



**Fondacija "Arheološki park: Bosanska piramida Sunca"** je neprofitna, nevladina i nepolitička organizacija registrovana za zaštitu kulturnog nasljeđa, arheološka iskopavanja, organizaciju kongresa i promociju arheološkog turizma na teritoriji Bosne i Hercegovine. Dva projekta Fondacije su istraživanje i zaštita kompleksa piramida u visočkoj dolini i katalogiziranje fenomena prahistorijskih kamenih kugli širom BiH.

Ajla Šabanija Softić, MA in Archaeology

Foundation "Archaeological Park: Bosnian Pyramid of the Sun"

Ravne bb, Visoko, 71300, Bosnia and Herzegovina

## **Archaeological Research Report of the Ravne 3, Ravne 4, Ravne 5 and Ravne 6 Tunnels**

Location: Ravne bb, Visoko, Bosnia and Herzegovina

Investor: Foundation "Archaeological Park: Bosnian Pyramid of the Sun"

Research Contractor: Foundation "Archaeological Park: Bosnian Pyramid of the Sun"

Head of Research: Ajla Šabanija Softić, MA in Archaeology

Period of Research: August–December 2025

Visoko, December 2025



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## INTRODUCTION

The archaeological site of the Ravne tunnel complex is located in the area of the town of Visoko and represents a complex underground system of tunnel structures. Archaeological research at the sites of the Ravne tunnel complex has been conducted for the fifth consecutive year, since 2020, at the request of the Foundation "Archaeological Park: Bosnian Pyramid of the Sun," which is also the investor of the works. The Foundation was established in 2005 and is registered for activities related to the protection of cultural heritage, the implementation of archaeological research, the organization of scientific and professional conferences, and the promotion of archaeological tourism within the territory of Bosnia and Herzegovina.

Archaeological research carried out to date at this site has indicated the presence of multiple cultural layers, as well as evidence of intensive anthropogenic activity, which justified the need for the continuation of archaeological investigations. An additional and one of the key reasons for their implementation was the discovery of a new tunnel – Ravne 6.

The objective of the continuation of archaeological research was the systematic examination and documentation of cultural layers, the identification and analysis of traces of anthropogenic activity, as well as the systematic archaeological investigation and recording of the newly discovered Ravne 6 tunnel within the tunnel complex.

Furthermore, the research aimed to determine the archaeological potential of the site, to identify tunnel passages and analyze their function, as well as to define the character and chronology of the underground structures, including their documentation through the application of standard archaeological methods.

The works were carried out in accordance with the methodological parameters defined in the *Plan of Archaeological Research of the Underground Network of the Ravne 3, Ravne 4, Ravne 5 and Ravne 6 Tunnels in Visoko, Bosnia and Herzegovina, for the period 2025–2030*.

Based on the aforementioned research plan, a permit for the continuation of archaeological research was issued by the Ministry of Education, Science, Culture and Sports of the Zenica-Doboj Canton in August 2025. This represented the fifth campaign of systematic



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archaeological research. The 2025 campaign focused on the systematic investigation of the Ravne 6 tunnel, as well as protective and revision research of the Ravne 3, Ravne 4 and Ravne 5 tunnels. Both destructive and non-destructive archaeological research methods were applied, which will be explained in more detail in the following sections of this report.



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## COURSE OF RESEARCH, WORK ORGANIZATION, TEAM COMPOSITION, METHODOLOGY

The methodology applied during the fifth campaign of archaeological research of the Ravne tunnel complex was largely based on the previously prepared *Archaeological Research Plan of the Underground Network of the Ravne Tunnel Complex in Visoko*, with no significant deviations. The fifth archaeological research campaign began on 29 August 2025 and lasted until 31 December 2025. Archaeological investigations at the site of the Ravne tunnel complex were conducted in accordance with Decision No. 10-36-6660-2/25 of 19 August 2025, issued by the Ministry of Education, Science, Culture and Sport of the Zenica–Doboj Canton. The said decision was adopted on the basis of the opinion of the Federal Institute for the Protection of Monuments in Sarajevo, to which annual reports on conducted archaeological research are regularly submitted and which reviews and approves them. In addition, proposals for future archaeological research are also submitted to the Federal Institute for the Protection of Monuments, based on which the Institute issues an expert opinion and consent, serving as the basis for the issuance of permits by the competent cantonal ministry. Research was carried out on land parcels designated as cadastral plots no. 1426/1, 1444/1 and 1489/1, Cadastral Municipality Kraljevac, that is, in the tunnels designated as Ravne 3, Ravne 4, Ravne 5 and Ravne 6.

Given that archaeological research had been conducted at the aforementioned sites in previous years, several methodologically different types of research were combined during this campaign. Both destructive and non-destructive methods were applied, as well as protective and systematic research. Protective archaeological investigations were carried out in the Ravne 3, Ravne 4 and Ravne 5 tunnels, within the context of the continuous use and arrangement of the underground space. These investigations were conducted in areas where there was a potential risk of degradation of stratigraphic layers, collapse, or damage caused by human activity and natural processes. Within the framework of protective research, the removal of recent material (deposits, rubble) was carried out under archaeological supervision, and, additionally, the replacement of wooden shoring was performed in sections where this was required.



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In the Ravne 6 tunnel, systematic research was conducted, which involved manual excavation of specific tunnel sections, i.e. deposits/fill, in order to precisely investigate the existing archaeological traces. In addition, a non-destructive research method was applied—geodetic surveying—which enabled precise mapping of each tunnel as well as their mutual relationships. In this way, non-invasive methods provided information on the depth, orientation, position and possible continuations of the tunnel systems.

The research team included Dr. Sc. Semir Osmanagić, and in addition to the head of the archaeological research, Ajla Šabanija Softić (MA), the team consisted of Foundation employees who were permanent members of the team, as well as a group of volunteers during the summer period. Volunteers had the opportunity to participate in the archaeological excavations during the volunteer season, which covered the period from early June to mid-October 2025. Daily records of individual members involved in the archaeological excavations were kept in the archaeological diary.

Supervision over all the aforementioned activities during the archaeological campaign was carried out by members of the Visoko Homeland Museum, with which a valid cooperation agreement is concluded each year. In accordance with applicable legal regulations, the Museum was regularly informed of all discovered archaeological finds, which were jointly professionally examined, recorded and documented, and subsequently taken over with the issuance of appropriate museum documentation (receipt forms).





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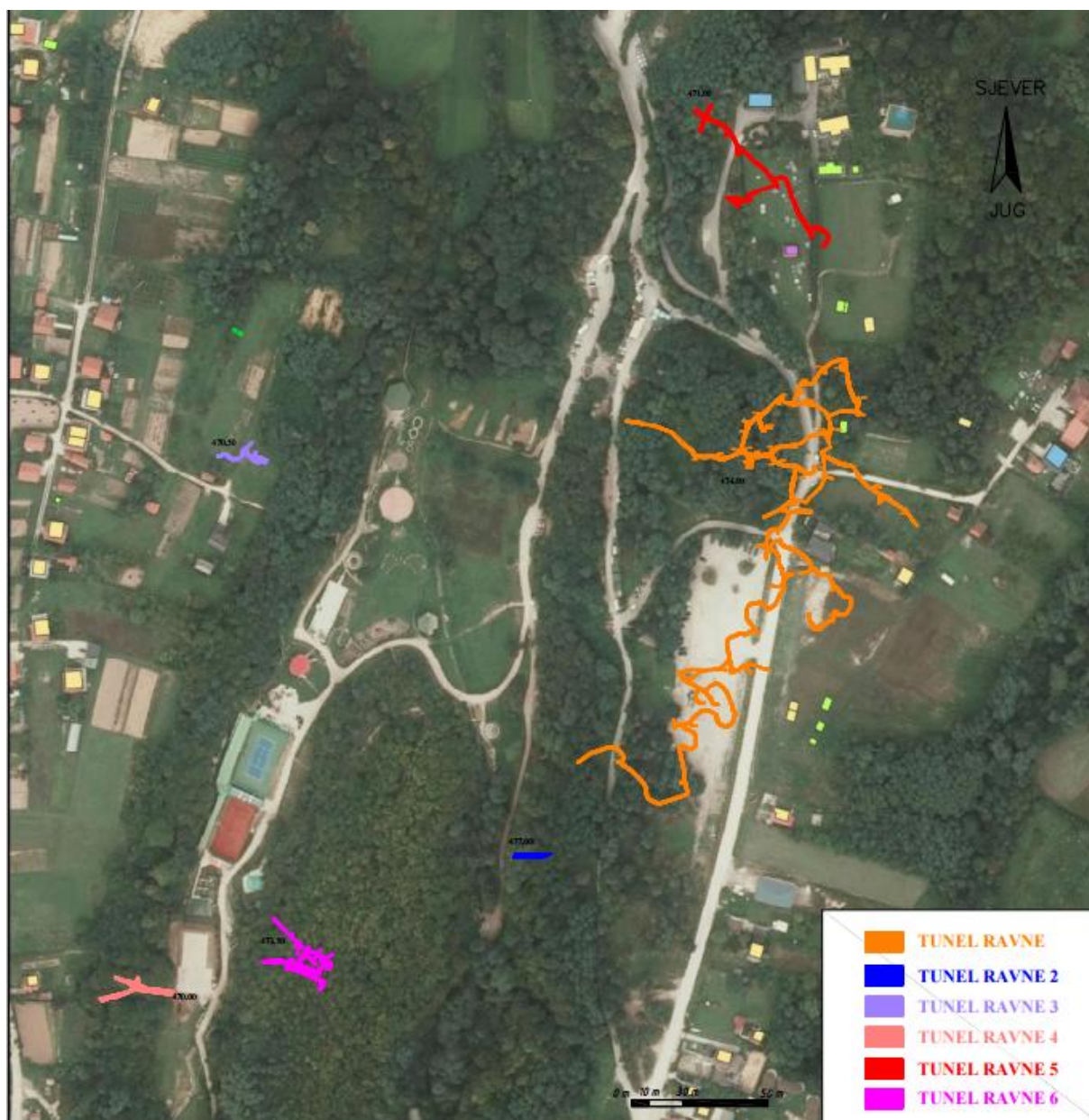


Figure 1: Geographical location and spatial extent of the Ravne tunnel complex



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## DESCRIPTION OF THE LOCATION

The Ravne tunnel complex is located in the immediate vicinity of the town of Visoko, in an area belonging to the Bosna River valley. It is situated in the settlement of Ravne. The tunnel system is set within a hilly terrain characterized by gentle to moderate slopes and pronounced geomorphological processes. The surroundings of the site are predominantly forested. The Ravne 2, 3, 4 and 6 tunnels are distributed within a valley approximately 30 m in height, extending in a north–south direction, while between the two sides of the valley, in an alluvial plain, Park Ravne 2 is located.<sup>1</sup> The Ravne 5 tunnel is situated at the same level as the Ravne tunnel, alongside the local road leading to this settlement.

The Ravne 3 and Ravne 4 tunnels are located on the western side, while Ravne 2, Ravne 5 and Ravne 6 are situated opposite them, on the eastern side. The underground passages are developed within a geological substrate composed of sedimentary rocks, predominantly conglomerates and sandstones, with distinct layers of loose material.<sup>2</sup> Microclimatic conditions within the tunnels are characterized by elevated humidity and a stable temperature (13°C). The tunnels are mostly positioned opposite one another, with Park Ravne 2 extending between them on a gently sloping alluvial plain between the two sides of the valley. Within Park Ravne 2, the Ravne 2, Ravne 3, Ravne 4 and Ravne 6 tunnels are located, while the Ravne 5 tunnel lies slightly outside these boundaries, in close proximity to and at the same level as the main Ravne tunnel, which was first explored and discovered by Dr. Osmanagić in 2006.

The elevations of the entrance points of individual tunnels, determined by geodetic surveying, are presented in Table 1.

<b>Tunnel</b>	<b>Elevation (m a.s.l.)</b>
Ravne	474,00
Ravne 2	477,00
Ravne 3	470,50
Ravne 4	470,00
Ravne 5	471,00
Ravne 6	473,50

Table 1. Elevations of the tunnels

<sup>1</sup> Hoyle 2019, 5.

<sup>2</sup> Ibid





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## HISTORY OF RESEARCH

The first phase of archaeological research began in 2019, when exceptional discoveries of several different cultural layers were made within the Ravne 3 tunnel. During this initial phase, preliminary investigations were conducted, followed by systematic archaeological research within Section A of the Ravne 3 tunnel. This section was completely free of collapsed or intentionally deposited material. The elevated floor, ranging between 20 and 60 cm, contained numerous artefacts from different chronological periods.<sup>3</sup> In cooperation with the Visoko Homeland Museum, the finds were identified and relatively dated. The assemblage includes fragments of ceramic vessels, which are the most numerous, as well as metal objects, dated to the Neolithic, Roman period, and the medieval period.

The second phase of archaeological research was carried out in 2021, under the leadership of archaeologists Amna Agić (MA) and Amar Tufa (BA). Research continued in Section A with the aim of further systematic investigation. The final 20 m of the Ravne 3 tunnel were explored, out of its total length of 75 m. The work focused on the removal of loose gravelly material, and through the sieving of the excavated deposits, the presence of organic material—carbonized wood—was observed. In addition to organic remains, a significant quantity of river pebbles was recorded, which may indicate the former presence of a dry-stone structure that had collapsed over time.<sup>4</sup>

The third phase of research commenced in early June 2022. According to the report of the then head of research, Amna Agić, the work focused on cleaning and removing loose material with the aim of reaching an open space or chamber. A total of 15 m of the southern part of Section A of the tunnel were cleared. During the previous phases of research, 60 m of this section had already been investigated, and with the third phase included, the total length of the investigated zone of the Ravne 3 tunnel reached 75 m. Archaeological research conducted over these years has confirmed that Ravne 3 represents a significant archaeological site.<sup>5</sup>

<sup>3</sup> Hoyle 2019

<sup>4</sup> Agić 2021

<sup>5</sup> Agić 2023, 4.



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As previously noted, the archaeological investigations carried out to date have indicated the presence of several distinct cultural layers. Within a number of archaeological trenches, a substantial quantity of diverse artefacts was recorded within these layers. The cultural layers identified in the trenches are filled with clear evidence of anthropogenic activity within the Ravne 3 tunnel.<sup>6</sup>

The analysis of cultural layers is of exceptional importance, as it provides insight into various aspects of past human life and activities. These discoveries are of fundamental value for understanding the function and use of the tunnel space. The cultural soil layers are saturated with materials that originally belonged to the natural environment but, through human activity, became part of everyday life. In this context, remains of animal bones, leaves, twigs, pits/seeds, as well as other substances of plant and animal origin, were identified. These elements were recorded in several trenches, predominantly at the surface level or within layers up to a depth of 2 to 5 cm.



Figure 2: Trial trench excavation of Section A, Ravne 3 tunnels, 2019

<sup>6</sup> Agić 2022.



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The recovered archaeological materials are in direct contact with one another and together form a coherent picture of a specific period of human life. The layers were formed in several phases; the first layer, or initial phase, represents the physical deposition of natural deposits, for example the accumulation of clay. In this way, the initial zone of the cultural layer was formed.

Several different cultural layers are present in Section A. The earliest includes fragments of Neolithic pottery, followed by archaeological material from the Roman period, and extending through to the medieval period.

Ceramic fragments are the most prevalent among the recovered archaeological materials. More than 3,000 pottery fragments from different chronological periods were discovered. Based on the number of recovered sherds, as well as the variety of vessel rims, seven or eight vessels of different types, shapes, and dimensions were identified. Particularly notable finds include fragments of *terra sigillata* pottery, a Roman *tegula*, a piece of jewelry—a pendant—and a stone bearing evidence of anthropogenic modification. Out of a total of 17 archaeological trenches opened, two were excavated in 2021. Trenches measuring 100 × 200 cm were opened at the far end of Section A.

In quadrant A302, a total of 86 fragments belonging to two different ceramic vessels were discovered, identified on the basis of vessel rims and wall thickness. One ceramic fragment is of particular significance. This fragment bears a swastika symbol, on the basis of which the recovered sherds were partially dated. The pottery belongs to the Early Medieval period in the territory of Bosnia and Herzegovina. According to the commonly accepted traditional periodization of European history, the Early Middle Ages begin with the fall of the Western Roman Empire in AD 476.

The swastika symbol appears on numerous objects, including ceramic vessels and weapons, and is also frequently found at the ruins of ancient settlements. It was used as a decorative motif symbolizing the Sun, life, and love, and is present across various historical periods. The ceramic fragment depicting a swastika, discovered in the Ravne 3 tunnel, most likely belongs to the swastika motifs used by the Slavs, which occurred in numerous and diverse



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forms. This fragment has been dated to the period between the 8th and 9th centuries, as swastika motifs were commonly featured on Slavic ceramic vessels during that time.



Figure 3: Ceramic fragment with a swastika symbol

During the 2023 research season, representing the fourth phase of investigations, work in the Ravne 3 tunnel focused on cleaning and removing loose material from the lateral sides of the tunnel. The primary aim of this procedure was to widen the tunnel structure in order to improve passability, as well as to enable further archaeological and geological documentation of the space. Previously identified dry-stone walls within the tunnel provided the research team with indications that the Ravne 3 tunnels are connected with neighboring sections—Ravne, Ravne 4, and Ravne 5. This assumption is based not only on the discovery of dry-stone walls, but also on the fact that all tunnels have similar entrance levels, suggesting the existence of an organized and deliberately constructed underground network.

The first dry-stone wall discovered was located beneath a well-preserved layer of conglomerate stone, on the surface of which stalagmites had formed. Beneath this layer, immediately in front of the dry-stone wall, a second layer was identified, also covered with stalagmites. Stratigraphic analysis clearly demonstrated that the construction of the dry-stone





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wall predated the formation of both stalagmite layers, which allowed a chronological framework for its construction to be established.

For the purpose of precise dating, samples from both stalagmite layers were sent to the Czech Institute of Geology, where uranium–thorium radiometric dating was carried out. The results showed that the older stalagmite (US001) is approximately  $19,000 \pm 1,000$  years old, while the younger stalagmite (S008), which formed above the first stalagmite and the dry-stone wall, is approximately  $15,000 \pm 1,000$  years old. These results indicate that the dry-stone wall itself must have been constructed during the Early Paleolithic period, providing significant insights into the age and function of the underground structures.

By the end of 2023, a total of five dry-stone walls had been discovered in the Ravne 3 tunnels, and the relevant museum and research institutions were duly informed. During the removal of loose gravelly material in Section A of the tunnel, next to dry-stone wall no. 2, an exceptional discovery was made—analyses showed that dry-stone walls no. 2 and no. 3 are in fact segments of a single continuous dry-stone wall. This confirmed that it represents the longest dry-stone wall within the Ravne 3 tunnels, as well as within the entire tunnel complex, measuring 480 cm in length, with a height varying between 60 and 80 cm. The wall is constructed of 7 to 9 courses of stone blocks, compactly stabilizing the space of a larger underground chamber and ensuring the retention of loose material. The orientation of the dry-stone wall is toward the northwest, and its discovery was recorded 45 m from the main entrance to the tunnels.

Adjacent to the aforementioned dry-stone wall, a significant quantity of organic material was discovered, including carbonized wood, indicating the presence of a fireplace or hearth. The collected samples are planned to be submitted for radiocarbon dating to two European laboratories, which will further contribute to understanding the chronology of human activity within the tunnels. Based on the discovered artefacts and remains of organic material, it can be concluded that the tunnels were used by an organized group of people in the past, for specific purposes that remain partially unknown.<sup>7</sup>

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<sup>7</sup> Agić 2023.





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Figure 4: Roman *tegula* found in fragments in the Ravne 3 tunnels, 2019

These findings emphasize the importance of continued research and documentation of the Ravne tunnel complex, as there are indications that the discovered dry-stone wall extends along the entire length of the tunnel, connecting the structures identified so far into a unified underground network. All research results will be duly submitted to the relevant institutions, ensuring their scientific evaluation and preservation.



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Figure 5: Fragments of ceramic vessels, 2019

The Ravne 4 tunnels were discovered in November 2019 during works on the development of the Archaeological-Tourist Park Ravne 2. While preparing the ground for the installation of benches and tables, Foundation workers encountered a small conglomerate cavity. Further clearing of soil and vegetation revealed the entrance to a new underground complex, which, due to its connection and parallel elevation with the Ravne 3 tunnels, was named the Ravne 4 tunnels. Preliminary analysis suggests that this is part of the same tunnel network connecting different sections of the underground complex.

The first detailed survey of the tunnels was conducted in 2019 by a professional team from the Foundation under the leadership of Dr. Semir Osmanagić. Initial investigations indicated the anthropogenic nature of the tunnels, showing that they were created by human activity. The passages within the tunnels extend both to the right and left but are partially blocked by dry-stone walls. During the first intervention, the main tunnel passage, which at that time was passable, was measured at 63 meters from the entrance.



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Archaeological research of the Ravne 4 tunnels was carried out according to standard principles and methods of archaeological excavation, covering an area 60 meters from the entrance. Before excavation began, a reconnaissance survey was conducted to confirm the archaeological potential of the site. The existing condition of the tunnel was documented before any intervention, as archaeological excavation irreversibly alters the original context.

The research was particularly challenging due to the specific physical conditions of the tunnels—narrow passages, low ceilings, and the presence of water and mud limited the movement of researchers and the transport of materials. Additional difficulties included modern modifications of the tunnel, such as buried electrical cables, drainage pipes, and installed support pillars used for worker safety.

For precise and efficient documentation of the tunnels, digital photogrammetry was used, with permanent reference points placed along the edges of the tunnel walls. This method enabled detailed measurements of the passage dimensions, which is crucial for planning future research using various archaeological techniques.

The Ravne 4 tunnel extends southeast from the entrance, and preliminary test investigations have not revealed any movable archaeological material so far. Nevertheless, early findings confirm that the complex has potential for further research, which could shed light on the function and historical significance of this underground network.



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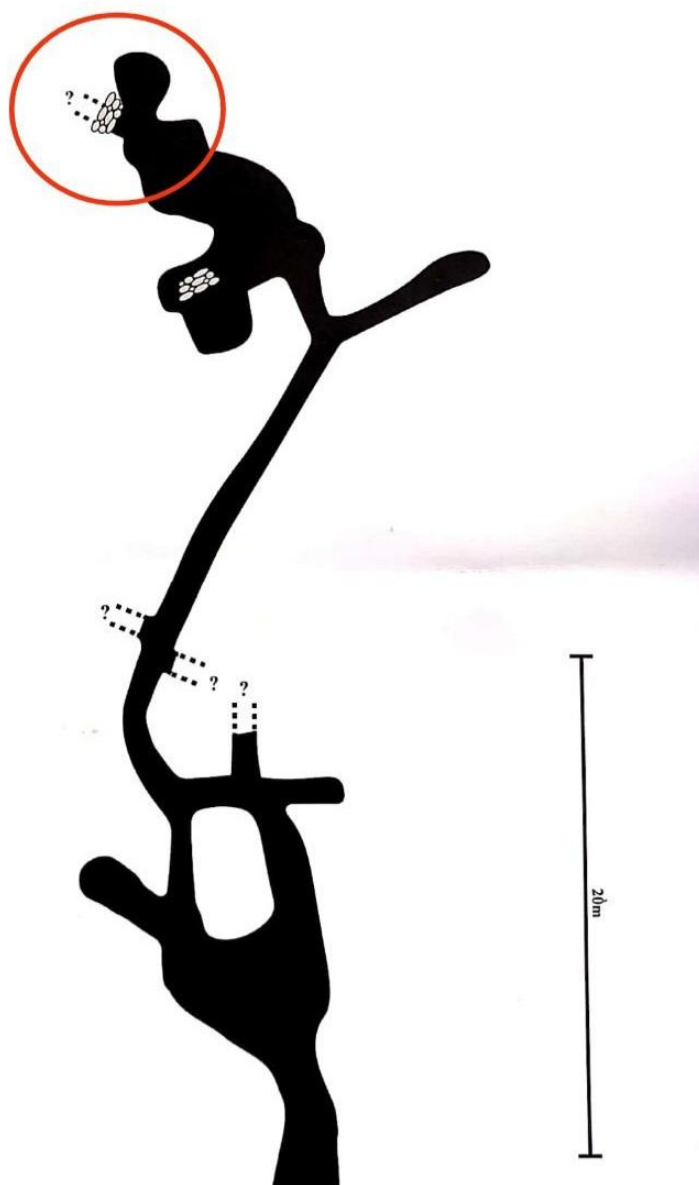


Figure 6: Map of the Ravne 4 tunnels created after surveying with a total station





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The Ravne 5 tunnel was discovered in 2018, and since its discovery, the Foundation has continuously conducted preparatory activities for future archaeological research within this part of the underground complex. The Ravne 5 tunnel constitutes the northern segment of the Ravne tunnel complex, connecting with other sections in the network of underground passages.

During initial works, the Foundation research team cleared a total of 122 meters of tunnel space, revealing a passage completely free of loose gravelly deposits. The first field survey and prospection identified a section 15 meters in length that required more detailed measurements and analyses by the professional team. Final documentation showed that the open and passable part of the tunnel measures approximately seven meters (680 cm) in length, with a ceiling height of 125 cm. The orientation of this section runs northwest–southeast, corresponding to the natural orientation of the entire complex.

During the research mission, all previously deposited loose material in the tunnel was carefully sieved and examined. Analyses did not reveal the presence of archaeological or organic material, nor have any dry-stone walls been recorded in this part of the tunnel to date.

Although current documentation shows an absence of material traces, the Ravne 5 section represents an important segment of the network, as its spatial positioning and structure contribute to the overall understanding of the organization of underground passages within the Ravne complex. These data facilitate the planning of future systematic research, which could clarify the function and historical significance of this part of the tunnel system.<sup>8</sup>

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<sup>8</sup> Agić 2023, 21.





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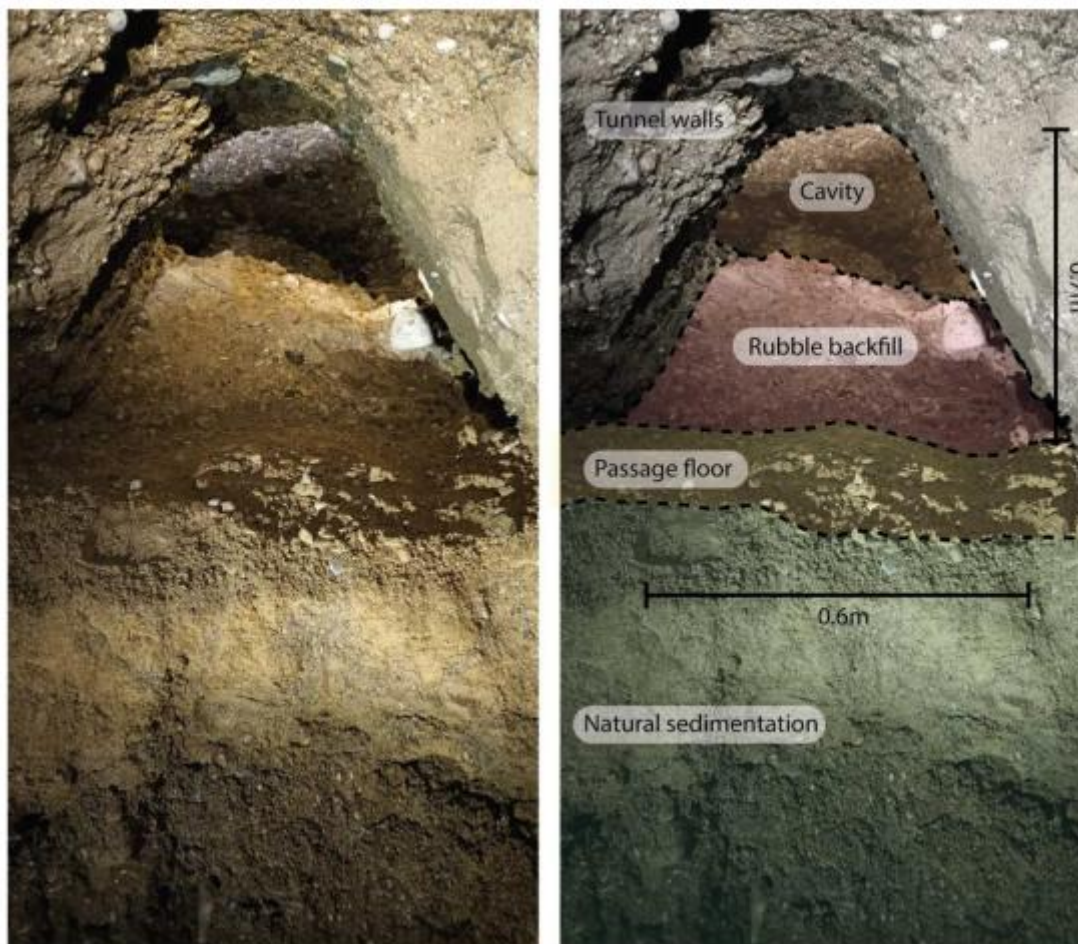


Figure 7: Stratigraphic layers of a section of the Ravne 5 tunnel



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## RESULTS OF PROTECTIVE RESEARCH IN THE RAVNE 3, 4, AND 5 TUNNELS

Protective archaeological research within the Ravne 3, Ravne 4, and Ravne 5 tunnels was conducted during the 2025 research phase, building upon previous investigations carried out at these sites since 2018/2019. The research was driven by the need to repair and replace deteriorated wooden supports, which posed a potential risk of collapse and threatened the safety of both researchers and visitors.

Protective work was carried out selectively, exclusively in sections of the tunnels where support replacement was necessary to ensure structural stability and safety. The procedure involved the manual removal of recent deposits under constant archaeological supervision during all construction and repair interventions, with the aim of preserving archaeological layers and preventing potential damage. Special attention was given to maintaining existing stratigraphic relationships and documenting any archaeological occurrences.

Methodologically, the research involved the hand-removal of recent deposits accumulated along the sides and floor of the tunnels, with continuous archaeological monitoring throughout all phases of wooden support replacement. All interventions were performed in a manner that allowed for the observation of stratigraphic relationships and the recording of any archaeological phenomena.

As part of the work in the Ravne 5 tunnel, a geodetic survey was conducted, which played a significant role in documenting the spatial configuration and orientation of this tunnel section. The collected data enabled a more precise determination of the direction of the Ravne 5 tunnel and its spatial relationship to the main Ravne tunnel system. The closest current distance between these two tunnels is 65 m. This work has contributed significantly to understanding the organization and potential connectivity within the wider Ravne complex.

During the protective archaeological research in this phase, no significant archaeological finds, structures, or movable materials were recorded. Nevertheless, the work provided better insight into the preservation of tunnel profiles and the condition of deposits, as





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well as creating safer conditions for the continuation of future archaeological and conservation activities within the Ravne tunnel complex.



Figure 8: Northern chamber of the Ravne 5 tunnel after surface cleaning



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## RESULTS OF SYSTEMATIC RESEARCH IN THE RAVNE 6 TUNNEL

Following preliminary archaeological investigations of the Ravne 6 tunnel in 2023, and after obtaining a permit for archaeological research from the Ministry of Education, Science, Culture, and Sports of the Zenica-Doboj Canton, systematic archaeological research of this tunnel began in August 2025. Prior to this phase, since the tunnel's discovery in 2023, 28 meters of the tunnel had been explored, with a total discovered and open space of 65 meters. During these investigations, both movable finds, such as organic material (wood), and immovable finds, including dry-stone walls, were uncovered.

Before applying destructive archaeological methods, a detailed recording and documentation of the tunnel's existing condition was conducted to preserve information about the original context and minimize data loss. All tunnel elements were recorded, including the total length of the explored and discovered section, lateral passages, dry-stone walls, detailed measurements of all tunnel features, the condition of infill and deposits, measured tunnel heights and widths, infill heights at various sections, structural characteristics of walls and vaults, and all visible signs of anthropogenic activity. Documentation was carried out through photography, geodetic surveying, sketching and drafting of the tunnel, and recording field notes, ensuring a comprehensive understanding of the site's original state before excavation began.

The tunnel is oriented east–west, with lateral tunnels branching off in various directions (north and south). Even at the entrance, the distinction between the main tunnel axis and the lateral passages is clearly visible.

The tunnel entrance has been technically secured with concrete and doors to ensure controlled and safe access, as well as to protect the interior from potential collapse and unauthorized entry. This intervention did not affect the internal stratigraphic relationships but is important for understanding the current condition of the site.



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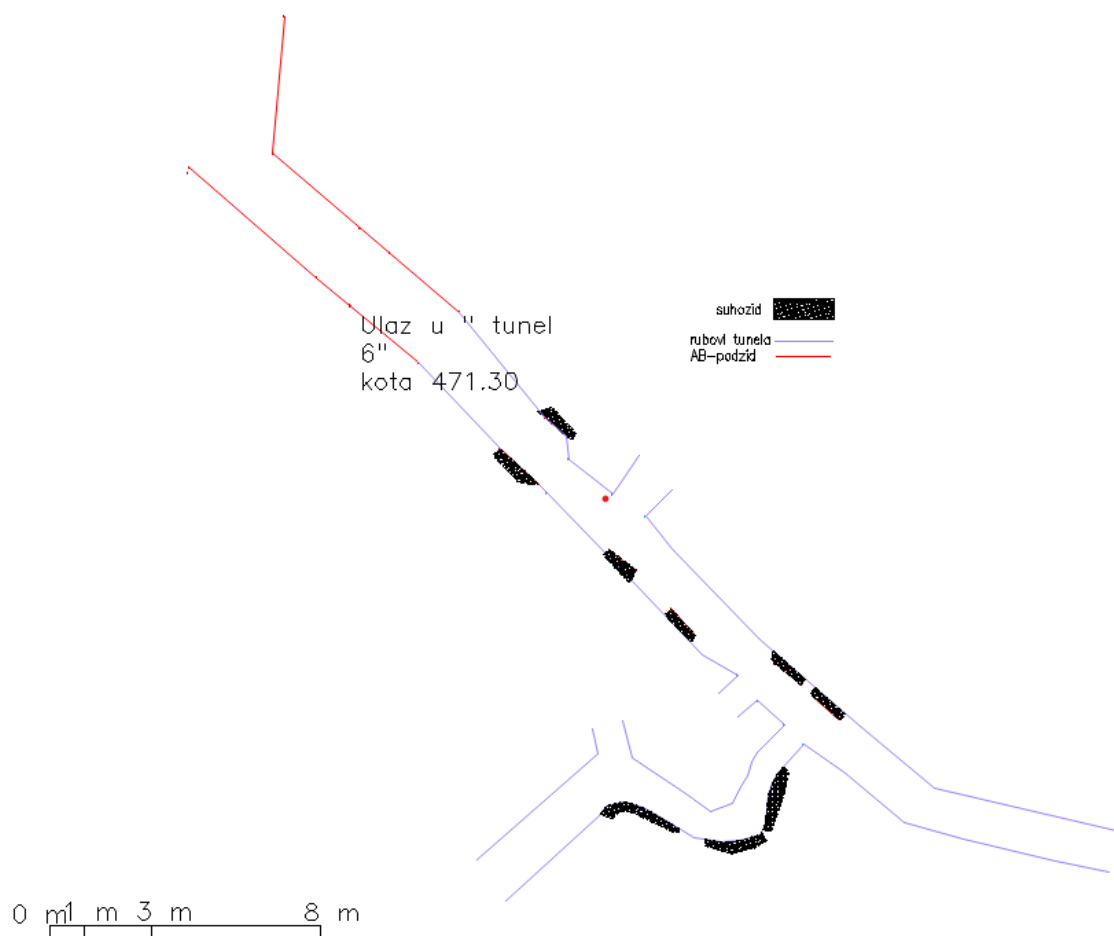


Figure 9: Previously explored section of the Ravne 6 tunnel

Upon the first entry, the distinction between the previously explored and unexamined sections of the tunnel is clearly visible. The first 28 meters of the main tunnel axis had already been investigated and completely cleared of infill and deposits. Within this section, lateral tunnels branching to the left and right were recorded, primarily oriented toward the north or south. The lateral tunnels were not the focus of past research, except for one side passage, as previous investigations concentrated on cleaning and studying the main tunnel axis. Within this 28-meter explored section, a total of eight lateral tunnels and seven dry-stone walls were documented. Of these, five dry-stone walls are located along the main tunnel axis, while two dry-stone walls are situated within lateral tunnel BT5. The dry-stone wall structures are clearly visible; some remain intact, while others are partially collapsed. The condition of each recorded dry-stone wall was thoroughly documented, with precise measurements taken, as well as photographic documentation and detailed sketches.





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Figure 10: Ravne 6 Tunnel – 28th meter of the tunnel, before and after the start of research

In the explored section of the tunnel, no movable archaeological finds were recorded during this phase. The entire section has been completely cleared of infill, providing a clear view of the spatial organization of the main tunnel axis and the arrangement of lateral passages, as well as precisely marking the point where previous research was halted—the location from which systematic investigations are to continue (28 m+).

After detailed documentation of the existing condition of the already explored section, attention was focused on recording the remaining, uninvestigated portion of the Ravne 6 tunnel before beginning any destructive archaeological work. The goal at this stage was to gain insight into the tunnel's original condition and spatial organization, assess the state of infill, potential stratigraphic relationships, and the tunnel's structural features. Measurements were taken of the tunnel dimensions, including the main axis and lateral passages; dry-stone walls and other





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structures were recorded, along with the presence of infill and other features. All findings were documented through photography, field notes, sketches, and detailed drawings.

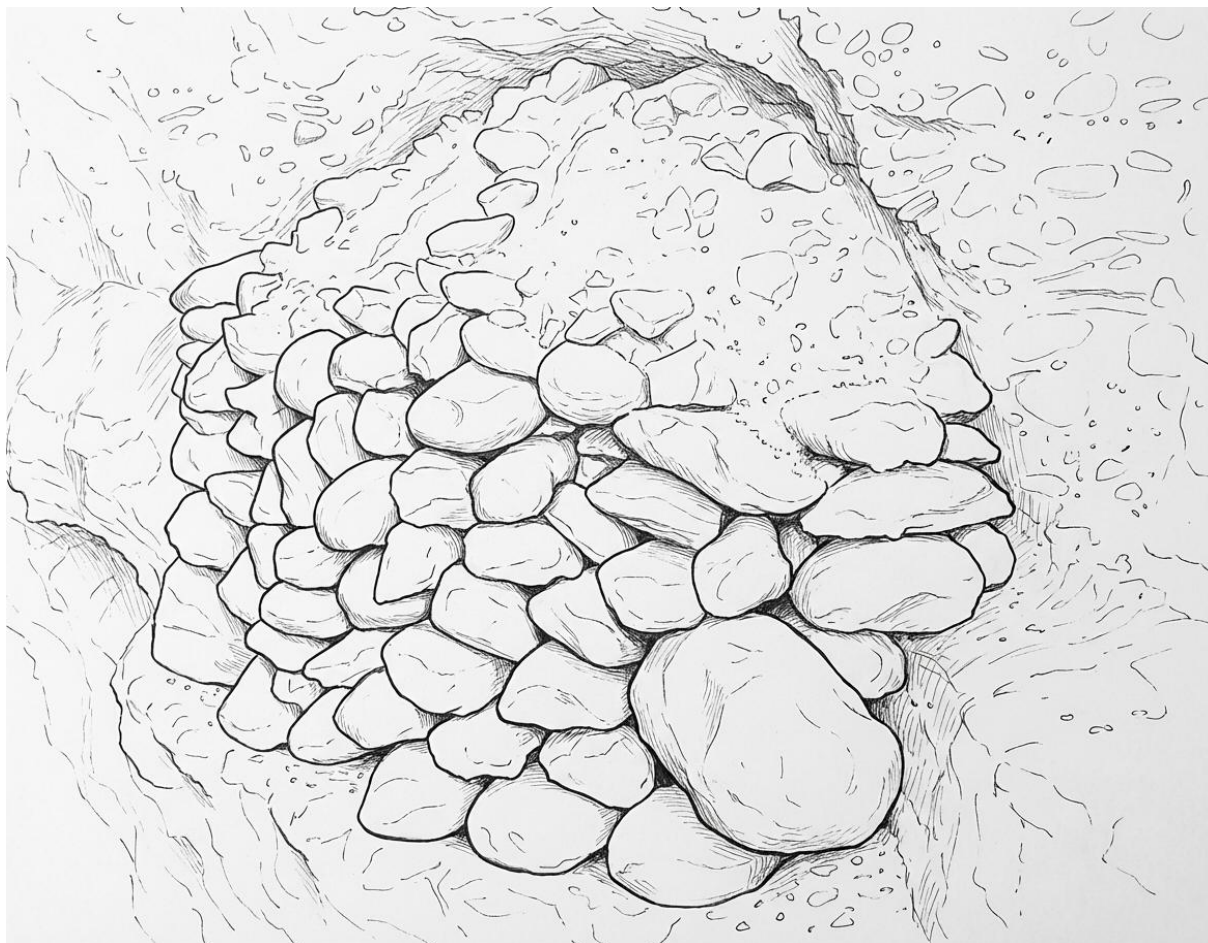


Figure 11: Draft of Dry-Stone Wall No. 2 (BT2 S2)

The main axis of the tunnel, continuing from the endpoint of the previously explored 28 m, extends east–west for an additional 12 m. In this segment, seven lateral passages (BT9–BT15) were recorded, with no dry-stone walls present. At the end of this stretch, a dry-stone wall was documented, marking the closure of the tunnel's continuation. Beyond this wall, the tunnel continues but is completely filled with infill and was impassable during this phase.

After the additional 12 m, the tunnel makes a 90° turn to the left, heading north, where it extends for 4 m. In this section, lateral passage BT17 was recorded, in front of which a surface find of organic material (wood) was observed during preliminary prospection. A detailed analysis of this find is provided in a separate chapter dedicated to the discoveries.



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At the fourth meter of this northern branch, the tunnel changes direction again, turning east and continuing as the main axis. At the point of this turn, a large dry-stone wall measuring 5 m in length was recorded, with a side passage (BT18). In this section, there is a significant reduction in the height of the tunnel (0.5 m) due to the presence of a large rock in the ceiling, on which speleological formations—stalactites—were observed. The side passage BT18, 5 m in length, also extends beneath this low and narrowed section.

Opposite BT18, on the other side, another dry-stone wall (S10) was documented, also approximately 5 m in length. At the end of this wall, a find of organic material—wood—was observed; at the time of documentation, only its upper part was visible, while the remainder was embedded in the fill. This find was recorded at the 45th meter of the main tunnel axis and was spatially located at the end of dry-stone wall S10 and at the beginning of the side tunnel (BT19), identified during the prospection of the unexplored section of the tunnel. After its extraction, it was determined that the object was located at a depth of 1.02 m, with a total height of 45 cm, while the visible part measured 12 cm. Its detailed analysis is presented in the chapter on finds. Opposite the location of this find, an interesting geomorphological feature was recorded in the form of a semicircular rock base with clearly visible traces of working, at the bottom of which there is fill containing water. This point also marks the end of the open, unexplored section of the tunnel that was accessible for documentation during this phase of research.

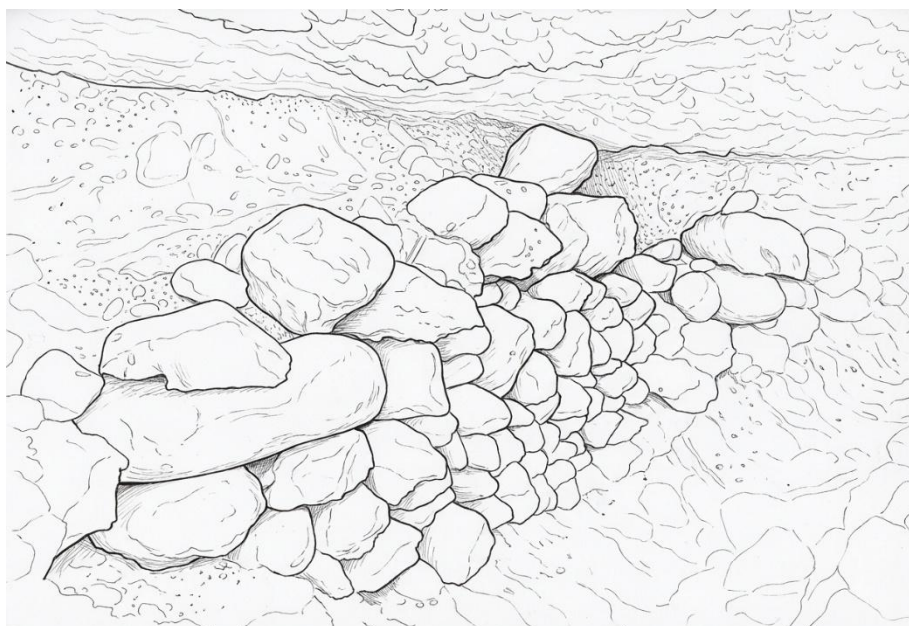


Figure 12: Plan (drawing) of dry-stone wall No. 9 (BT18 S9)





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Figure 13: Dry-stone wall (S9), length 5 m

The average height of the unexplored section of the tunnel is approximately 1 m, while the average width is about 1.50 m. The height of the fill varies along the tunnel course but averages around 0.50 m, which further contributed to the reduced passability of certain segments. During this phase, no removal of the fill was undertaken; only visual prospection and documentation of accessible elements were carried out.

After detailed recording and documentation of the observed condition of both the explored and unexplored sections of the Ravne 6 tunnel, basic data were obtained on the organization of the tunnel system, the condition of the fill, the presence of structures, and potential archaeological indicators. Based on the observed characteristics—particularly the presence of dry-stone walls and recorded surface finds in the unexplored section of the tunnel—it was assessed that the site possesses significant archaeological potential. Accordingly, a planned and controlled implementation of systematic archaeological excavations was initiated, applying standard methodology and principles of preservation of the stratigraphic context.



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Archaeological investigations commenced from the 28th meter of the main tunnel axis, i.e., from the point at which previous research had been suspended. In the initial phase of work, the main tunnel axis was cleared only up to the access point of side tunnel BT14, which was selected for investigation due to its southern orientation.

All works were carried out manually, using the method of gradual, stratigraphic removal of the fill. Each phase of work was thoroughly documented through field notes and photographic documentation, ensuring continuous monitoring of stratigraphic relationships and context.

As the works progressed, temporary wooden safety shoring was installed in order to control potential collapses and to ensure safe working conditions within the tunnel.

During the removal of the fill, at the 32nd meter of the main tunnel axis, a movable find—organic material (wood) in the form of an arrow—was recorded within the stratigraphic context of the deposits. The find was documented in situ and recovered for further processing; its detailed analysis is presented in a separate chapter dedicated to finds.

Subsequently, the cleaning of side tunnel BT14 was initiated. At the very entrance, an additional side passage was observed, extending in the opposite direction, parallel to the main tunnel axis. Upon entering BT14, an expanded space—a chamber—opens, from which a side tunnel extending further south, designated BT14a, continues.

In the initial section of BT14a, a low ceiling caused by a rock outcrop was recorded, along with a collapsed portion of the tunnel, which required more intensive removal of the fill and careful work. After the removal of the collapsed material, a new, previously unknown section of the tunnel was opened, resulting in the documentation of more than 60 meters of newly discovered tunnel network. The newly discovered section is characterized by relatively good preservation, pronounced humidity, and the presence of natural deposits, which necessitated a cautious and phased continuation of the research.



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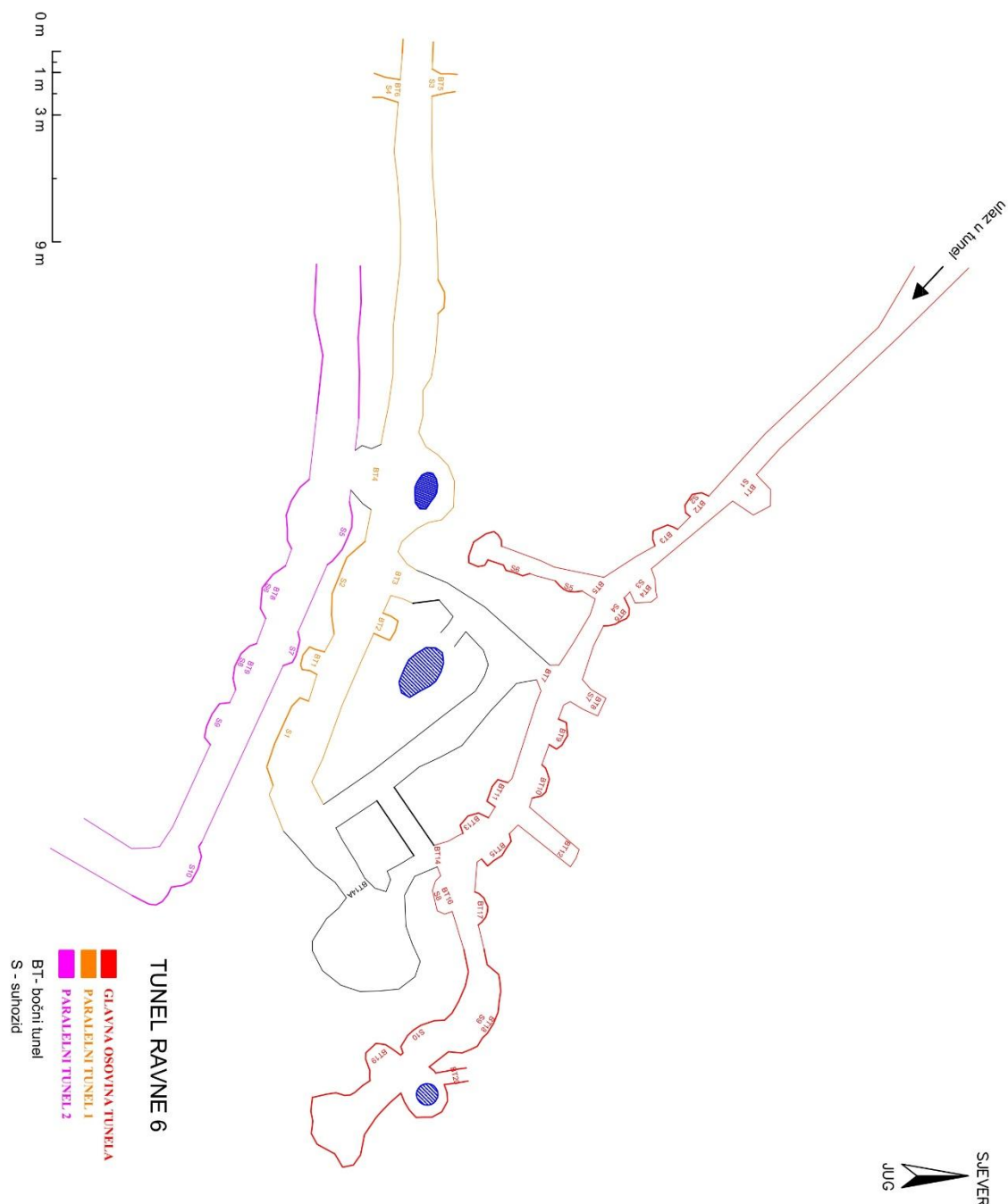


Figure 14: Map of the Ravne 6 Tunnel – 2025



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After the opening of the newly discovered tunnel section, and prior to the continuation of any destructive works, a visual survey and detailed documentation of the existing condition were carried out, including photographic documentation, basic measurements, and field descriptions, in order to record the original state of the space.

The orientation of the newly discovered tunnel section is northwest–southeast, extending parallel to the main tunnel axis. Within this section, two parallel tunnel routes of the same orientation were recorded. Approximately halfway along one of the tunnels, an entrance leading into the other parallel tunnel was identified, indicating a complex spatial organization of the underground system. The fill within the newly discovered section is not uniform—some parts of the tunnel are partially filled with sediment, while other areas are completely free of fill.

During the visual prospection and documentation of the existing condition, a total of nine side tunnels and ten dry-stone walls were recorded, distributed along both parallel tunnels. As in previously documented parts of the tunnel, a semicircularly worked rock surface was also observed in this section, with water present in its lower part. Among the surface movable finds, organic materials—bone and wood fragments—were recorded in the parallel tunnel adjacent to a dry-stone wall. All finds were documented in situ, properly recorded and sampled, and sent for radiocarbon (C14) analysis, while their detailed processing and interpretation will be presented in a separate chapter dedicated to finds.

Due to difficult access to side tunnel BT14a, caused by a low passage and the presence of a rock outcrop, it was decided to proceed with the cleaning of side tunnel BT7 from the main tunnel axis. This intervention established a connection between BT7 and side tunnel BT3 of the newly discovered section (NS-BT3), thereby creating another link between the main tunnel axis and the newly discovered tunnel section.

From this point onward, the removal of fill within the newly discovered section continued, applying the same methodological approach as in previous phases of research—manual removal of fill by stratigraphic units with continuous documentation. Within this phase of investigation, a total of 32 m of tunnel were cleared. No archaeological finds were recorded in this segment of the research.



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These activities concluded the archaeological investigations conducted during this research season. The discovery and preliminary investigation of the newly discovered section significantly expanded the understanding of the spatial extent and complexity of the Ravne 6 tunnel system, thereby establishing a foundation for planning future systematic and protective research.



Figure 15: Existing condition of the newly discovered section of the Ravne 6 tunnel



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## FINDINGS

During the systematic archaeological investigations of the Ravne 6 tunnel, a small number of movable archaeological finds were recorded. These were documented at various stages of the research process, both during the preliminary inspection and prospection of unexplored tunnel sections and during the controlled removal of fill and archaeological excavations. In addition to movable finds, immovable archaeological features—dry-stone walls—were also registered, documented in detail, and analyzed.

In total, five movable finds were recorded. Based on their material, all can be classified as organic: four wooden finds and one find consisting of animal bone. The finds were recorded in different contexts, including surface finds, finds within the fill in a secondary position, and finds in a primary (in situ) position.

Some of the finds were discovered during visual prospection and documentation of the existing condition, while others were identified during the stratigraphic removal of the fill. Particular attention was paid to their spatial context and their relationship to surrounding structures, especially dry-stone walls and side passages.

The following section presents the individual finds recorded during the research, systematized according to the order of discovery and spatial context, with descriptions of their stratigraphic attribution, position, and basic characteristics.

### **Find No. 1 (R62025-001) – organic material (wooden arrow)**

The find was recorded in the main axis of the Ravne 6 tunnel, at the 32nd meter of the main axis, in the northern part of the tunnel, near side passage BT12. It was discovered during the manual phase of fill removal, within stratigraphic unit SU 001 (tunnel fill).<sup>9</sup>

The find was located in a secondary position, within the fill, at a depth of 0.30 m below the upper surface of the fill, or 1.00 m from the tunnel ceiling. Although found in a secondary

<sup>9</sup> SU 001 represents a homogeneous tunnel fill, composed of loose soil with admixtures of clay and small stones, without clearly defined internal stratigraphic subdivisions.





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context, the position of the object is unusual and interpretatively interesting, as its shape resembles a wooden arrow, with the tip oriented downward and embedded into the deposit.

No other archaeological finds or stratigraphic changes were recorded in the immediate vicinity; the fill was homogeneous and corresponded to the standard tunnel infill material. Despite its secondary context, the manner in which the find came to rest in this position remains an open question, which adds to its interpretative value.

The find was discovered in a state of degradation. The outer layers of the wood were partially carbonized, while the internal structure was relatively well preserved, which may be related to the stable microclimatic conditions and increased humidity within the tunnel.

The total length of the find is 20 cm, while the width varies between 2.5 and 3.5 cm. The object was thoroughly documented (photographic documentation and field records), after which it was properly stored. A sample was taken and submitted for radiocarbon ( $C^{14}$ ) analysis, the results of which provided a date of **1485–1515 AD**.



Figure 16: Wooden arrow find, Ravne 6 tunnel





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### **Find No. 2 (R62025-002) – organic material (wood)**

Find No. 2 was recorded in the main axis of the tunnel, at the 38th meter, in the immediate vicinity of side tunnel BT17. It was discovered during the recording of the tunnel's existing condition, prior to the start of destructive archaeological investigations, in a section of the tunnel that had not been previously explored.

The find was located on the surface of the tunnel fill and is therefore considered to be in a secondary position. It consists of organic material—wood—without a clearly defined or recognizable shape. No other archaeological elements or changes in the fill structure were observed in the immediate vicinity that would indicate a specific context.

The dimensions of the find are 53 cm in length and 9 cm in width. It was recorded at a depth of approximately 1.0 m from the tunnel ceiling. During documentation, no traces of processing or functional use were observed.

Due to its position on the surface of the fill and the absence of associated context, its chronological and functional interpretation remains limited at this stage of research.

The find was documented with photography and field records and properly stored. A sample was submitted for radiocarbon ( $C^{14}$ ) analysis, which yielded a date of **1469–1495 AD**.



Figure 17: Find  
R62025-002



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### **Find No. 3 (R62025-003) – organic material (wood)**

This find was also recorded in the main axis of the tunnel, at the 45th meter, in the unexplored section of the tunnel. It was discovered during prospection before the start of archaeological excavations. The find was located **in situ**, buried within stratigraphic unit SU 001 (tunnel fill). Its tip protruded 12 cm above the surface of the fill, while the remainder was buried in the deposit down to the clay layer.

The find was located at the very end of dry-stone wall S10, near side tunnel BT19. Its total height is 45 cm, and its width varies between 5 and 15 cm. It was located at a depth of 70 cm from the tunnel ceiling. Its shape resembles a totemic structure.

Among all recorded finds, this object was in the **best state of preservation**, likely due to the specific microclimatic conditions inside the tunnel, particularly the elevated humidity. It was documented with photography and standard archaeological recording methods, properly stored, and a sample was sent for C14 analysis. The dating results indicate **1495–1521 AD**.



Figure 18: Find R62025-003



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#### **Find No. 4 (R62025-004) – organic material (wood)**

This find was discovered in the newly uncovered section of the tunnel, in parallel tunnel 2 (R6-PT2), at the 16th meter. It was found next to dry-stone wall S9, embedded in the wall structure, i.e., in the tunnel wall. The find was in a secondary position.

The find was poorly preserved, in a degraded state, similar to other wooden finds discovered during the research. Its dimensions are 19 cm in length and 4 cm in width. The find was documented with photography and archaeological records, properly stored, and sent for C14 analysis. Results for this find have not yet been received.



Figure 19: Find R62025-004



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### **Find No. 5 (R62025-005) – organic material (bone)**

This find consists of bones and bone fragments of a small animal, discovered in the newly uncovered section of the tunnel, in parallel tunnel 2 (R6–PT2). The finds were recorded at the 18th meter of parallel tunnel 2, on the surface of the fill, and are therefore in a secondary position.

A total of 12 bones and bone fragments were found. They were documented with photographs and field notes and properly stored.



Figure 20: Bone find, Ravne 6





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During the systematic archaeological investigations in Ravne 6, numerous immovable finds in the form of dry-stone walls were recorded, representing a significant element of the spatial organization of the tunnel system. A total of 19 dry-stone walls were registered: 10 in the main tunnel axis, 4 in parallel tunnel 1, and 5 in parallel tunnel 2.

In most cases, the dry-stone walls served to close or partially block access to side tunnels, while some were recorded as partitions within the main and parallel tunnel routes. The dimensions of the dry-stone walls vary, with some reaching lengths of up to 5 m, while their height and number of construction layers are not uniform.

Differences in construction techniques, preservation levels, and locations of the dry-stone walls were observed, which may indicate different phases of closure or partitioning of tunnel passages. All dry-stone walls were documented through photographs, situational drawings, and field notes and were recorded as important immovable elements for further interpretation of the function and chronology of the tunnel system.

During the systematic archaeological investigations of Ravne 6, a limited number of movable archaeological finds were recorded, exclusively organic materials (wood and animal bones). Finds were registered in various contexts—surface, secondary positions within the fill, and in situ—indicating complex processes of tunnel formation and filling.

Particular significance is attributed to the in situ wooden finds, whose position, preservation, and relation to dry-stone walls and side passages may provide important indicators of the functional organization of the space. The microclimatic conditions within the tunnel, particularly high humidity, greatly contributed to the preservation of organic materials.

Immovable finds in the form of numerous dry-stone walls represent the dominant archaeological element of the explored space and indicate planned interventions within the tunnel system. Their distribution, dimensions, and functional connection to side passages confirm the existence of multiple phases of closure and regulation of movement within the tunnels.



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Results of radiocarbon (C14) analysis indicate that all analyzed samples date to the **late medieval period**, with calibrated dates roughly ranging from the second half of the 15th century to the early 16th century.

Although no ceramic, metal, or stone finds were recorded, the collected archaeological data provide a basis for further interpretation and chronological assessment of the site, particularly through radiocarbon (C14) results, which allowed a more precise understanding of the timing and nature of Ravne 6 tunnel use.

During the research, controlled measurements of microclimatic and environmental parameters were also conducted, including temperature, relative humidity, negative ion concentration, radioactivity levels, and electromagnetic fields. Measurements were taken using an **Air Ion Counter, model AIC2M (AlphaLab Inc.)**, at multiple locations inside the tunnel and in front of the Ravne 6 tunnel entrance. Results are presented in **Table 2**. The obtained data indicate stable conditions within the tunnel, which have a direct impact on the preservation of materials and archaeological finds, as well as the state of underground structures, creating favorable conditions for temporary human presence within the tunnel.

THE ARCHAEOLOGICAL PARK: BOSNIAN PYRAMID OF THE SUN FOUNDATION							
Time:	Temperature (°C)	Humidity (%)	Negative ions	Positive ions	O <sub>2</sub> (%) - draeger uredjaj	Nuclear radiation (μS/h)	Electromagnetic radiation (mW/cm <sup>2</sup> )
Outside (in front of the tunnel)	7,5	73	500	400	20,9	0,11	0,00
Entrance	7,7	74	12000	29000	20,2	0,10	0,00
Below the concrete ceiling	7,7	77	77000	95000	19,9	0,10	0,00
Tunnel face	7,7	78	79000	97000	19,9	0,10	0,00

Table 2: Results of various measurements conducted inside the Ravne 6 tunnel



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## CONCLUSION

The systematic archaeological investigations conducted in the Ravne 6 tunnel provided a detailed understanding of the spatial organization, stratigraphy, and nature of finds within this part of the Ravne tunnel complex. The research encompassed documentation of the existing condition, the application of non-destructive methods, as well as controlled manual removal of fill by stratigraphic units, with continuous documentation at all stages of the work.

During the investigations, a branched network of tunnels was recorded, including the main axis, side passages, and newly discovered parallel sections extending parallel to the main tunnel axis. Particularly significant is the discovery of over 60 meters of previously unknown tunnel section, which substantially expanded the understanding of the extent and complexity of the Ravne 6 tunnel system.

The archaeological finds are of organic origin, including wooden elements and animal bones. They were recorded in various contexts—as surface finds, secondary deposits within the fill, and in situ finds preserved in their original positions.

Radiocarbon (C14) analysis of the wooden samples indicates a temporal range within the late medieval period, approximately between the late 15th and early 16th centuries (ca. 1469–1521 AD), providing for the first time a reliable chronological framework for part of the activities within the Ravne 6 tunnel.

Immovable archaeological features, primarily dry-stone walls, represent one of the most significant elements recorded during the investigations. A total of 19 dry-stone walls were documented, distributed along the main axis and parallel tunnels, most commonly serving to block side passages. Their varying dimensions, heights, and construction techniques indicate multiple phases and purposeful shaping of the underground space.

Based on the results obtained, it can be concluded that the Ravne 6 tunnel represents a complex and intentionally organized underground structure, with clear evidence of human activity during the late medieval period. The investigations confirmed the high archaeological potential of the site and highlighted the need for continued systematic research, further analysis of finds, and additional measures for the protection and preservation of this unique subterranean complex.



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**Accelerator Mass Spectrometry Laboratory**  
Saulėtekio ave. 3, LT-10257 Vilnius, Lithuania  
Mobile: +370 665 01554, E-mail: vilinas.ezerinskas@ftmc.lt

**Vilnius  
Radiocarbon**

Performed by

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## DATING CERTIFICATE

**No. 2025-10-09-FTMC-DT95**

28<sup>th</sup> October 2025

1. Applicant for analysis: Ms Ajla Šabanija Softić, Foundation "Archaeological park: Bosnian Pyramid of the Sun", Ravne bb, Visoko
2. Material of sample: Wood
3. Date of sample receiving: 2025-10-15
4. Analysis date: 2025-10-28
5. Equipment used for analysis: Single stage accelerator mass spectrometer (SSAMS, NEC, USA), Low-Energy Accelerator (LEA, Ionplus AG, Zürich), Automated Graphitization Equipment AGE-3 (Ionplus AG, Zürich).
6. Method of analysis: Samples were pretreated with an acid-base-acid-bleaching protocol. IAEA C3, IAEA C9, and NIST-OXII were used as reference materials.
7. Results of analysis:

Sample designation	Lab. code	Radiocarbon age, BP	pMC
R6 - 1	FTMC-DT95-1	415±29	94.97±0.34
R6 - 2	FTMC-DT95-2	433±28	94.76±0.33
R6 - 3	FTMC-DT95-3	402±29	95.13±0.34

*The results are given in years before 1950 (radiocarbon age BP). The uncertainty in the age determination is given +/- one standard deviation. All radiocarbon ages are corrected for isotopic fractionation using the measured 13/12C-ratio. The radiocarbon ages must be translated to calibrated radiocarbon years.*

8. Calibrated radiocarbon dates:





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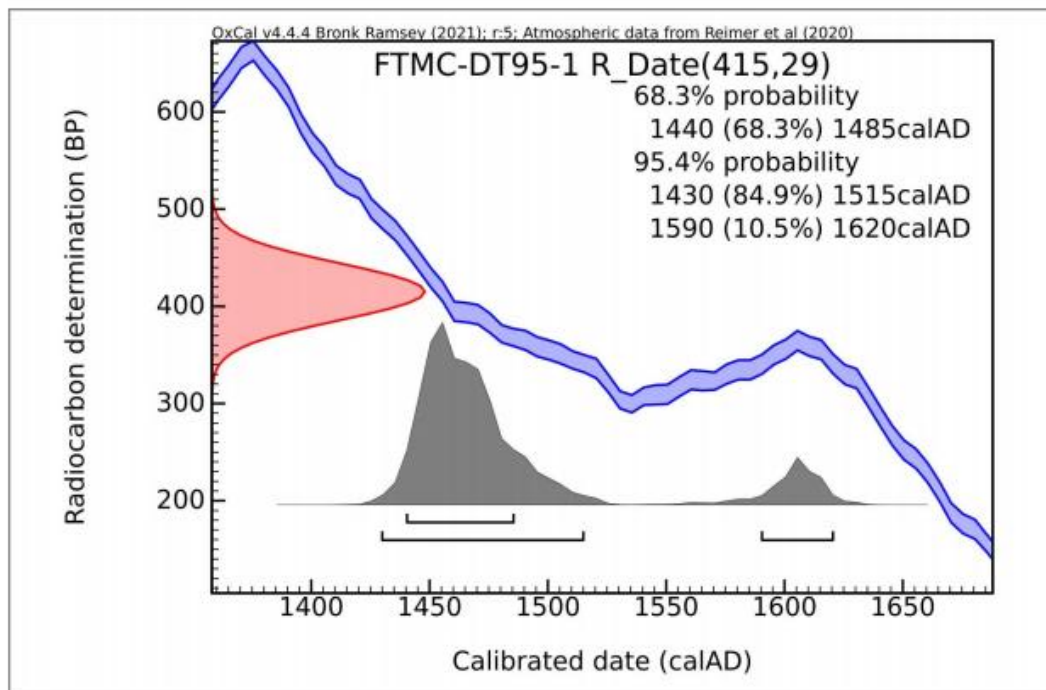


Fig. 1. Radiocarbon date  $415 \pm 29$ BP (red), part of the calibration curve (blue) probability density function (grey) calculated in OxCal.

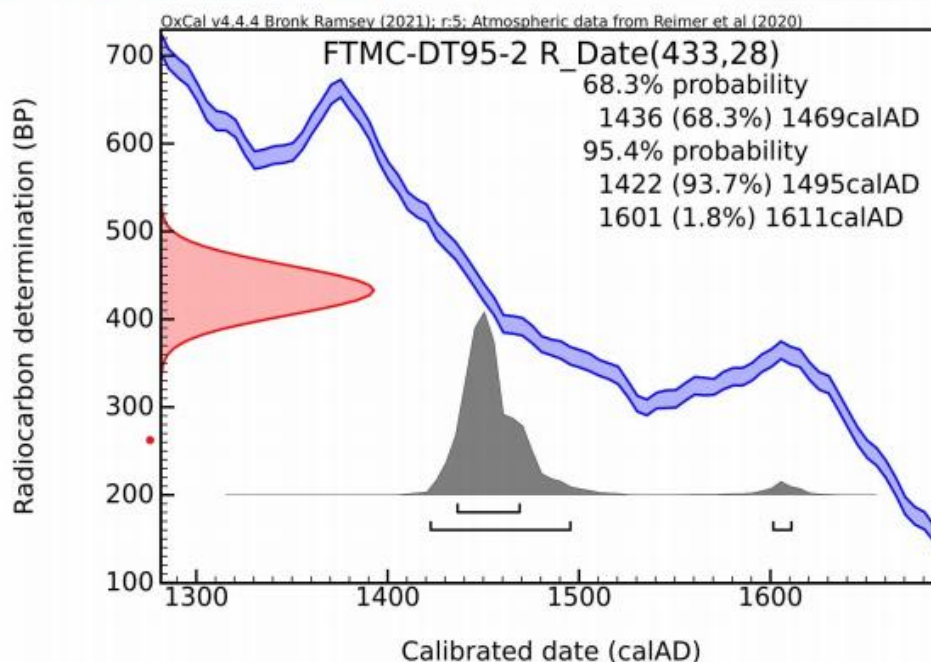


Fig. 2. Radiocarbon date  $433 \pm 28$ BP (red), part of the calibration curve (blue) and the calibrated probability density function (grey) calculated in OxCal.



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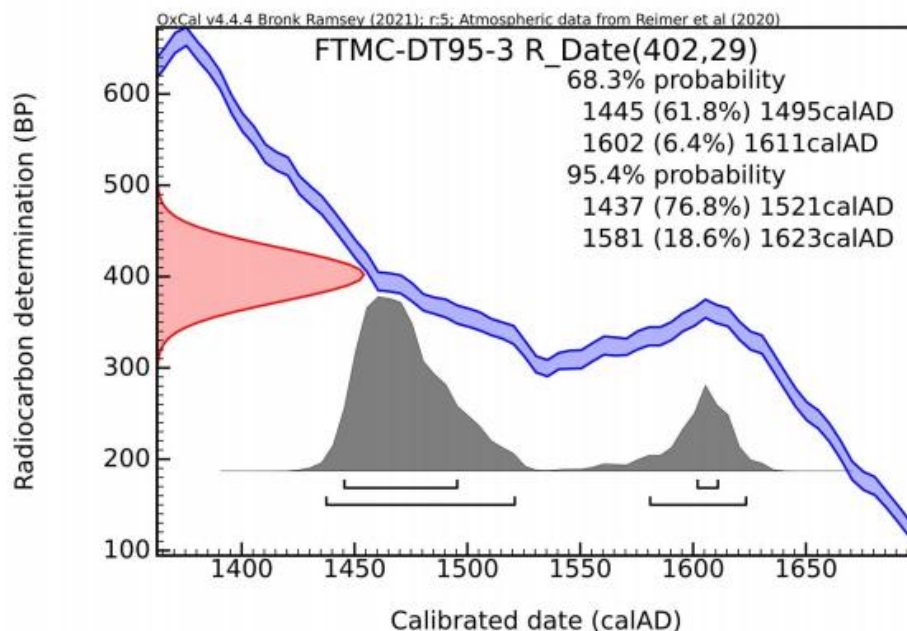


Fig. 3. Radiocarbon date  $402 \pm 29$ BP (red), part of the calibration curve (blue) and the calibrated probability density function (grey) calculated in OxCal.

9. The results of the certificate are valid only for the tested sample. Without written permission from the laboratory, it is prohibited to reproduce or distribute individual parts of the certificate by any means.

Responsible person: dr. Žilvinas Ežerinskis

## Appendix 1: Laboratory Report on the Dating of Finds



Fondacija "Arheološki park: Bosanska piramida Sunca" je neprofitna, nevladina i nepolitička organizacija registrovana za zaštitu kulturnog nasljeđa, arheološka iskopavanja, organizaciju kongresa i promociju arheološkog turizma na teritoriji Bosne i Hercegovine. Dva projekta Fondacije su istraživanje i zaštita kompleksa piramida u visočkoj dolini i katalogiziranje fenomena prahistorijskih kamenih kugli širom BiH.

## BIBLIOGRAPHY

### Abbreviations

BT – side tunnel

K.O. – cadastral municipality

R6-GO – main tunnel axis

R6-PT1 – parallel tunnel 1

R6-PT2 – parallel tunnel 2

S – dry-stone wall

SU – stratigraphic unit

### References

Agić, 2021 – Agić A., *Report on Archaeological Work in the Ravne 3 Tunnels*, Foundation "Archaeological Park: Bosnian Pyramid of the Sun", Visoko, 2021.

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### Illustrations

Figure 1: Geographical location and distribution of the Ravne tunnel complex (photographed by: Ajla Šabanija Softić)

Figure 2: Test excavation of Section A, Ravne 3 tunnels, 2019 (photographed by: Amna Agić)

Figure 3: Pottery fragment with swastika symbol (photographed by: Ajla Šabanija Softić)

Figure 4: Roman tegula found in fragments in Ravne 3 tunnels, 2019 (photographed by: Amna Agić)



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Figure 5: Fragments of ceramic vessels, 2019 (photographed by: Amna Agić)

Figure 6: Map of Ravne 4 tunnels made after total station survey (from Amna Agić, *Report on Archaeological Work in Ravne 3, Ravne 4, and Ravne 5 Tunnels*, 2023)

Figure 7: Layers in a section of Ravne 5 tunnel (photographed by: Richard Hoyle)

Figure 8: North chamber of Ravne 5 tunnel after surface cleaning (photographed by: Ajla Šabanija Softić)

Figure 9: Previously investigated section of Ravne 6 tunnel (prepared by: Tarik Sokolović)

Figure 10: Ravne 6 tunnel – 28th meter, before and after start of investigations (photographed by: Ajla Šabanija Softić)

Figure 11: Plan of dry-stone wall No. 2 (BT2 S2) (prepared by: Haris Mutevelić)

Figure 12: Plan of dry-stone wall No. 9 (BT18 S9) (prepared by: Haris Mutevelić)

Figure 13: Dry-stone wall, 5 m in length – S9 (photographed by: Ajla Šabanija Softić)

Figure 14: Map of Ravne 6 tunnel – 2025 (prepared by: Tarik Sokolović, Ajla Šabanija Softić)

Figure 15: Existing condition of the newly discovered section of Ravne 6 tunnel (photographed by: Ajla Šabanija Softić)

Figure 16: Wooden arrow find, Ravne 6 tunnel (photographed by: Ajla Šabanija Softić)

Figure 17: Find R62025-002 (photographed by: Ajla Šabanija Softić)

Figure 18: Find R62025-003 (photographed by: Ajla Šabanija Softić)

Figure 19: Find R62025-004 (photographed by: Ajla Šabanija Softić)

Figure 20: Bone find, Ravne 6 (photographed by: Ajla Šabanija Softić)

Field Archaeologist

Ajla Šabanija Softić, MA

M.P

Director of the AP:BPS Foundation

dr.sc. Sam Osmanagich

Visoko, December 2025.