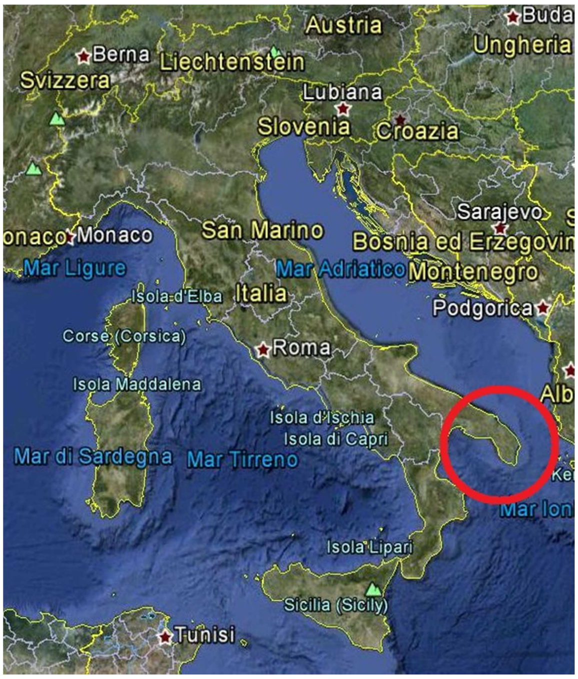
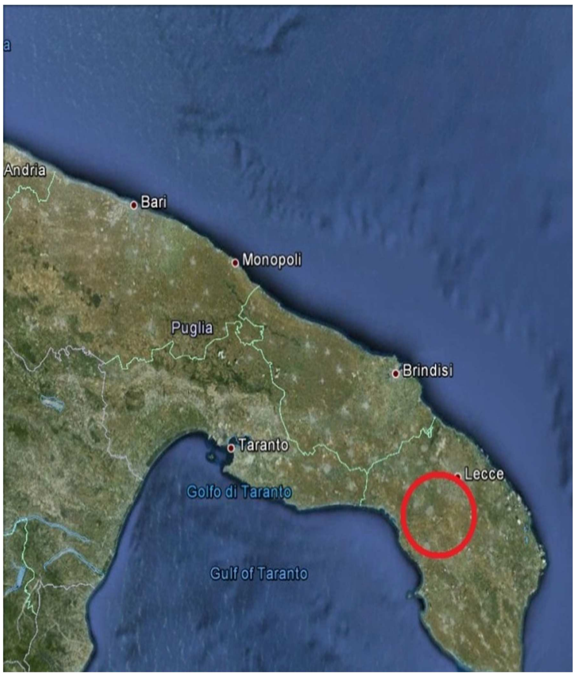
Geomatics and hypogeum oil mills in Lequile (LE-IT)*

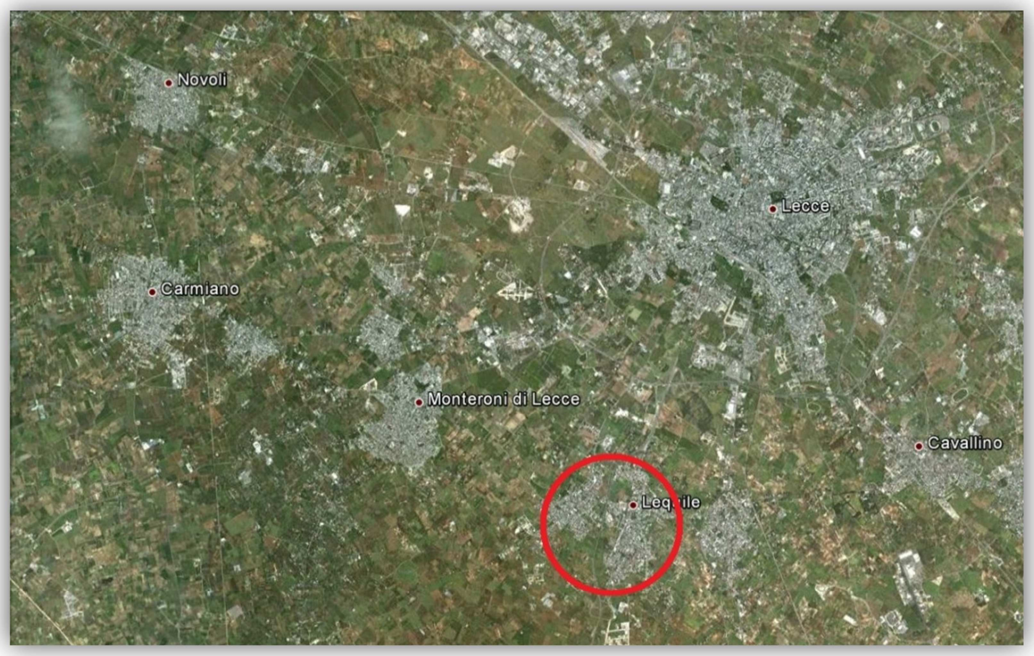
ANTONIO PATAVIA, Italia.

Location in Italy

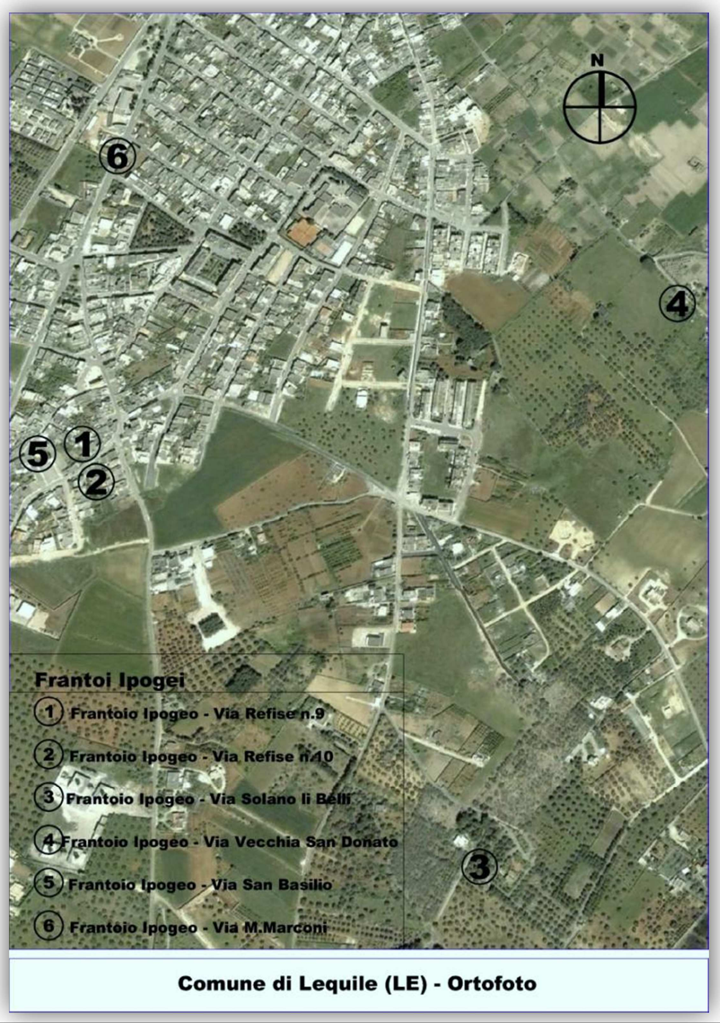


Location in Puglia



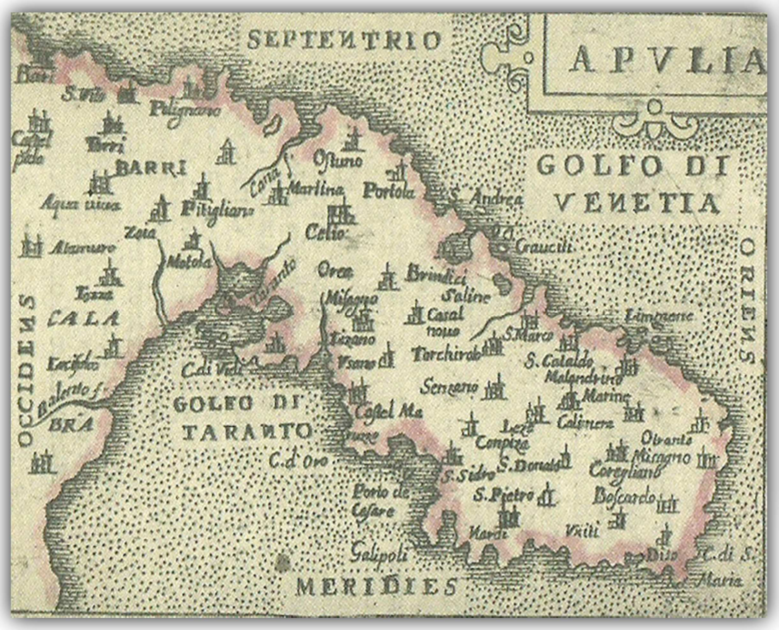


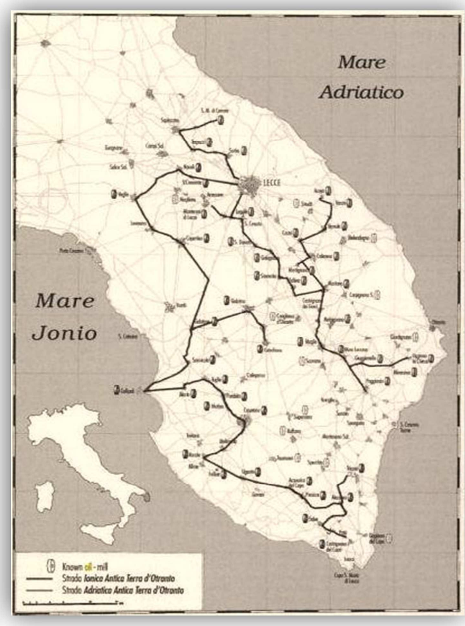
The measurements were performed in the city of Lequile, in the province of Lecce, these images show the location:



This is the position of the hypogeum mills in Lequile

Geomatics is a term created by the Laval University in Canada at the beginning of the 1980's, as a result of the potential offered by the electronic computing that revolutionised the science of remote sensing and computerized drawings. The revolutionary and ingenious foresight at that time was focused on geo-referencing: the attribution of the correct coordinates to everything that is placed on our planet. Geomatics is defined, therefore, as a systematic, integrated and multidisciplinary approach for the selection of tools and techniques suitable for a metric and thematic data acquisition, and for integration, analysis, storing and distribution of geo-referenced



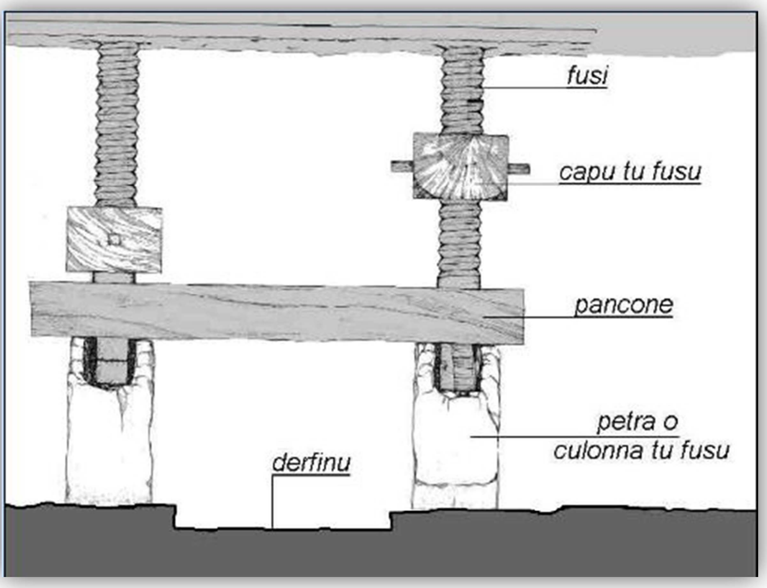


spatial data in digital format.

In the city of Lequile, in the province of Lecce (IT), hypogeum oil mills play an important role in the historical and cultural architecture, and represent the striking examples of industrial archaeological settlements of the Salento used for the production of olive oil. They are structures carved into the limestone in the subsoil and built in the years between 1400 and the end of 1700, by teams of experienced builders called *li foggiari.*

The old land of Otranto was divided into four districts which included Lecce, Gallipoli, Taranto and Brindisi. The district, between 1880-1890 had 1800 hypogeum oil mills.

They were dug underground and specifically designed to optimize the preservation of the product.



In fact, the environments for the pressing of the olives had to have a constant temperature between 18 and 20 degrees Celsius, so as to facilitate the flow of oil during the pressing and its settling into the wells.

The *trappiti ipogei* are below the ground level and reach a depth ranging from 3.00 m to about

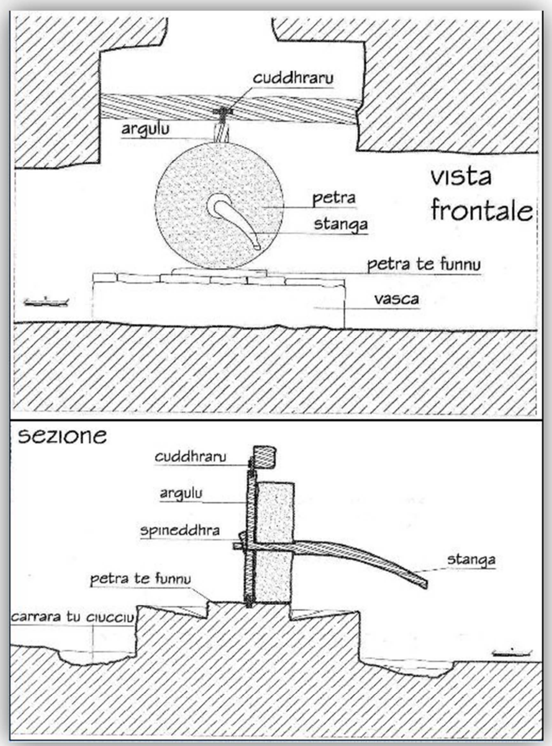
4.50 m: their average height in meters varies from 1.70 meters to 3.00 m.

The workforce was made up of one *nachiro* (a leader), 4 *trappitari* (mill workers), two donkeys and a *turlicchiu* (a mill boy, usually the younger brother of one of the *trappitari* or someone less able).
The work of the men and animals did not have regular rhythms, as the sunrise and sunset, the night and the day, were nothing more than a memory to them. The workers went underground in October and came out in April, working continuously only with the exception of some holidays.

From above the mill, the farmer unloaded the olives, which fell
into the trappeto through a hole located at ground level and into the storeroom.

Much of the oil was exported throughout Europe, and was used as fuel for lighting and to manufacture soap. Only a small part of it was intended for human consumption.

The entrance consists of a stairwell carved into the rock, covered with a half-barrel ceiling. Situated at the foot of the stairs was the primary workroom. On either side of the workroom were located some rooms called *sciave*. These were always dug into the stone, and were used to store the olives which were waiting to be pressed.



Often circular in shape, the workroom housed the operations of the milling of the olives and the grinding of the paste into the tank, which had a diameter of about 3m. The *petra te trappitu* (the grindstone) was about 1.50 to 1.60 m in diameter, and 0.55 m thick. It was formed from a single block of stone in a cylindrical shape, and placed vertically on a circular track around the edge of the tank.

The topographic operations needed to acquire the geometry of these structures, which also require the cartographic representation of a geo-referenced underground environment, represent the ***Survey of the Hypogeum***.

Due to the morphological complexity that characterizes even the smallest cavities, it is not always possible to obtain a reproduction that has an acceptable accuracy, unless one uses expensive techniques, such as the Laser Scanner.

The underground survey, for the purpose of which it is normally ordered, needs to provide the representation of the whole three-dimensional space, while providing a cost effective product in terms of expense and quality; and ensuring as a result, drawings which are sufficiently reliable and easily interpretable.
The survey work was done with: Rollin meter, laser level, laser measuring, GPS, Laser Total Station.

In almost all the oil mills, there were two vertical connections with the outer surface, the openings located at the load of olives.
The points are measured with the G.P.S. and georeferenced in WGS84 coordinates. All measurements were made by the entrances of the hypogeum oil mills, measuring the azimuth angles and distances between two consecutive vertices. Also measured were the height of the vault and the distance between the walls to draw more of the underground rooms.

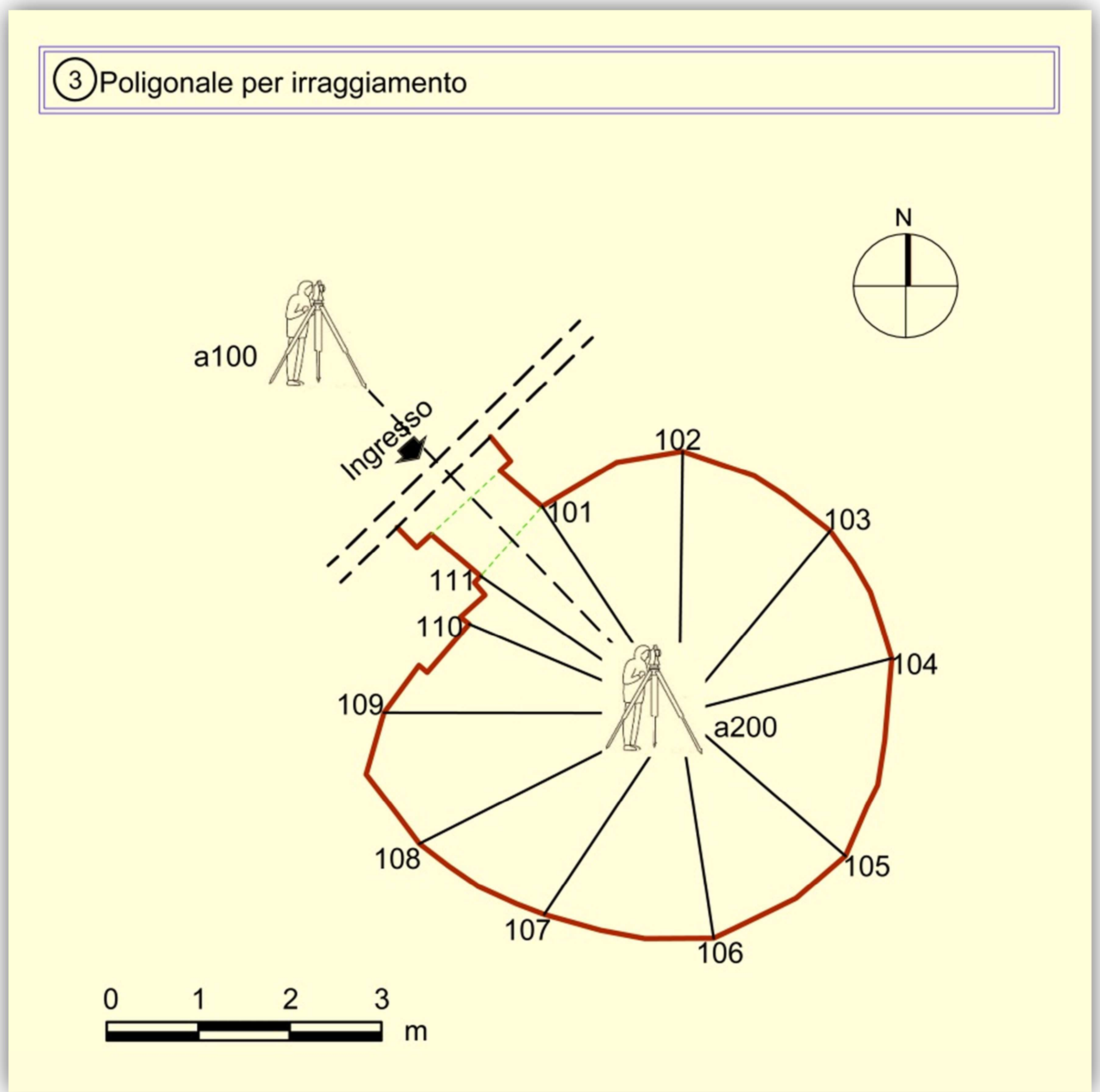
The interiors of the underground cavity were measured with the aid of main and small secondary traverses.

The main feature of the traverse has been to have some points hooked to the points which were detected with the GPS described above, and carefully screened on the floor inside the hypogeum with a proper plumb-line.

The secondary corridors leading from the main cavity, were measured trilaterally and radially with a laser meter. The reference points used for the radial measurements had been previously defined with the total station laser.

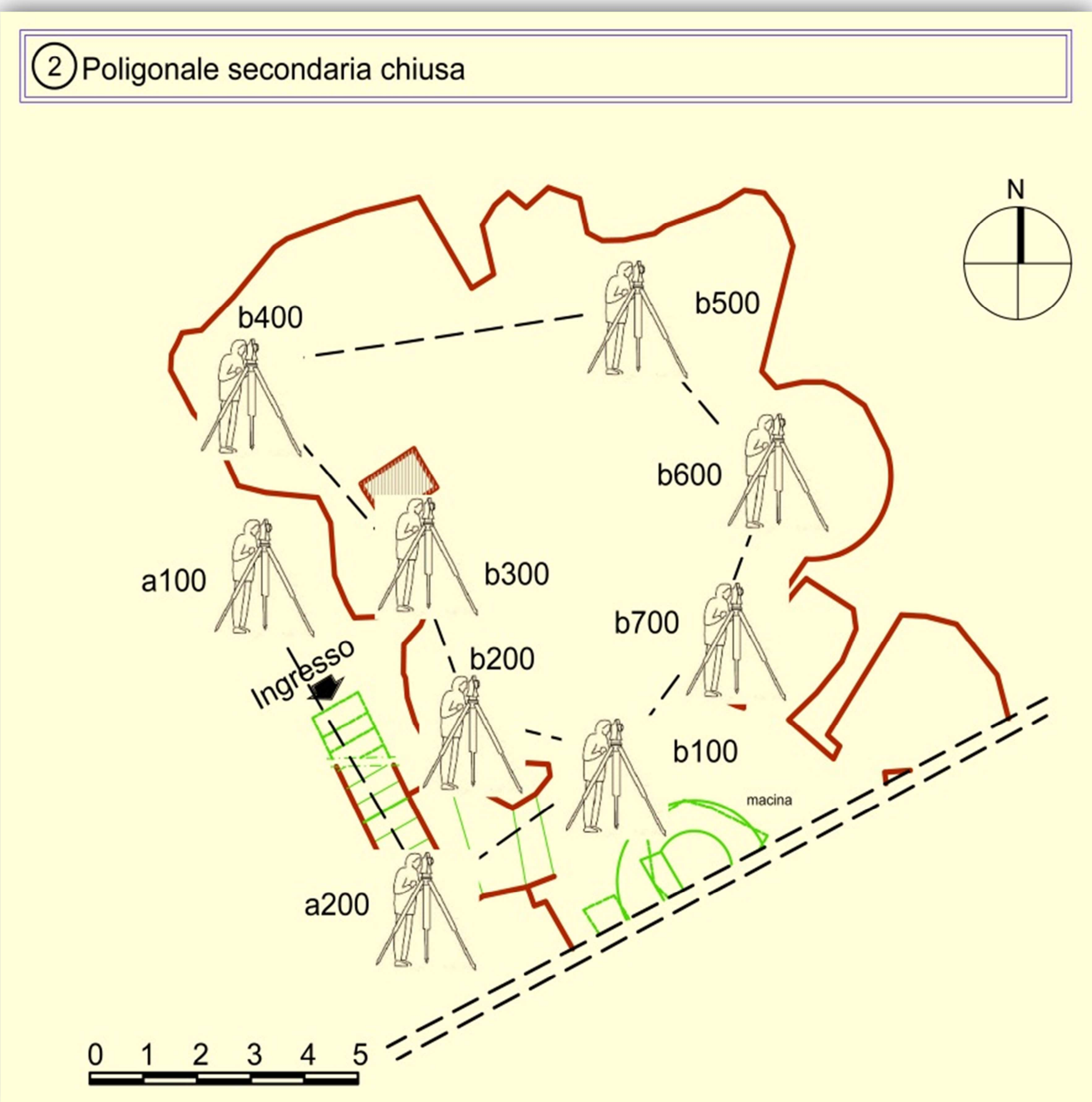
The survey of the aforementioned reference points, was completed by stopping at a known point of the main traverse, at the central point of the space (CG); and executing, as a result, the measurements to some significant points on the perimeter. It was also necessary, in this case, to obtain the distances or measurements of the sides of each triangular constituent.

This method of radial measurement, in general, is faster and certainly the most convenient, so the operator does not have to move from his position.



The altimetry, i.e, the measurements of the differences in height in reference to the points on the surface, was determined by both the laser Total Station and the meter laser level.
Each secondary corridor branching from the main workroom was classified by a lowercase letter. This letter refers to the 'anchor' point (marked by the laser total station, and indicated with a capital letter) in the main workroom from which all subsequent measurements in that corridor were made.

For the classification and labeling of the points within each secondary corridor, lowercase letters of the alphabet, accompanied by numbers, were used. Each point in the secondary corridors were labeled using a lowercase letter and numbers of three digits. The lowercase letter indicates the aforementioned main ‘anchor’ point in the main workroom. The following



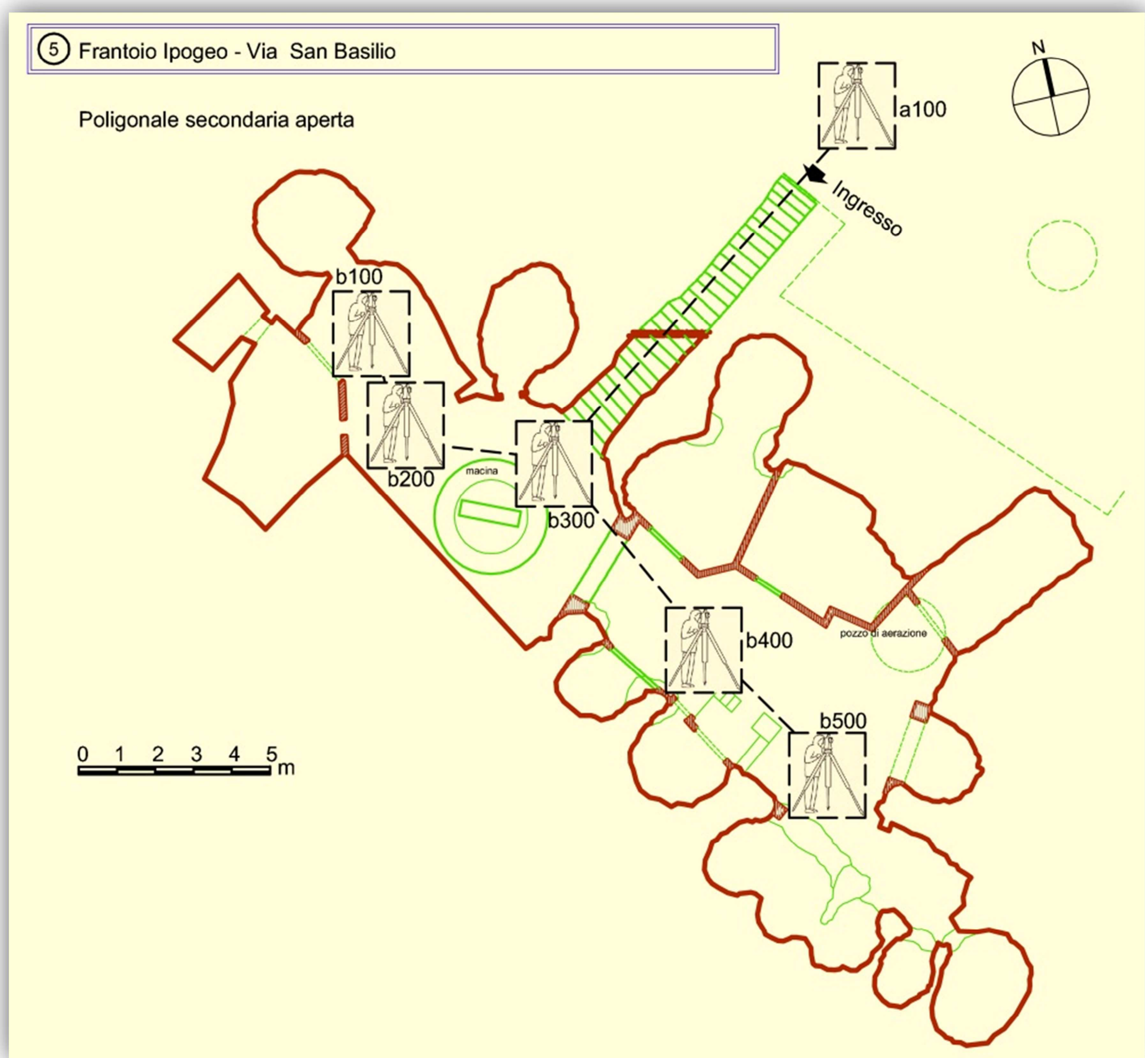
three digits distinguish the points from each other. The measurements were obtained, some with a data recorder, and others have been recorded in an appropriate field book, with pages numbered consecutively, accompanied by simple sketches.
The set of drawings have been produced:
-Plans in 1:100 scale.
They are the representations obtained by projecting the planimetric measurements of the underground space on a horizontal plane. These drawings depict the cavities using the maximum planimetric breadths and provide an altimetric indication only related to floor quotas.

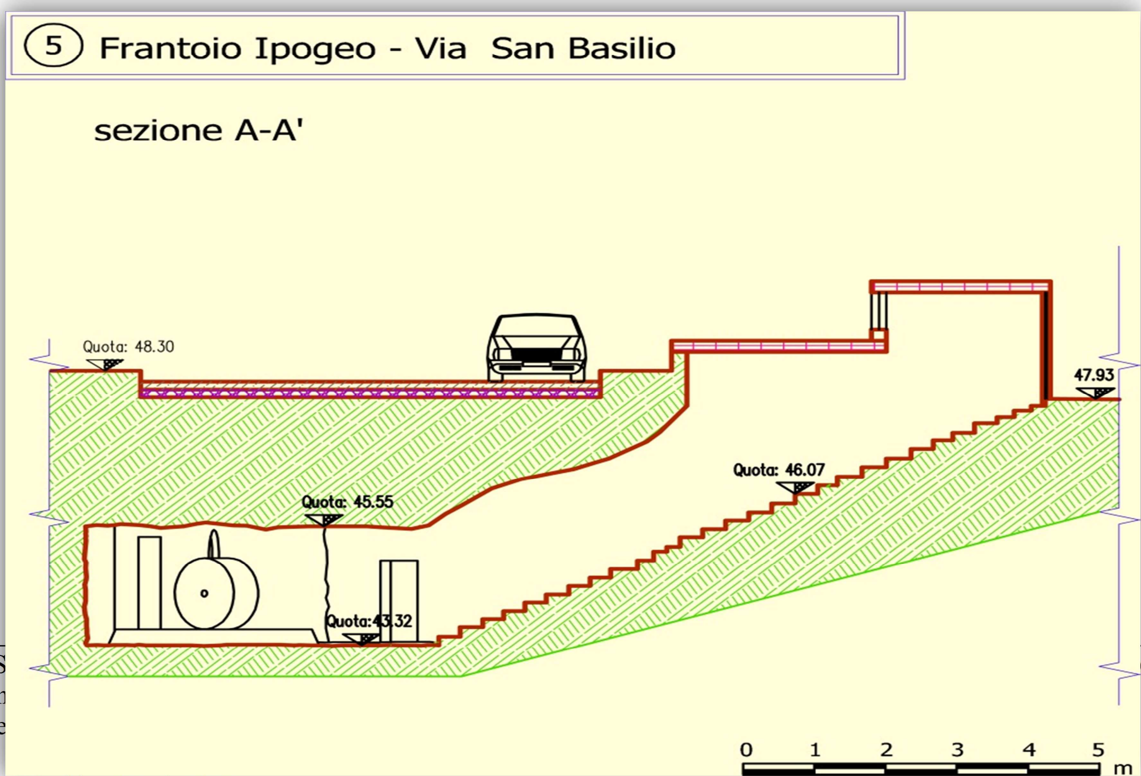
The longitudinal sections are the representation of the elevation obtained by the intersection of the cavity, with consecutive, but not-aligned vertical planes. Therefore, in the drawings, the

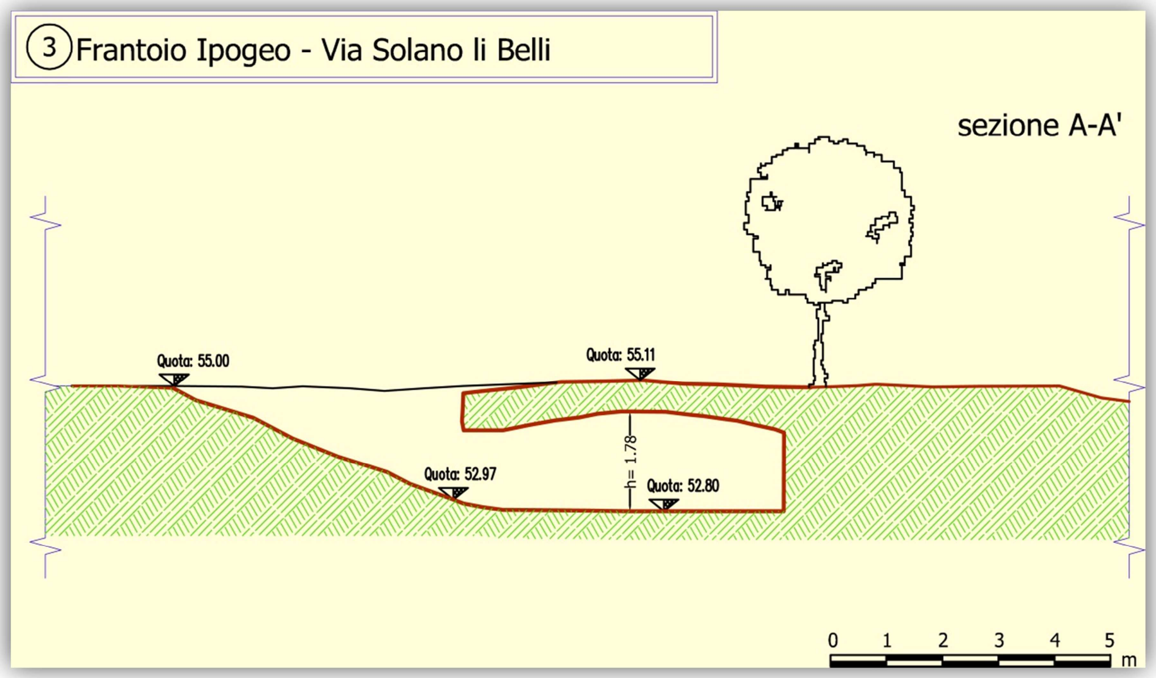
representation of the elevation is taken along a broken line extended in a longitudinal direction, thereby perfectly reproducing the sharp edges of the side of the cavity, with all the vertical elements included (any unevenness, such as stairs, wells and chimneys, etc.).

The sections were marked with upper case letters (eg, Sec. A-A '). All plans, with the images of the altimetric profile of the oil mills, have finally been made coplanar. The graphics depict the cavities only reproduced with regard to both the floor and the ceiling, without providing any information on the scale of the rooms.
The plan and cross-section are almost never sufficient to represent, realistically, the exact shape of the contours of the underground rooms. In fact, generally, in a common representation, the plan and the cross-section can show countless shapes detectable solely with cross sections. These cross-sections, in addition to providing a clear idea of the feasibility, also enable us to formulate realistic assumptions on the morphology of the cavity.

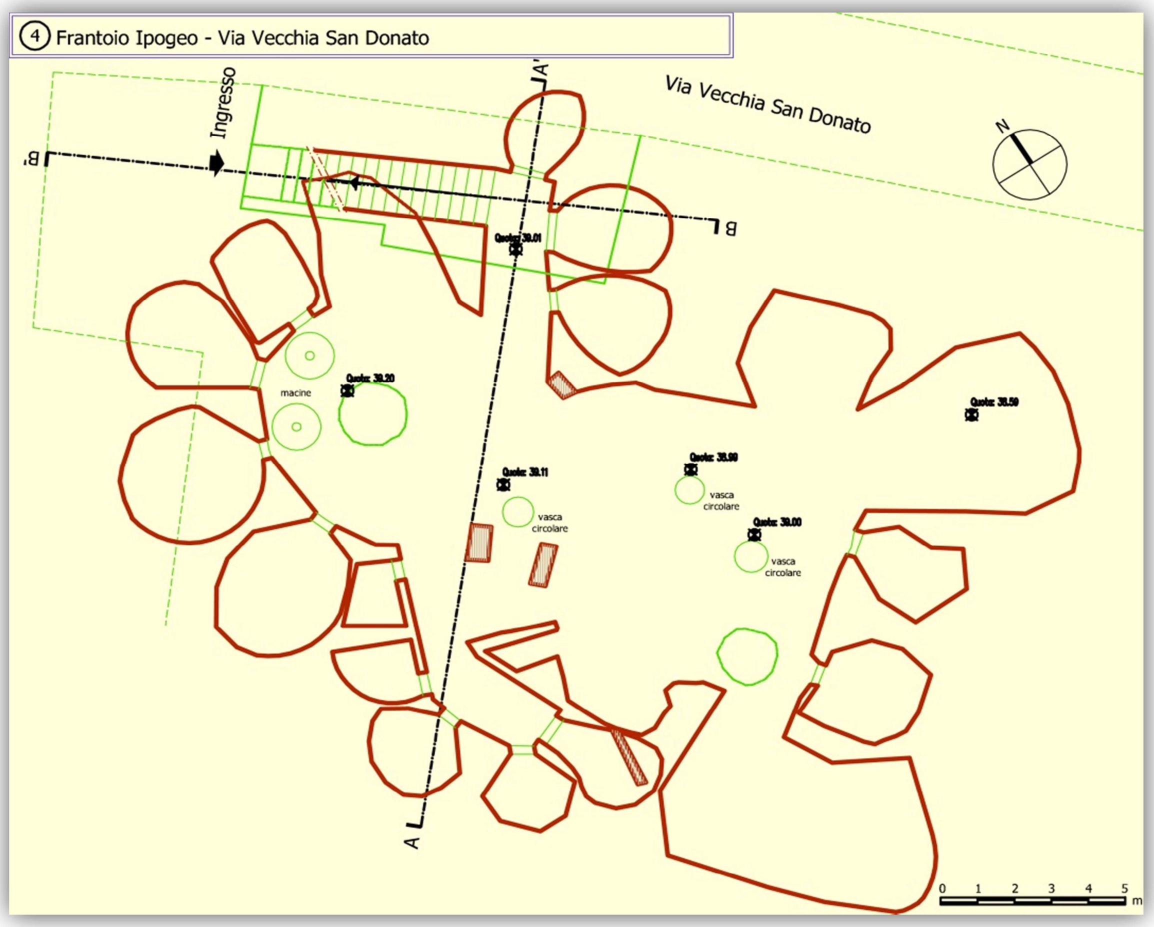
The following are the most significant drawings and some evocative photographs

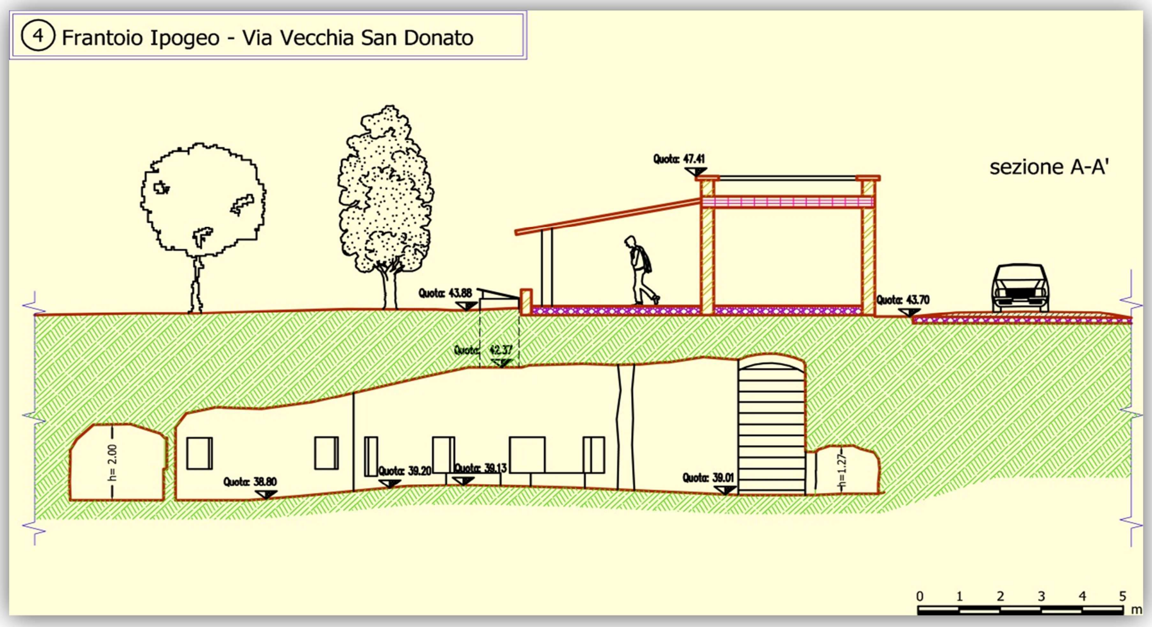

5 Frantoio Ipogeo - Via San Basilio
Poligonale secondaria aperta
N
a100
Ingresso
b100
b200
b300
b400
b500
macina
pozzo di aerazione
0 1 2 3 4 5 m

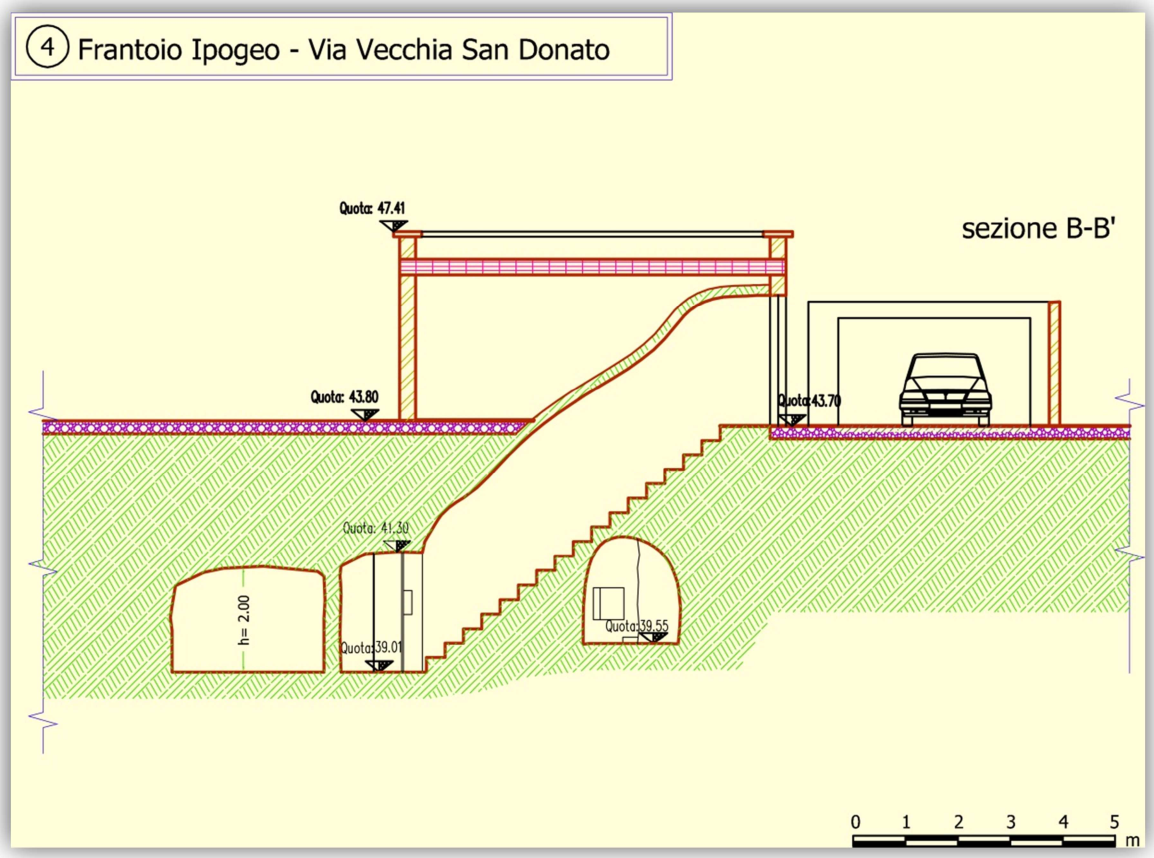

5 Frantoio Ipogeo - Via San Basilio
sezione A-A'
Quota: 48.30
47.93
Quota: 46.07
Quota: 45.55
Quota:43.32
0 1 2 3 4 5 m



3 Frantoio Ipogeo - Via Solano li Belli
sezione A-A'
Quota: 55.00
Quota: 55.11
Quota: 52.97
h= 1.78
Quota: 52.80
0 1 2 3 4 5
m


4 Frantoio Ipogeo - Via Vecchia San Donato
Via Vecchia San Donato
Ingresso
macine
vasca circolare
vasca circolare
vasca circolare


4 Frantoio Ipogeo - Via Vecchia San Donato
sezione A-A'
Quota: 47.41
Quota: 43.88
Quota: 43.70
Quota: 42.37
Quota: 38.80
Quota: 39.20
Quota: 39.13
Quota: 39.01



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Bibliographical notes:

-Guida pratica ai trappeti sotteranei nel Salento (Rossella Barletta)
-Presicce Sotterranea (Antonio Stendardo)
-La civiltà contadina Lu trappitu e li trappitari (Cosimo Occhibianco
-La Topografia - Igino Gortani e Angelo Pericoli;
-Surveyining Theory and Practice – James M. Andersom e Edward M. Mikhail;
-Rilievo in grotta- Commissione Nazionale Scuole di Speleologia della Società Speleologica Italiana