Georeferenced 3D Laser Scan

Correct Documentation and Descriptive Visualization

3D Scan of architectural structures in Würzburg 'Platz´scher Garten' and 'Gebhard´s Keller'

Project and Historcal Sources

The BfAD Heyse organizes excavation projects in southern Germany since 1995. Many investigations took place in medieval towns like Nürnberg, Würzburg and Schweinfurt.

Prior to construction works near the old town centre in Würzburg the BfAD recorded the area of 'Platz´scher Garten', once a noble dance hall, and the 'Gebhard´s Keller', a ninepins alley with a taproom. Both facilities had been destroyed during air raid in World War II. After the bombing the still intact cellar system remained untouched for decades and had then be recovered and documented (figure below).

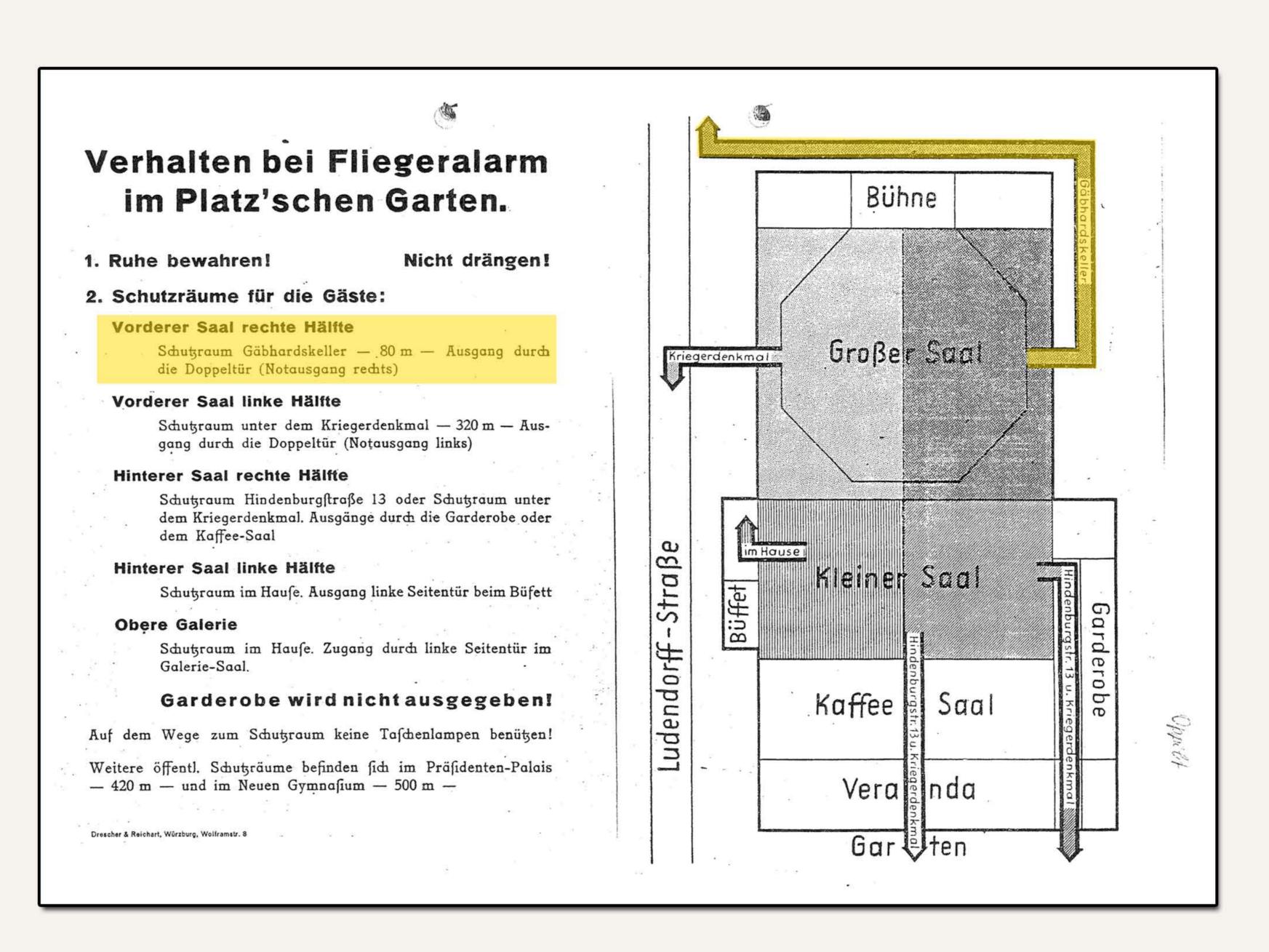
The origin of the cellar system dated back into 1855 when it was built by Martin Gäbhard, the owner of a nearby brewery. He needed them for the storage of beer kegs. The original building consisted of two northsouth-oriented cellars. The time when the third cellar in the east was built and the southern extension declared as an air raid shelter is not known.

A schematic diagram concerning the behavior during air raid in the Platz'scher Garten (figure right) shows that the 'Gäbhardskeller' had been included into the system of air raid shelter. The air defense area in the in the three rooms (including a gas lock and an emergency exit) of the southern vault offered a total capacity of 95 persons.

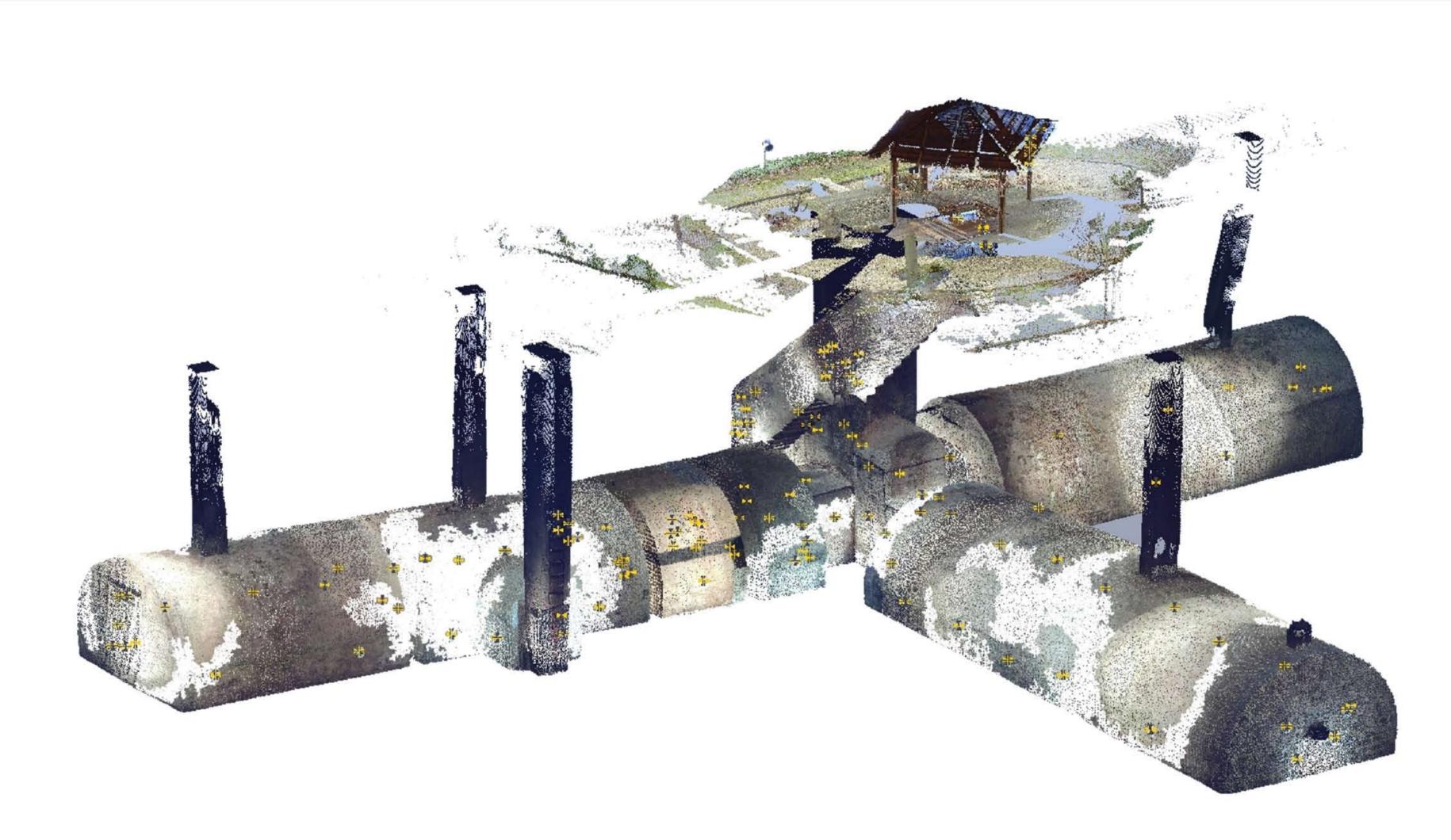
According to an estimate from 1948 the degree of destruction of the buildings caused by war was about 90% and the remains were considered completely useless for reconstruction. The site then remained undeveloped until the present time. More recently, an entrance has been installed in the vault of the cellar. In addition there is a small Japanese garden with gazebo. The modern access via a staircase along the elevator shaft ends at the cellar floor about 9 meters below the present surface. The basement consists of an access area with elevator and stairs. Each vaulted cellar offers an access to a ventilation shaft with an emergency ladder.



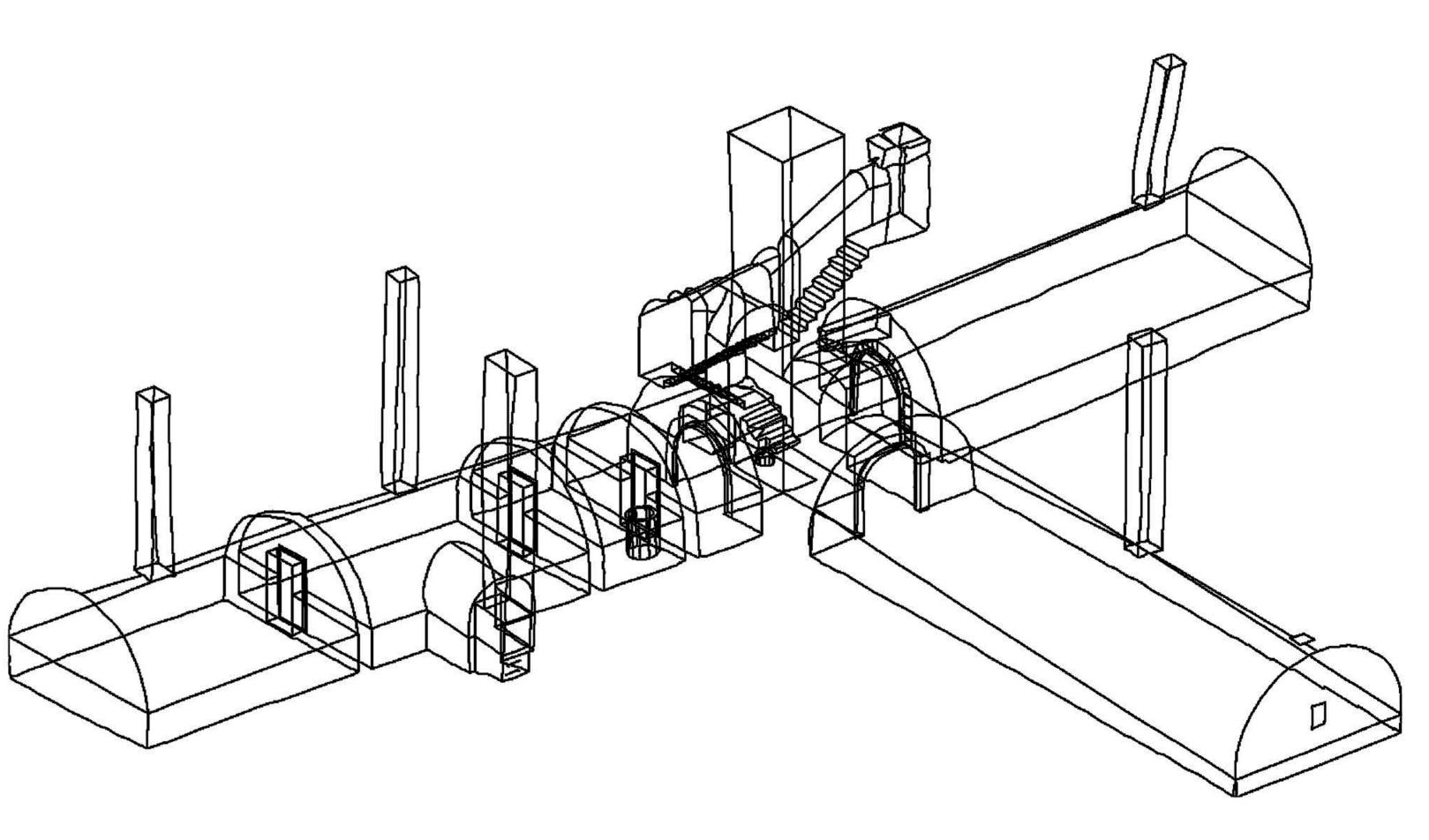
Photography of the 'Großer Saal' in 'Platz´scher Garten'.



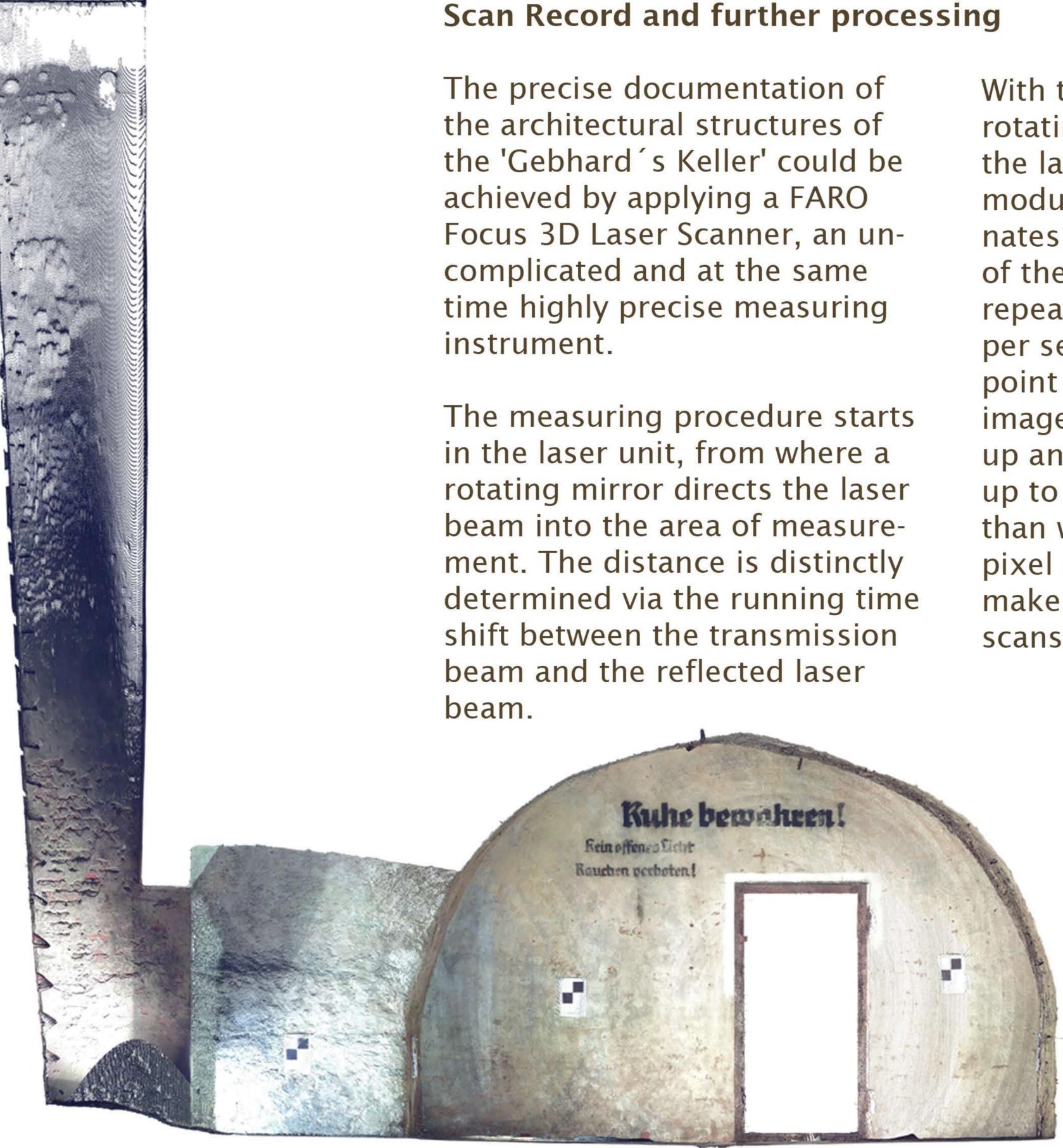
'Behaviour in case of air raid' - The original board explained how to reach the shelter underneath the 'Gebhard´s Keller' in case of emergency.



3D view of the basement. The section of the air raid shelter is situated in the southern part to the left.



Isometric view of the basement created on the basis of a CAD drawing.



With the help of the angle of the rotating mirror and the angle of the laser scanner itself the Faro module calculates the coordinates and stores the 3D-position of the point. This procedure is repeated several hundred times per second and creates a dense point cloud and a detailed 3Dimage of the environment (figure up and below). The resolution is up to a hundred times higher than with a commercial megapixel camera.Reference targets make it possible to connect scans of different visible ranges.

In the instance of the Gebhard's Keller the scan record shows a high resolved 3D image with the clearly visible precautions written on the wall. The record may also be used to extract datas for CAD drawings and further processes. Distances or sizes in the pointcloud can be read of easily with the faro software. Through processing the datas with AutoCAD software different isometric views could be produced. The records were georeferenced with a total station on the surface. The required fixed points have been produced by using a GPS. High accuracy of the measurements could be reached with correction datas of the mobile provider.

In the southern part of the cellar precautions in case of flight attack written on the wall mark the entrance to the air raid shelter. The visible reference targets were used to connect different scan records for complete documentation of the cellar system.