

Ground Penetrating Radar Survey Report:

Caiphas Burial Tomb Project Israel



Data Acquired May 29, 2008

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**Ground Penetrating Radar (GPR) Study:
Caiphaz Burial Tomb Project
4 June 2008 Report of 29 May 2008 Study**

Background

As part of Mnemotrix Israel's work in Geoarchaeology, we were contacted relating to a project where the subsurface location of the tomb Caiphaz was in question. In the hills of Jerusalem, Israel, are many burial tombs that have been previously excavated or identified by the Israel Antiquities Authority (IAA) dating to Antiquity. The tomb of the first century CE High Priest, Caiphaz, was discovered and excavated in recent years by the IAA. Afterwards its location was marked by a "soul-pipe" that is built to conform to Jewish law to provide a space for the soul to rise from its subsurface location. Thus in cooperation with Associated Producers Ltd. on the 29th of May, 2008, members of the Mnemotrix team came to the site and undertook the GPR Survey covered in this report.

Description of Survey Area

The site is located on the outer slope of the hills of Jerusalem, near the southern reaches of the Old City, but outside the walls. The survey area consists of two sub-areas, located in the hills of Jerusalem, Israel. Two soul-pipes extend from the surface, purportedly from the mouth/entrance of each burial cave found. According to the IAA report of the site, one badly damaged cave was found while another in good condition was excavated and its contents removed to IAA headquarters. The general outline of the burial cave could be described as that of a modern cartoon hand with four fingers. Areas A and B were not more than 100 meters apart.

Area A is down the road and downhill from Area B, along the road as it curves south. In Area A we completed two grids, one on the grassy area to the south of the road located close to the soul-pipe, and the other as a continuation of the features seen on the road further north. This can be seen in Figure 1.

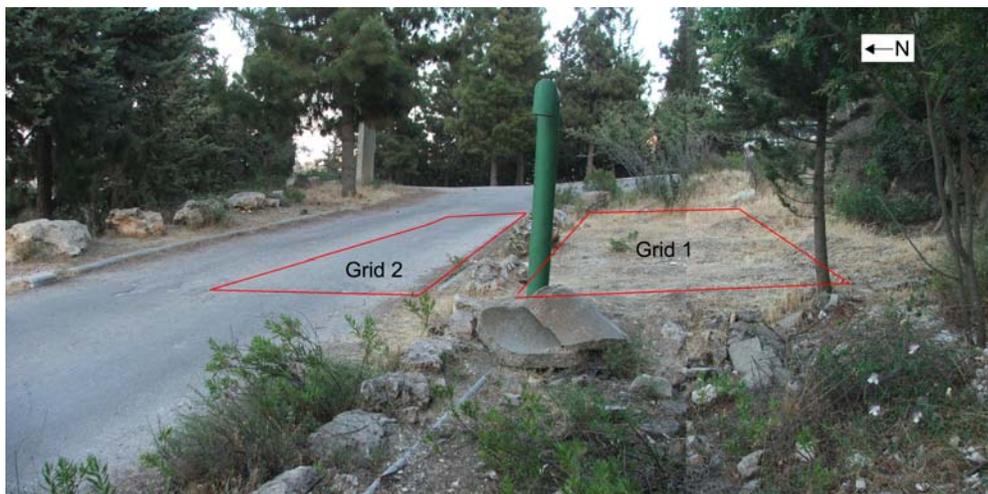


Figure 1: View of Area A (Grids 1 and 2), looking east.

Area B is at the front of a terraced pedestrian system down a hill-slope that was constructed by city engineers after excavation of the area. In Area B we completed three grids, all surrounding the area of the soul-pipe, which can be seen in Figure 2.

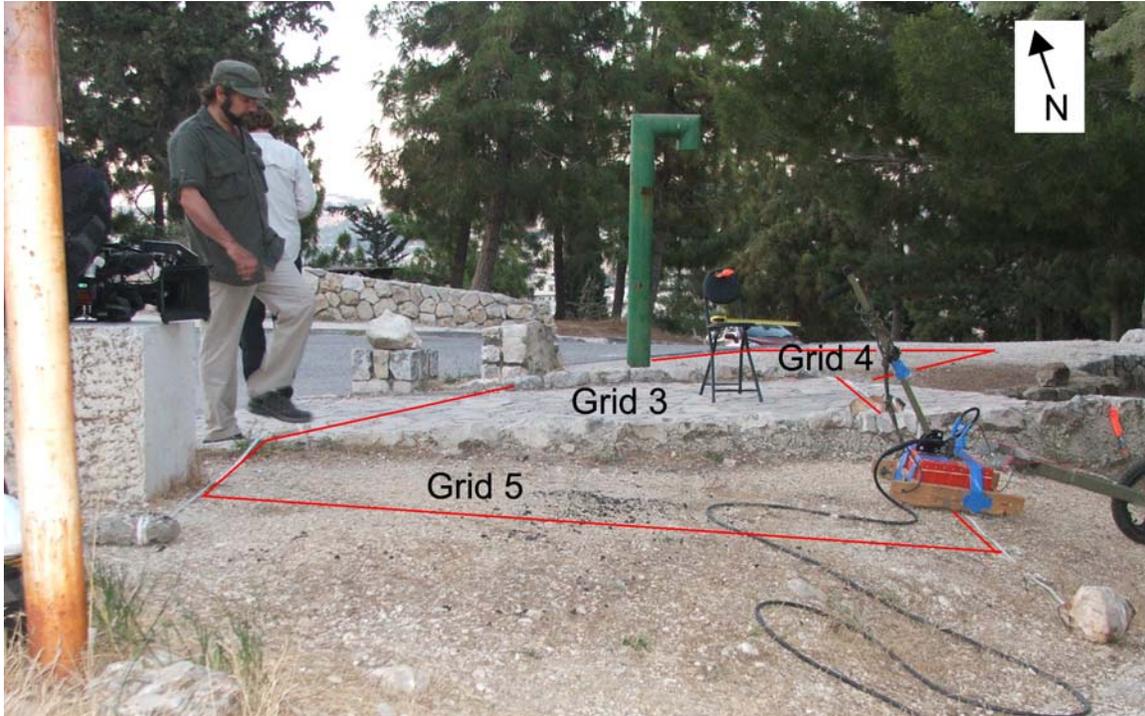


Figure 2: View of Area B (Grids 3, 4, and 5) looking slightly northeast.

GPR Survey Actions Taken

In this survey, the key goal was to see if we could locate the tombs beneath or in the area of the soul-pipes and then if locatable, to determine which tomb was the well-preserved one from which the High Priest Caiphas's remains have been recovered.

A 400 Mhz GSSI GPR antenna was used for this project. A 100 nanosecond window was chosen, which would give us a viewing window of about 2-5 meters. We chose a dielectric constant of 5.5 as we would be sending the GPR signal through concrete, soil, and limestone, for the most part, in this area.

Area A

After minor clearing of the site from debris, we began in the grassy area to the south of the road in a cleared space virtually touching the soul-pipe that is clearly seen in Figure 1. Data was acquired every 50 cm covering the full area of 6x7.5 meters wide. Grid 1 dimensions were 2x7.5 meters with the northern border relative to the cement border of the road. Grid 2 dimensions were 3x7.5 meters, located only 1 meter to the northeast on the road and parallel to Grid 1. A soul-pipe was located 3-4 meters to the west of Area A and it was believed to run parallel to the road towards the surveyed area. Data was acquired in a N/S direction perpendicular to the road.

Area B

Grids 3-5 compose Area B uphill from Area A. Data was acquired every 25 cm when possible and every 50 cm when there was an obstruction. The full area of surveys grids 3-5 was 3x5 meters. The soul-pipe can be seen clearly in Figure 2. At the time, members of the field team extended their arms into the opening of the pipe to possibly feel in which direction the pipe extended under the sub-surface. This was done in order to determine which area would be best to survey. It was believed to continue parallel to the road, thus we aligned our grids to optimally image this sub-surface feature. The five grids were put into two Super 3D files of interlocking data for spatial analysis of the sub-areas.

Post-Processing and Analysis

While in the field, we were unsure of whether or not we were able to see the well-preserved tomb or the badly damaged one. It was believed that in the field the well-preserved one was in the Area B location.

During post-processing the sub-surface became clearer. All GPR data profile lines were filtered for background removal individually and their 0-positions (start point from the antenna as the GPR signal enters the sub-surface) were corrected as per standard post-processing. Each grid was then created from the group of lines and subsequent Super 3D grids were created to link the grids for spatial analysis of the site(s).

Area A

The major features of this area are seen in Figure 3 below:

1. the soul-pipe reflection and
2. outline of the subsurface damaged tomb of Area A.

The outline of the tomb itself is visible in blue and the soul-pipe is clearly imaged leading towards the tomb.

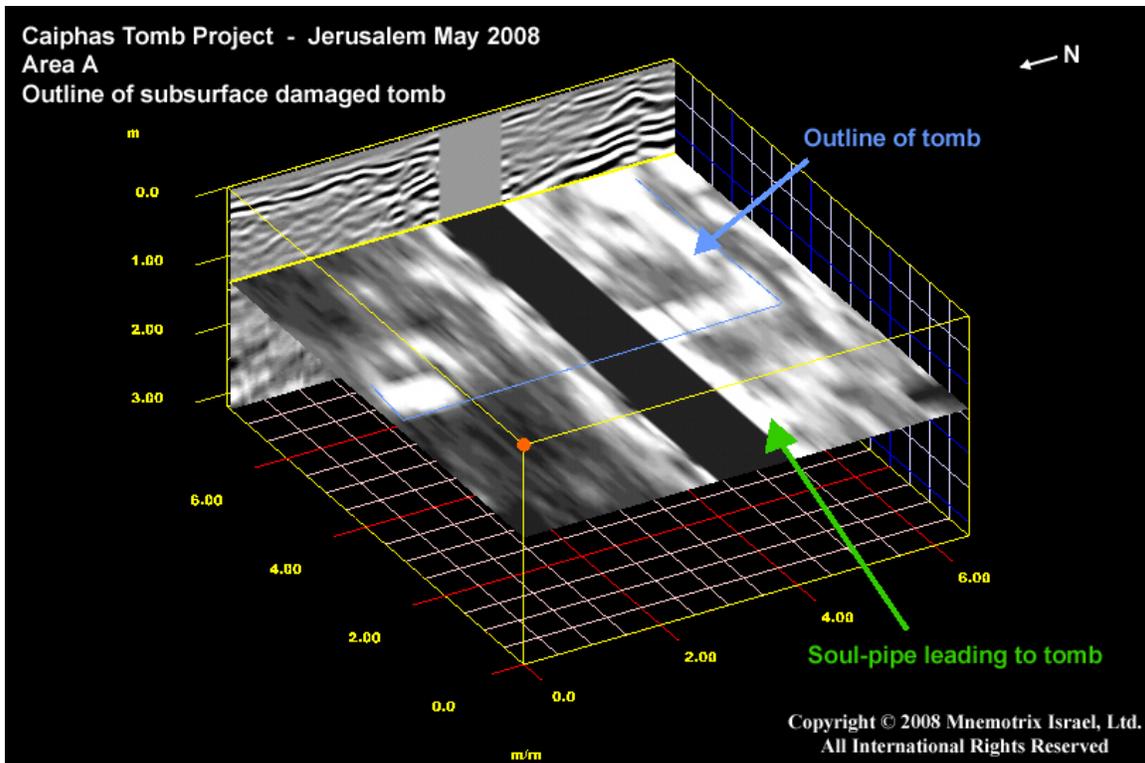


Figure 3: View looking SW. Image of Area A soul-pipe leading to damaged tomb.

In Figure 4 we are able to see (1) the depression of collapse present at this site, (2) the outline of the tomb itself, (3) the soul-pipe and (4) the soil layer above the tomb or the ceiling of the tomb.

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Area A

Depression of possible tomb collapse, soul-pipe, soil layer/top of tomb, & outline

Depth 1.38 m and at surface

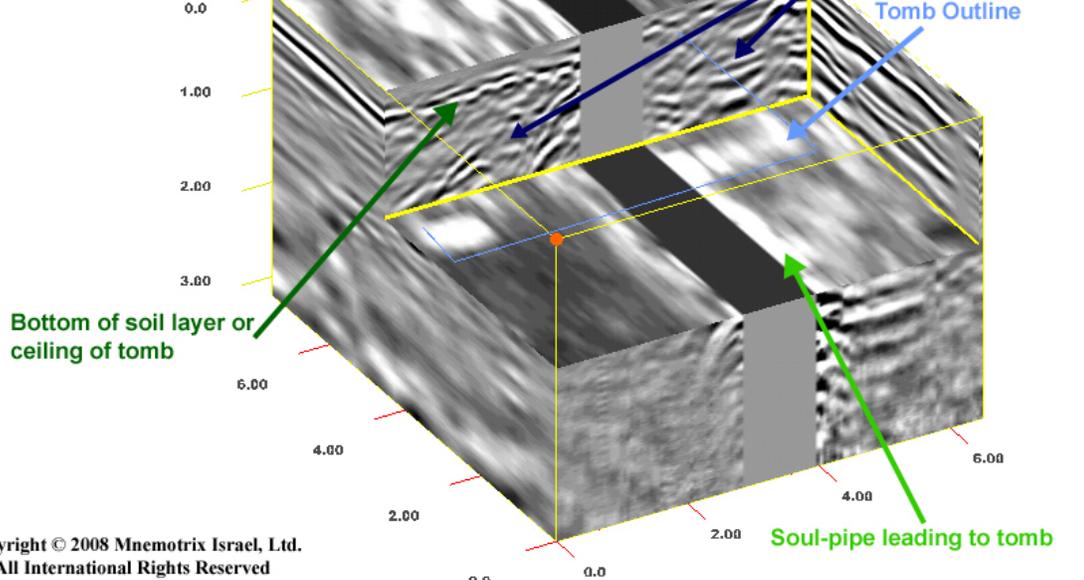


Figure 4: Area A showing (1) collapse, (2) soul-pipe leading to tomb, (3) outline of the tomb itself and (4) the bottom of the soil layer or possible ceiling of tomb.

Area B

Here we hoped to image the intact tomb of the High Priest Caiphaz. As mentioned earlier, while in the field it was decided to do a survey on top of the paved pathway at the site where we believed the soul-pipe was heading. As it turns out, a robotic camera was used and found that the soul-pipe continues towards the street, parallel to the area that we surveyed and not in fact the area that was chosen to survey. The camera was not able to reach the end, however, due the presence of a concrete slab or rock deterring further investigation.

The major features seen in the GPR data for this area are:

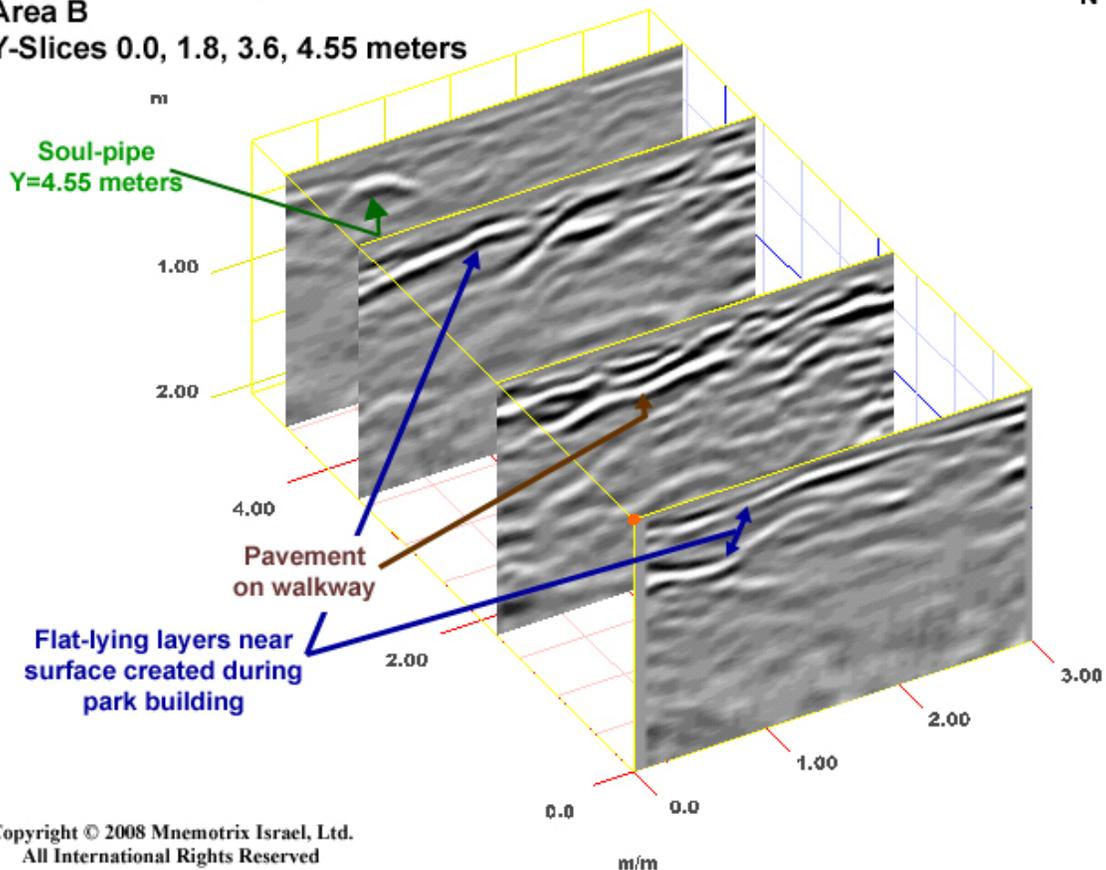
1. the soul-pipe, which disappears as it travels away from the grids.
2. the flat-lying substructure of pavement for the city installation there and a flattening of the soil with another horizontal, flat feature that was placed when the city made the park that now stands in this location.

Figure 5 shows these main anomaly features, specifically including the rounded hyperbolic reflection of the soul-pipe about 30-35 cm below the sub-surface. This pipe was visible within the grid from about 3.7-4.85 meters and its strongest point is shown here at y-slice 4.55 meters. It appears to veer slightly diagonal towards the road (in a northwest direction) around y-slice 4.0 meters and then disappears. The sub-structure to the pavement walkway seen in Figure 2 is clearly imaged at y-slice 1.8 meters as a horizontal reflection.

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Area B

Y-Slices 0.0, 1.8, 3.6, 4.55 meters



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Figure 5: Area B of the Caiphas Tomb Project. The flat-lying reflections are due to building procedures of the park while the rounded hyperbolic reflection seen at 4.55 meters is the location of the soul-pipe while in the field.

Summary and Closing Remarks

As this survey was part of a film series on early Christianity and specifically the High Priest Caiphas, the archaeological aspect of the work is an important factor. GPR has been useful in giving the audience a sub-surface view of these two tombs after preservation and re-burial by the Israeli Antiquities Authority. Given these circumstances this is likely the only future view of the tomb the audience will ever have a chance to see and could not have been done without the involvement of GPR.

The value of this study lies in our ability to image and identify sub-surface features at archaeological sites. We were able to image the collapsed tomb in Area A that possibly housed relatives of Caiphas during the first century CE. These "tomb signatures" will be added to a growing library of such identified images and will be incredibly useful for the future of archaeogeophysical work in the region as more GPR surveys are conducted and ground-truthed through excavation.