the main landscape earthwork's edge (K12:1/2, K13:1/2). These were approximately 4m wide, around 0.5m deep and may represent highly truncated remains of the outer and middle ditches. The subtle character of the readings may suggest this area has been heavily scarped and landscaped with re-deposited soils during formation and changes to the gardens. It may also account for the lack of cropmarks in this area.

5.5 Profile 15 & 16

Two profiles were recorded at the north of the gardens to assess for remains of a historic ornamental pond in this area. The profiles were recorded perpendicular increase probability of locating the archaeology from different directions.

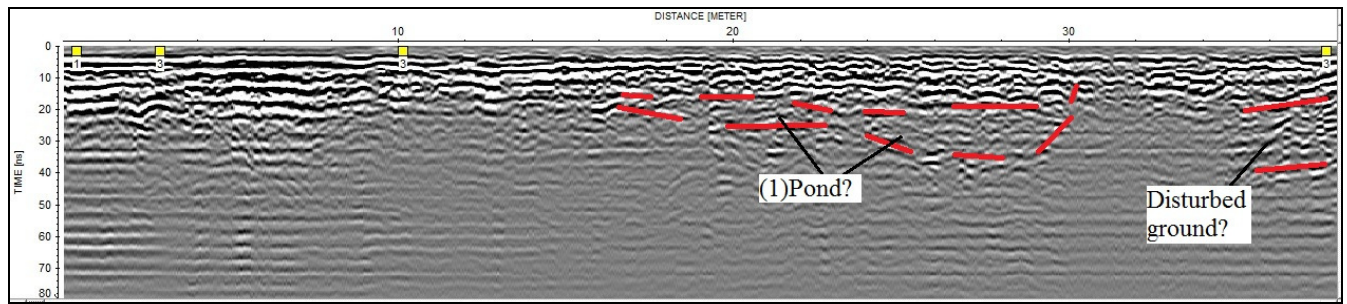


Figure: Profile K15 (80ns, SE to right, Mk3 = edge of landscaped earthworks)

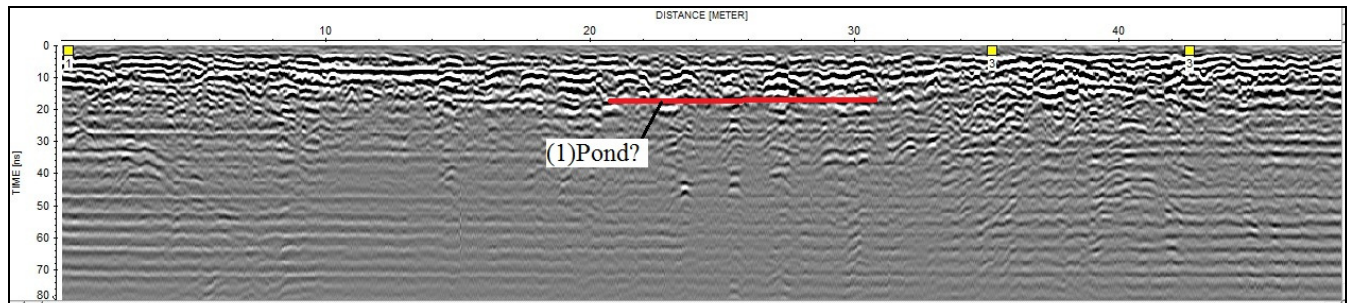


Figure: Profile K16 (80ns, SW to right, Mk3 = edge of landscaped earthwork)

Possible indications of the pond remains were evident in K15 across a 15m extent and approximate depth of 1.5m (K15:1, K16:1). This appears relatively deep and may be a result of attenuation of the radar signal by high water content silted deposits. K16 shows a poorly resolved area of disturbance, which may indicate the back-filled remains of the pond, associated with further attenuated signals. This was approximately 10m wide (K16:1).

5.6 Profile K17 & K18

Located to the west of the central earthwork, these profiles were intended to characterise the ditches in this area. Two T-sweep settings were used because of the uncertainty regarding the depth of the subsoils in this zone, 80ns and 60ns respectively.

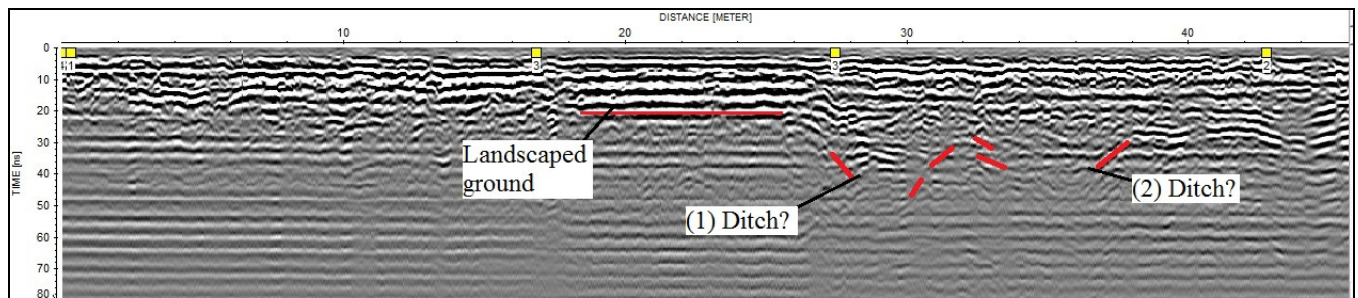


Figure: Profile K17 (80ns, E to right, Mk3 = edge of landscaped earthwork)

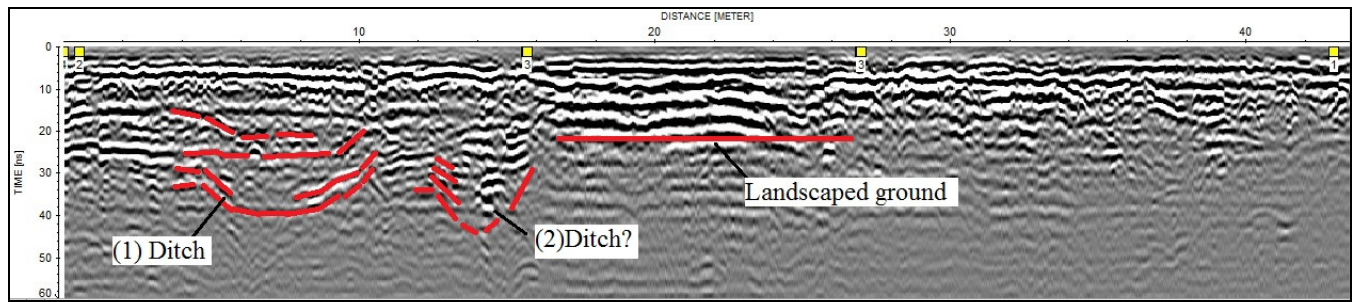


Figure: Profile K18 (60ns, W to right, Mk3 = Landscaped ground)

Profile K17 provided poorly resolved indications of two ditches 5m from the central earthwork's edge (K17:1/2). A change to 60ns in K18 provided better resolution, clearly showing the profile of the middle ditch and to a lesser extent the outer ditch (K18:1/2). The middle ditch appeared to be approximately 5m wide and over 1m metre depth with a flat to rounded base. The outer ditch was smaller at approximately 3.5m wide, steeper sloping sides to a depth of approximately 1.5m and apparently a relatively sharp angled base. These results indicate good survival of the archaeological remain at the W side of the site, in contrast to the E and NE.

6.0 Conclusions

The radar survey has complimented and enhanced previous surveys by characterising the profile of the ditch system at crucial locations around the King's Knot parkland, previously only recorded by aerial photographic reconnaissance. The results have provided useful detail about the specific character of the three buried ditches, indicating that the inner two ditches are between 4-5m wide and more substantial than the outer ditch at around 3-3.5m width. The depth of archaeological deposits varies across the site, with the ditches between 1m and 1.5m depth under approximately 1m overburden at the S and W sides, depleting to around 0.5m depth to the E and NE where the ditches are likely to have be truncated by landscaping. The apparent continuation of the middle and outer ditches to the N of the site is a new finding as are hints of a possible break or entrance to the E side. Interpretation of the open park ditch at the S of the site was complicated by a lack of topographical information, which it is hoped can be made available to the author at a later date to adjust the data. At the N of the park the possible remains of a pond were identified in an irregular zone of disturbance and attenuation of the signal. A scheme of targeted trial trenches is advised to test the veracity of the geophysical surveys and the data provide here should now allow for accurate quantification of resources necessary for this next phase of investigations.

7.0 Statement of Indemnity

Scheduled Monument Consent was confirmed by Historic Scotland prior to the survey commencing. OJT Heritage cannot be held responsible for costs incurred or damages caused by any subsequent works devised with reference to the findings and recommendations contained in this report. OJT Heritage hold professional indemnity and public liability insurance with Towergate Risk Solutions, including legal expenses cover.

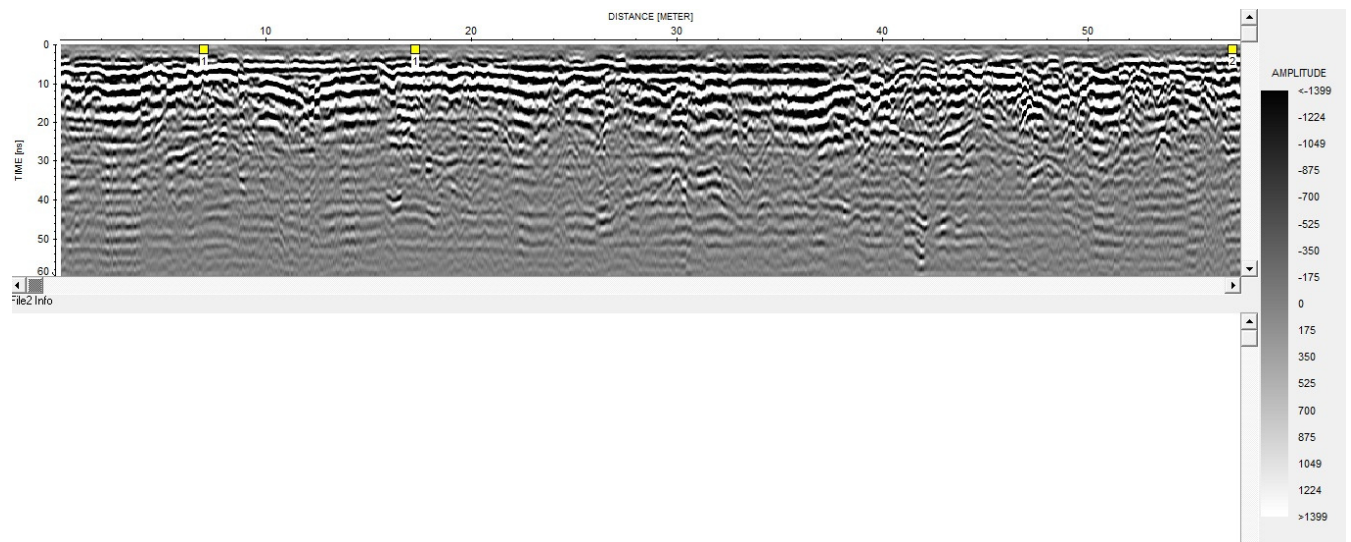
8.0 Bibliography

Cuenca-García, C. 2012 *GPR Survey (King's Knot, Stirling)* Unpublished report.

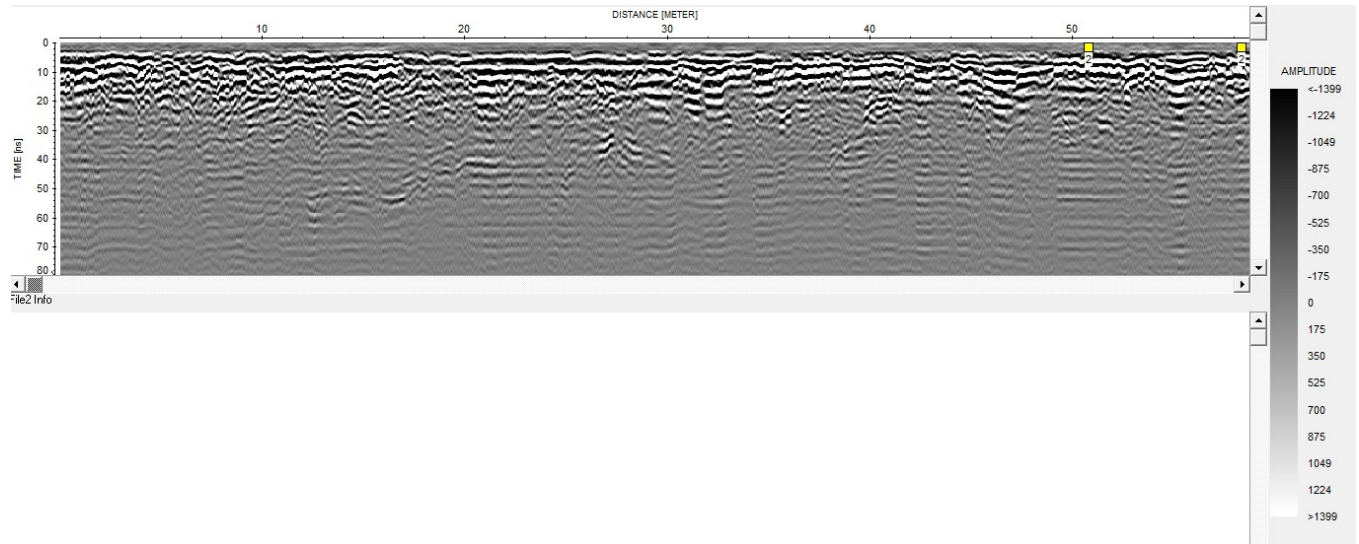
Jones, D.M. (ed.) 2008 *Geophysical Survey in Archaeological Field Evaluation*, Swindon: English Heritage.

9.0 Appendix

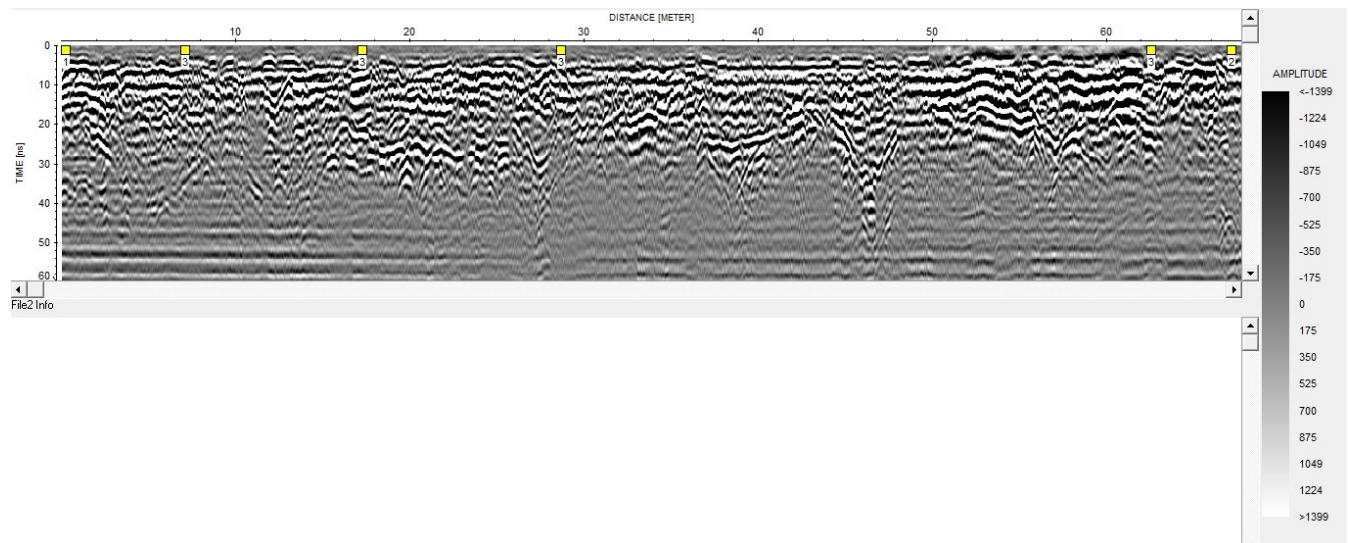
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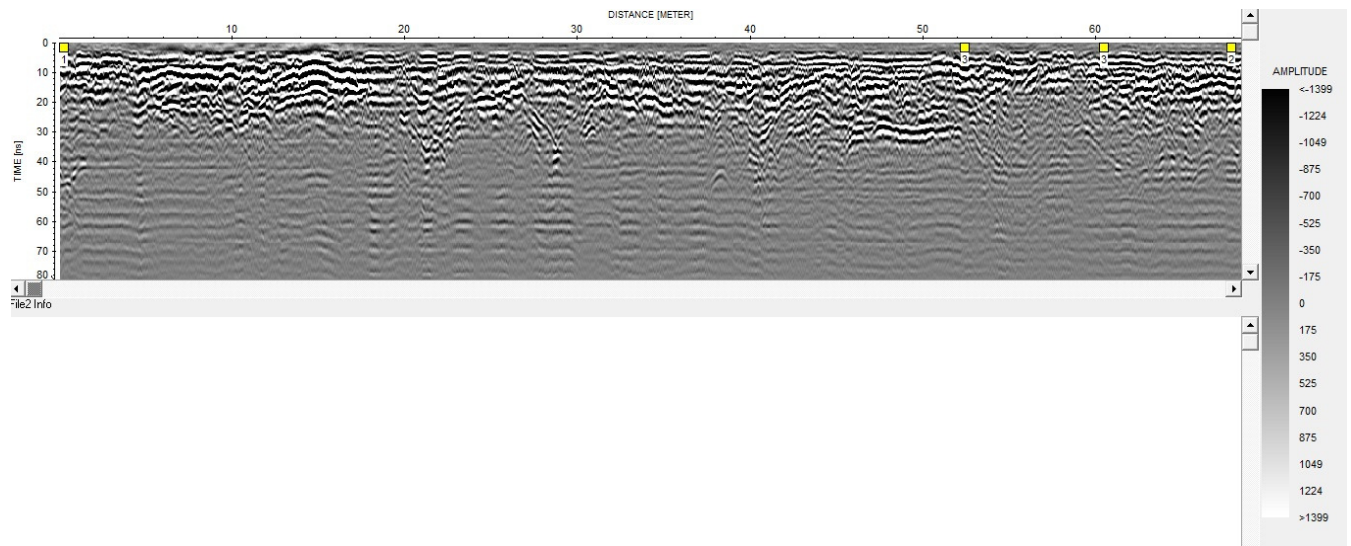
K4



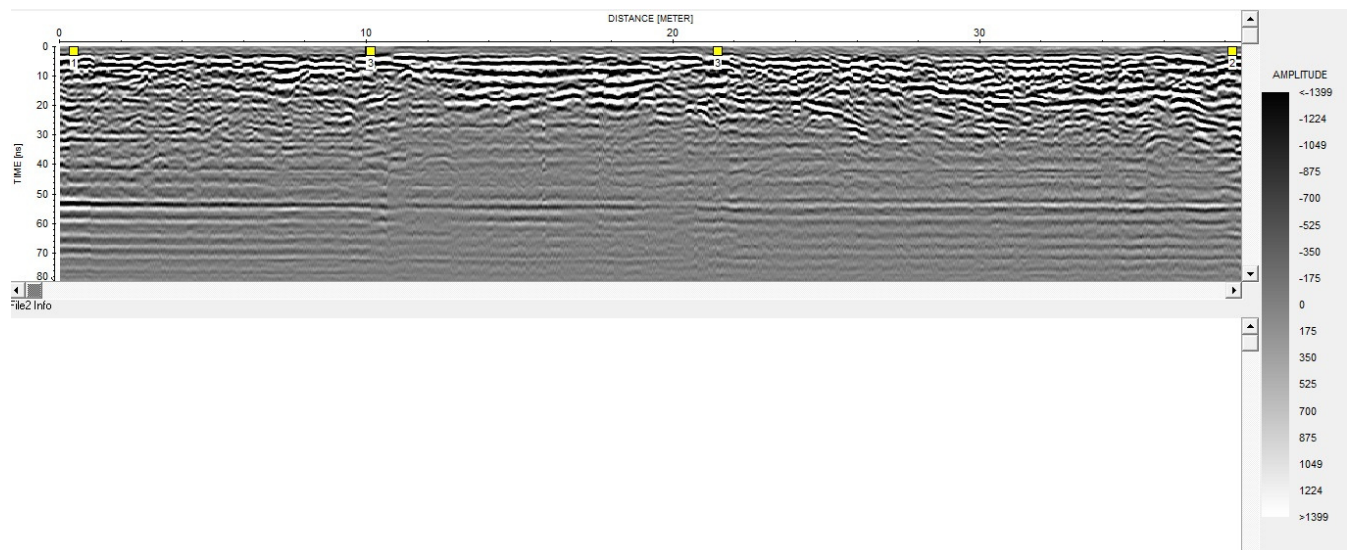
K6



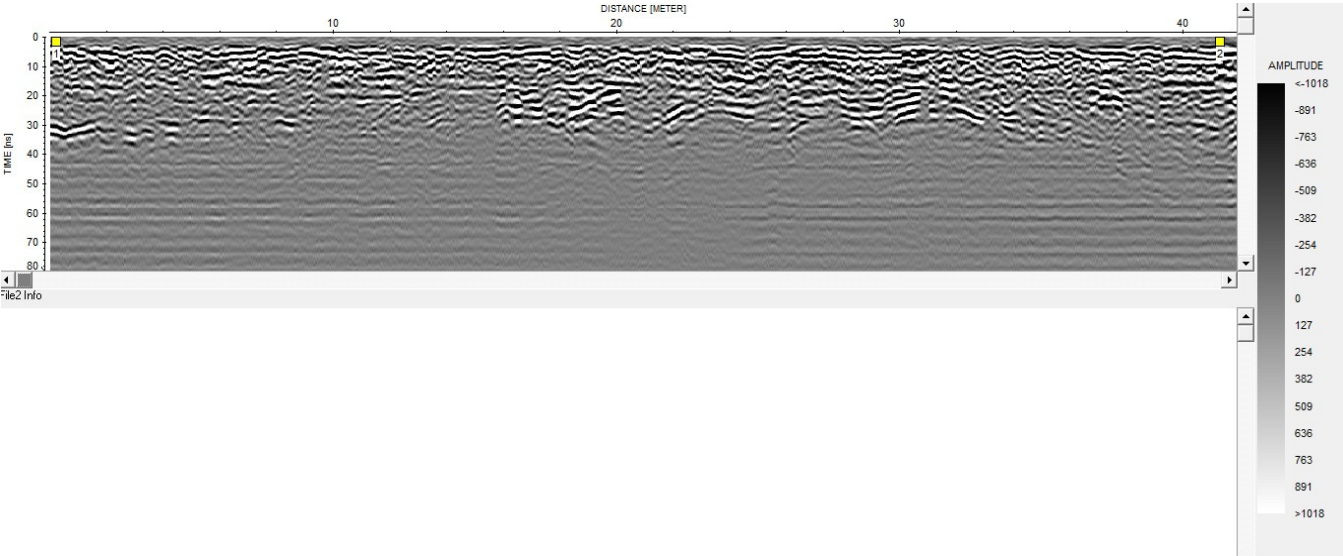
K7



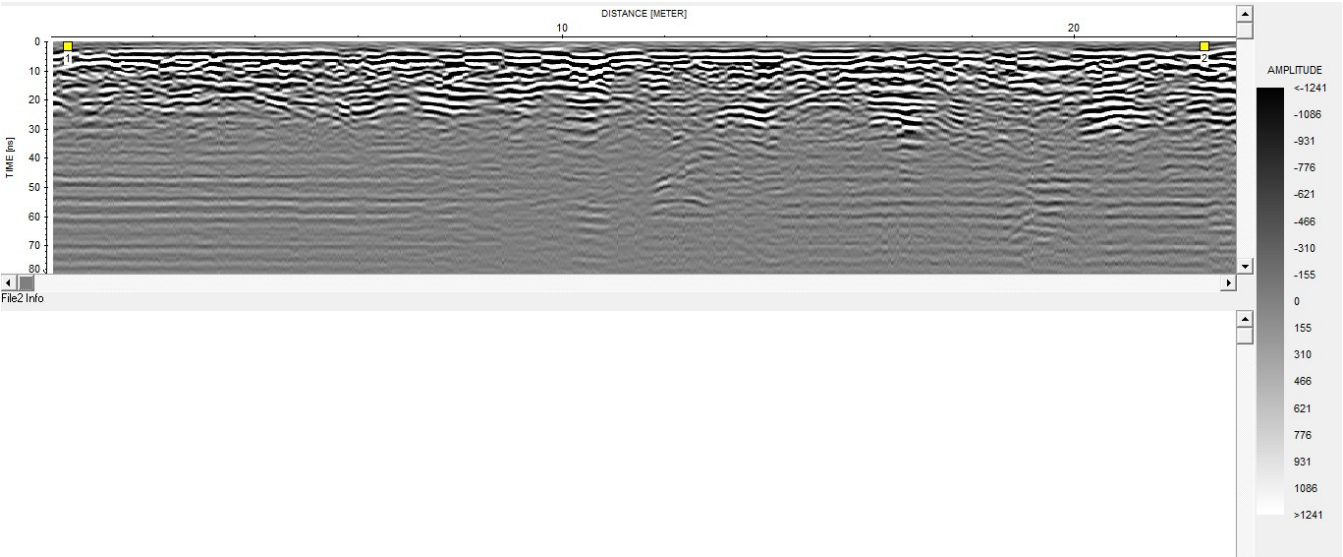
K8



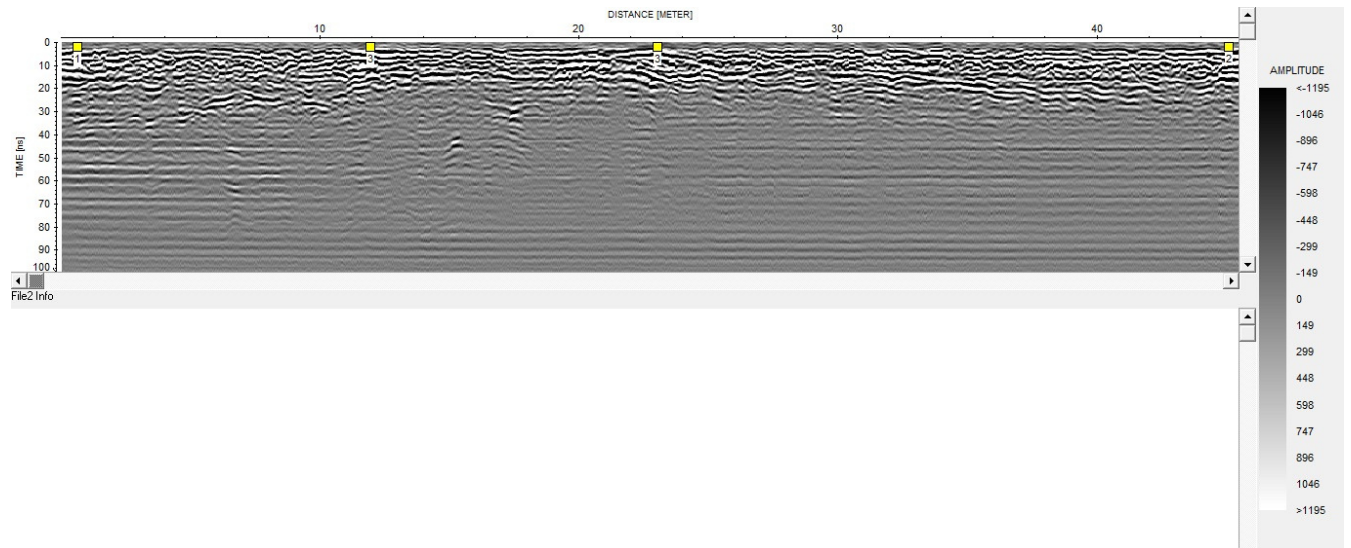
K9



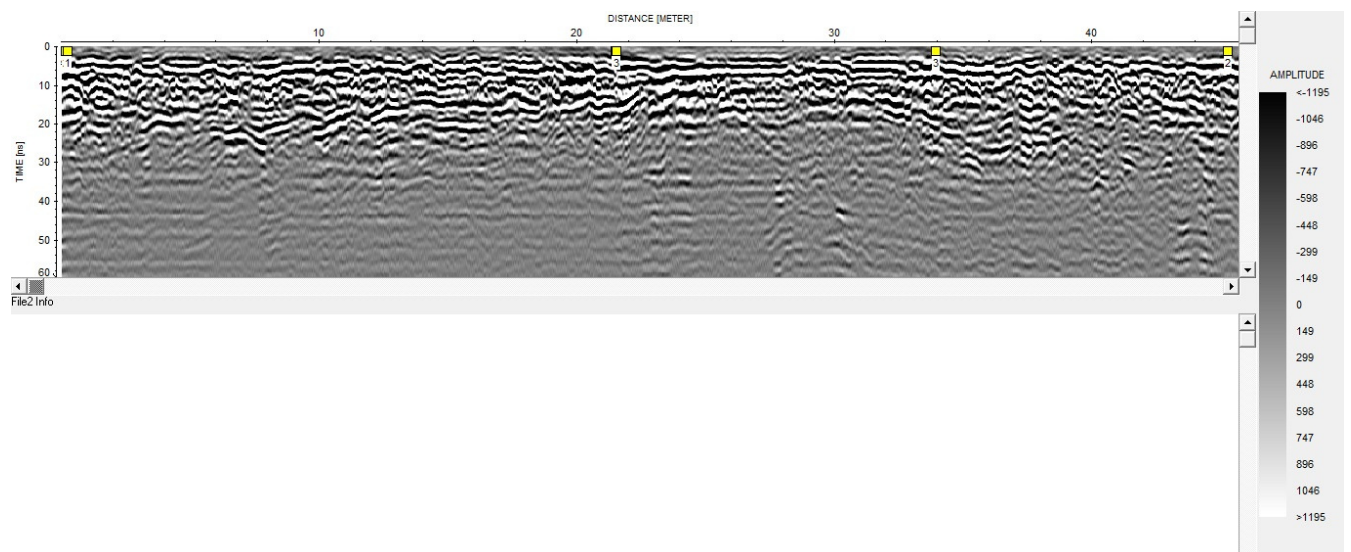
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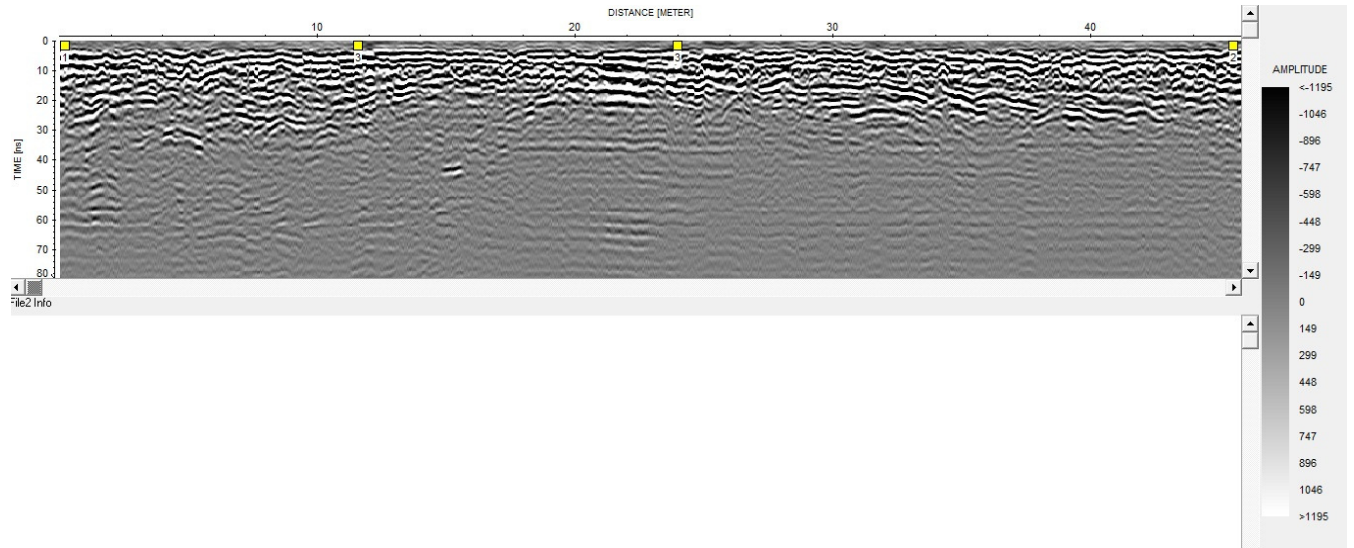
K11



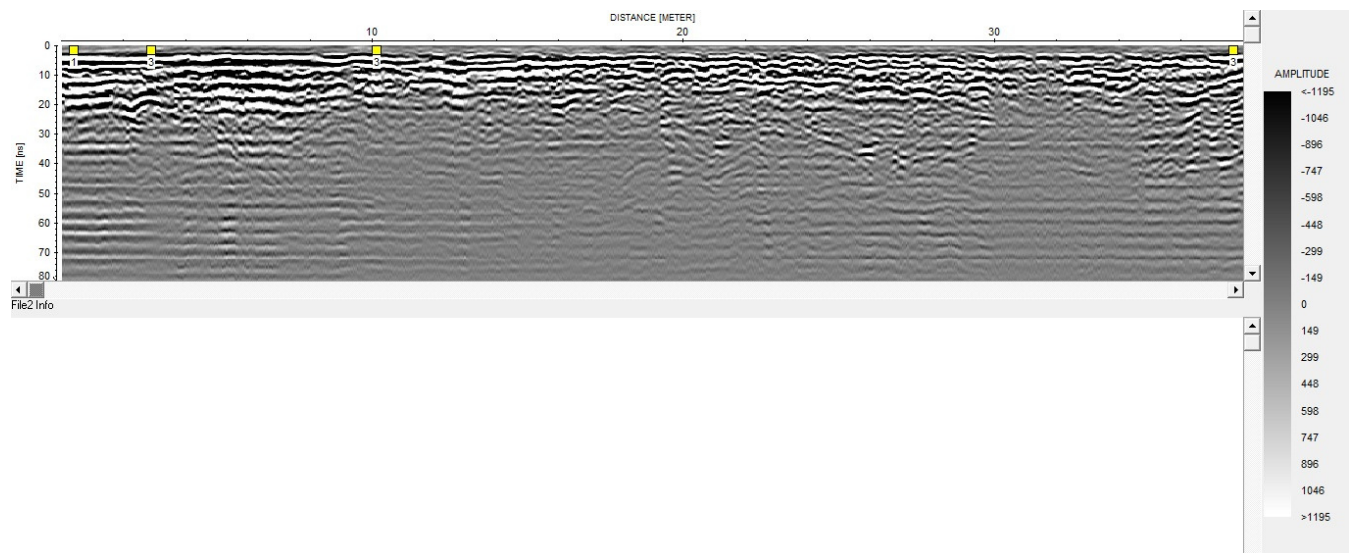
K12



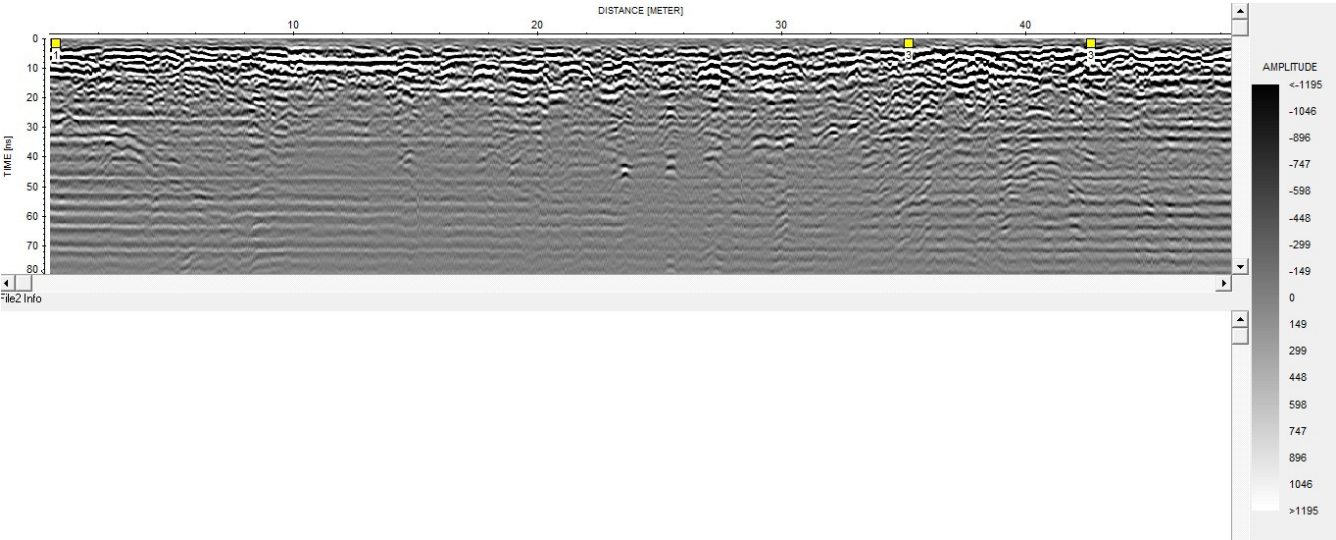
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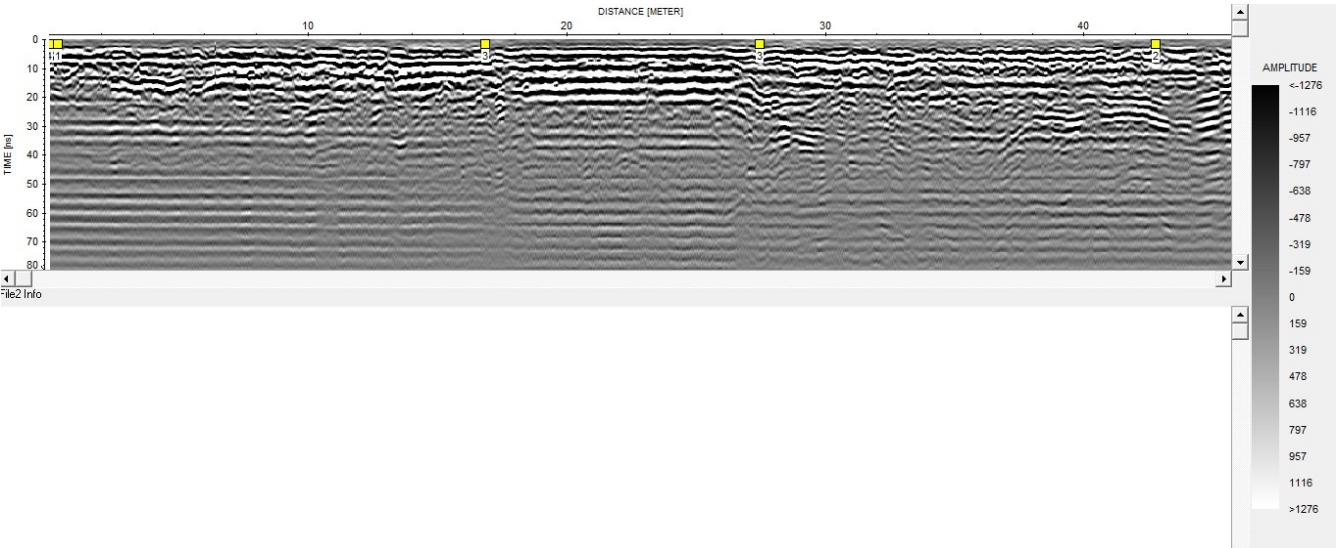
K15



K16



K17



K18

