Resistivity Survey

Tintinhull

Summary of Results

Site Summary Sheet	
Survey Reference	Tintinhull 5th September 2009
Site Name	High Spot of Field (Womans Long)
NGR	SW corner - ST 50344 20218 (± 7 m by Garmin Etrex GPS)
SMR and NMR refs	Not Known
Site Type	Resistivity survey
Description	A hilltop, potentially the 'hull' or hill of Tintinhull, not high but prominent with 360 degree views.
Period	Unknown, potentially Roman
Geology	Not Known
Land Use	Grazing land
Plan Survey	
Survey Type Resistivity	**Method** Zig-Zag
Instrument TR/CIA Meter twin probe array	**Survey Area** 800 sq m
Sample Interval 1 meter	**Traverse Interval** 1 meter
Method Electrical Cross section	
Instrument TR/CIA Meter in Wenner probe array	
Sample Intervals 1, 2, 3, 4, 5, 6 meters	**Processed** RS2DINV software
Summary of results Weather - Cool with threatening rain that held off until survey finished. Results show an anomaly in this field of which about half was covered. On the electric pseudosection the vertical boundaries really do look like walls. The results suggest a building set NSEW on the hilltop some 7 m square, possibly within another square. Speculation suggests this is consistent with a Roman Temple or Anti-aircraft platform – only an excavation will clarify.	
Survey 5th Sept 2009	**Survey Team**
Report Date Sept 2009	The Tintinhull Historical Society
Author R P M Smisson	

1.0 Location

One large grid of resistivity 60 m x 26 m was carried out to see if any targets offered themselves, with one electric pseudosection along the 27 m line to clarify findings, all carried out in 5 hours.

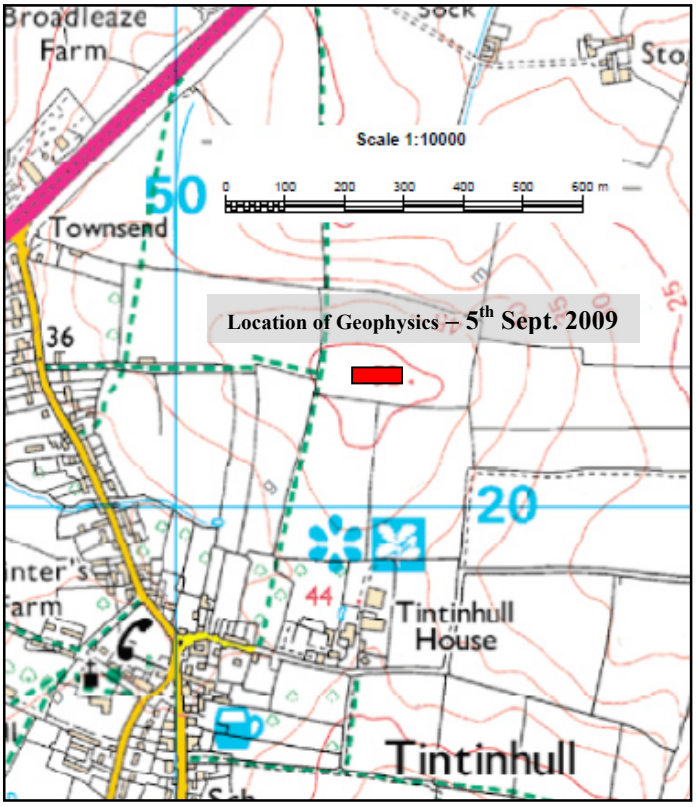

Figure 1 –Location Map [©Edina]

2.0 Geophysical Survey

2.1 Note

Whilst all survey reports are produced with as much care as possible, the resulting information is based on the accuracy and limitations of the equipment used, therefore no responsibility or liability is taken for any errors or omissions [Rowe 2005].

2.2 Resistivity Survey

The plan survey was carried out using a TR/CIA Resistance Meter developed for the Council for Independent Archaeology. Measuring the electrical resistance of the earth to a current being passed through it using a system of four electrodes (two current and two potential). A twin probe arrangement, with twin probes set 0.5 m apart being passed over a measured grid set out on the ground. The results being compared to a back reading obtained from a remote set of electrodes placed in a 'fixed' position located well away (over 15m) from the area being surveyed. The results are displayed and data logged as the resistivity of the ground, units Ohms-Metres. The effective depth of penetration for the TR/CIA meter is approximately 0.75 m, although the nature of the overburden and underlying geology can cause variations to this generality [Rowe 2005: Fadden 2002].

Displayed as greyscale images, the visual format of the results divides a given range of predefined arrangements of dots or shades of grey into a set number of classes. Increasing in intensity as the value increases, the resultant image is displayed in a toned/grey scale, enabling fast and accurate interpretation of any sub-surface archaeological features discovered [Rowe 2005].

Data Analysis

The data obtained has been processed using 'Snuffler', a geophysics-processing programme written by David Staveley. A computer programmer involved with archaeology, David Staveley wrote Snuffler after becoming frustrated by the limitations of the TR Systems software, and has made it freely available on the Internet [Staveley 2006]. This can be used not only to display the raw data but also to enhance the image mathematically. Processes can include clipping data to remove extreme readings, smoothing to simulate removal of geology; interpolation to improve clarity etc. but it must be remembered that use of such processes distorting the data so the results move away from reality and can become misleading.

2.3 Electrical Cross Section Surveys

Instrumentation

Cross section surveys were carried out using electrical imaging processes and the TR/CIA Resistance Meter developed for the Council for Independent Archaeology.

Method

The TR/CIA meter was specifically designed for use with the popular twin probe array for quick and detailed area surveys. However the meter can be used in a different configuration to produce vertical electrical sections. To generate a section a number of probes, say 20, are set out at regularly spaced 1m increments along a line. The meter is then used in the Wenner configuration to record all the measurements possible along this traverse of 20 probes.

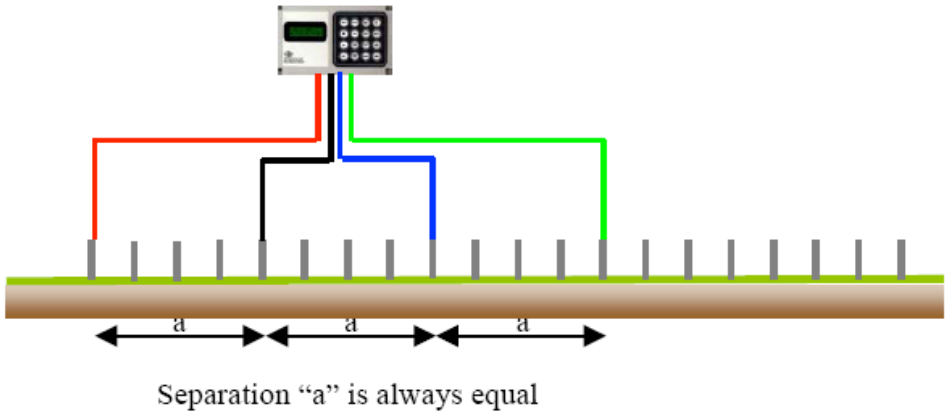

Figure 2 – Typical arrangement for the Wenner configuration

Typically a total of 57 readings are logged for a 20 m pseudosection using the meter, at six different separations - 1m, 2m, 3,m, 4m, 5m and 6m along the traverse, the probes remaining in position until all the readings are taken. The data is then downloaded using a new version of the interface program, automatically processed and saved in the appropriate format for the next stage of processing.

Data Analysis

To produce an electrical pseudosection the data is "inverted" using a special program called Res2Dinv. At the time of writing the Res2Dinv program is available as a free "demo" version.

Although this is a cut down version of the full software it does enable most surveys to be inverted satisfactorily. Res2Dinv program, associated instruction manual, along with tutorials and other support material is available from www.geoelectrical.com (Fadden 2007).

Presentation of Results

The output from the Res2Dinv program is presented as three images.

- The top image is a reproduction of the site data readings.
- The second image reproduces this data showing how the results of the analysis would appear as data, for comparison with the original surveyed data in the top image. Thus variations between the top two images indicates poor agreement with the analysed section so the results are suspect as a visual check of the processing
- The third section uses an iterative finite element analysis process to reveal the resistivity of buried features along the surveyed section that need to be there to produce the data as measured on site. Two types of iteration can be carried out, an inverse square function used where changes in underground resistivity are expected to be gradual for geology or sediment sequences, or a 'robust' iteration used where discontinuities such as building foundations are anticipated.
- In this report the robust iteration has been used to identify buried archaeology where it exists and can be detected using resistivity measurement.

Site readings

Interpolated Pseudosection

Section after finite element inversion analysis

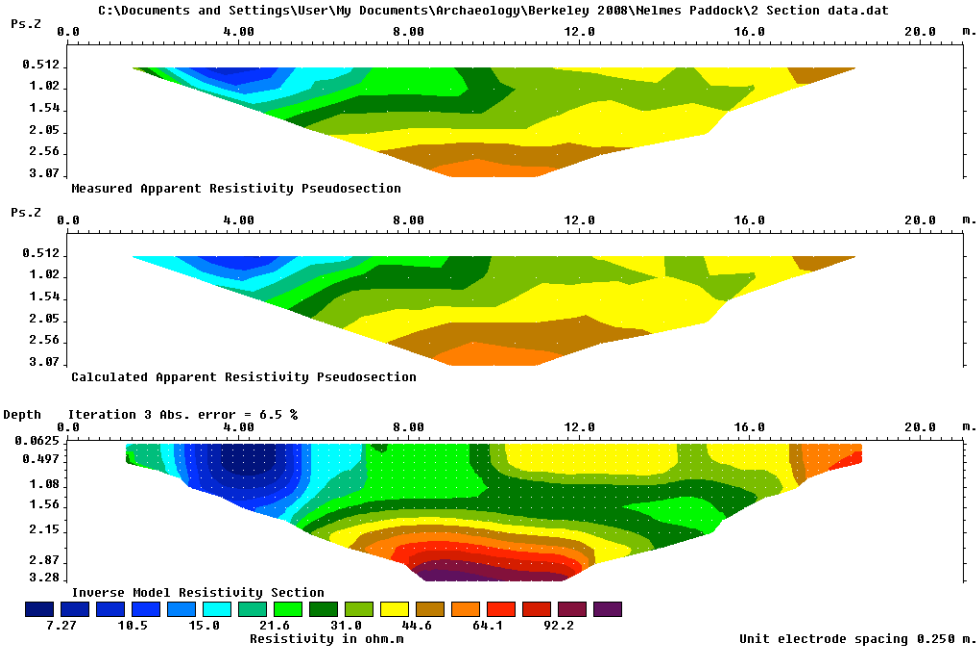

Figure 3 – Typical output from the Res2Dinv software

3.0 Results –Resistivity Survey

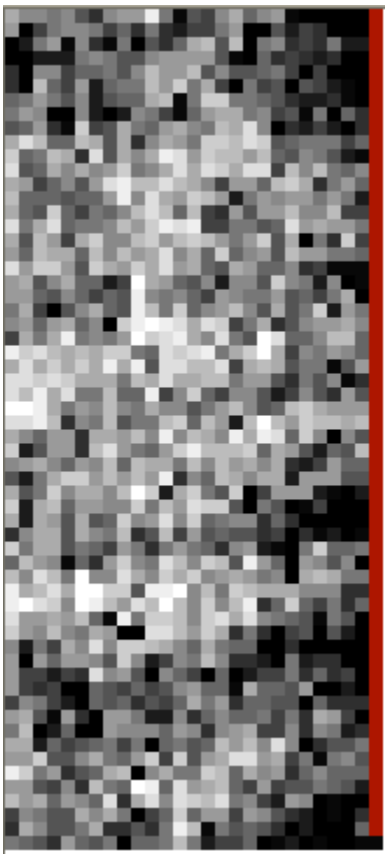

Figure 4 –Raw Data

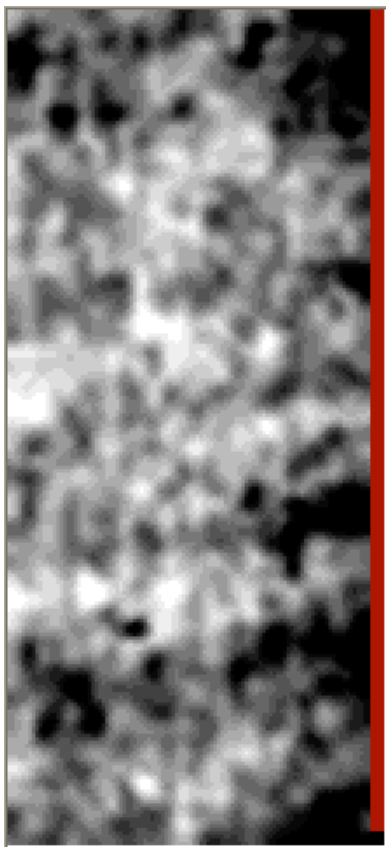

Figure 5 –Processed Data

Discussion

This field had been identified as being significant within the Tintinhull Parish. Although not to a great height, this is a low circular hill with open views all round. It was suggested this location is very similar to the locations used during the fourth century Roman temple construction period. The site is in clear view of other known temple sites such as Lamyatt Beacon and South Cadbury. Another possible line of site is over a depression in the hills to the northwest towards Brent Knoll.

This preliminary survey suggests there to be a feature some 7-9m square orientated NSEW in the southeast part of the area surveyed. The feature in a small flat area between the two high points in this field.

To obtain the maximum information possible during this one-day survey, it was decided to terminate the resistivity survey at this point to see if an electric pseudosection would add more detail to this feature. A 30 m section was set up from the southeast corner of the resistivity survey grid, extending northwards to cross this feature

3.0 Results – Pseudosection Survey

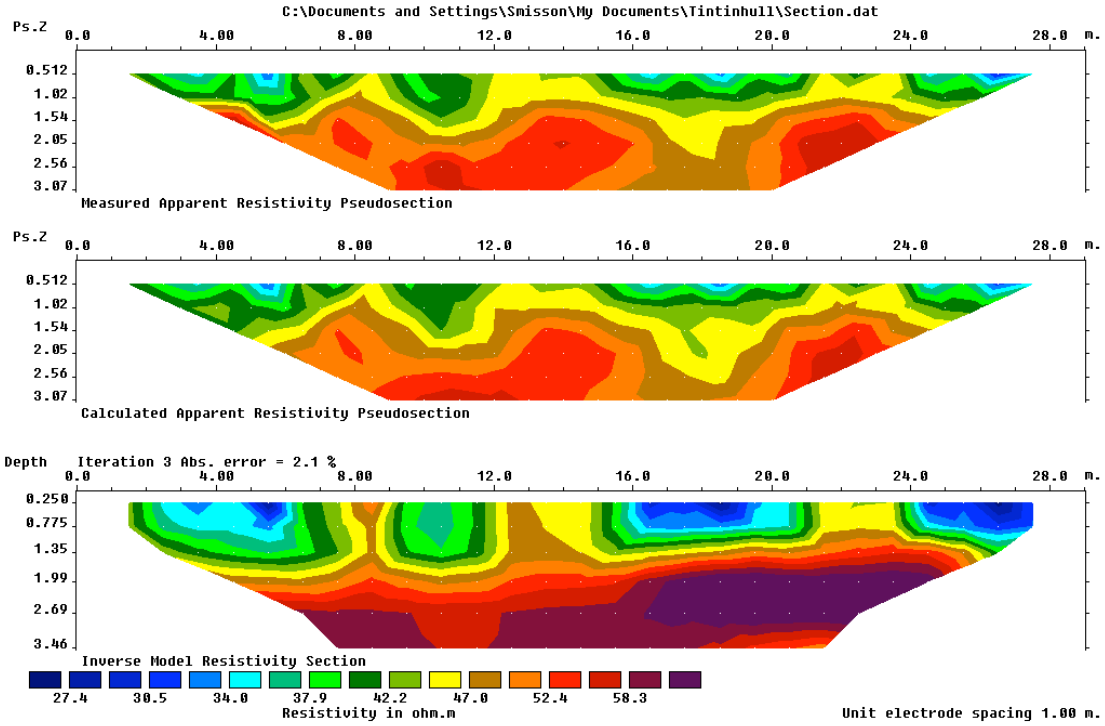

Figure 6 – Pseudosection along side of resistivity survey to cross high resistance feature.

Discussion

These results came as complete surprise. The third image showing the result of a finite element analysis to determine what should be in the ground to give the readings measured at the surface suggests the section crosses three walls, from 7-9m, 12-15m, and 21-24m. From experience from other sites it is difficult to imagine a geological process that could result in such a plot.

The size and location of these walls is consistent with this being a building with walls standing up to 1 m in height.

4.0 Conclusion

The results of this survey suggest there may well be archaeology in the field, with results not inconsistent with a suggestion that there might be a Roman Temple on this hill.

In view of the potential importance such a discovery would represent it is recommended that a small evaluation trench be excavated by hand over one of these possible walls so as to determine if these are features that warrant detail investigation

R P M Smisson September 2009

Bibliography

Edina, 2006 Ordnance Survey Maps through Athens Edina Digimap

Fadden K, 2002 *TR/CIA Resistance Meter manuals*

Fadden K, 2007 *Electrical Imaging Using the TR/CIA Resistance Met*er TR systems Ltd

Gaffney C & Gator J, 2003 *Revealing The Buried Past* Tempus Reprint 2004

Loke M H *2-D and 3-D electrical imaging surveys* Tutorial downloadable from www.geoelectrical.com .

Rowe P, 2005 Geophysics Report on Berkeley Excavations in 2005.

Schmidt A, 1988 *Geophysical Data in Archaeology: A guide to good practice"* Oxbow

Staveley D, 2006 "Snuffler Software" downloadable from http://www2.prestel.co.uk/aspen/sussex/snuffler.html