



Samarkand Archaeological Institute
named after Y. Guliamov



SOCIETY FOR THE EXPLORATION OF EURASIA, Switzerland
Samarkand Archaeological Institute named after Ya. Gulyamov
LLP RUTRUM

REPORT ON SCIENTIFIC RESEARCH WORKS AT THE SULEYMAN-TEPA NECROPOLIS IN 2025



Depiction of a cross on the 'Red Rock'

Almaty 2025

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Introduction

Sponsor: Society for the Exploration of EurAsia (Switzerland).

Implementers: LLP 'RUTRUM' (Almaty) in cooperation with the Samarkand Archaeological Institute named after Ya. Gulyamov.

In 2025, the fourth field season was conducted at the archaeological site of Suleyman-Tepa.

The aim of the work was to identify the spatial extent of the early medieval Christian necropolis.

The following tasks were carried out during the research:

Archaeological investigations were undertaken at two areas (excavations): ST-3, with an area of 146 m², and ST-4, an extension to the west of ST-3, with an area of 114 m²;

Eight new burials were identified in area ST-4; eight burials were excavated, of which five were located in area ST-3 and three in area ST-4.

At present, seven burials (No. 39–46) remain unexcavated in areas ST-3 and 4;

Field documentation was conducted: descriptions, photographic recording, geodetic surveying of plans, elevations, sections, and photogrammetry;

Collection of materials for scientific analyses—DNA, ¹⁴C dating;

Preliminary examination of anthropological material—determination of Sex, Age, pathologies, etc.;

Three-dimensional laser scanning of the excavation and caves with rock inscriptions was carried out using both a handheld and a stationary scanner;

All anthropological material was transferred to the Samarkand Archaeological Institute named after Ya. Gulyamov, in the anthropological laboratory.

All excavated burials exhibit the same construction: the entrance chamber is situated to the west, the burial chamber to the east, and the passage is sealed with blocks of clay or a mortar composed of fine gravel and clay.

In addition to the primary research activities, efforts were directed toward collecting archival data, as well as photographic and video materials. These resources were subsequently utilized to develop content aimed at the popularization of the monument. Kazakhstani videographer Andrey Kuryashkin participated in this phase of the project. The work resulted in the production of a video documentary titled *'Monastery Above the Clouds'* (focused on medieval Christianity in Central Asia and available on YouTube), as well as an article titled *'Christianity and Central Asia'*, published on Academia.edu."

1. Link to the video clip

https://youtu.be/4gut-jjv7Hk?si=_lIEgSwTK5IXLtnv

2. Link to the publication “Christianity and Central Asia. A. N. Kuryashkin.”

https://www.academia.edu/164490602/%D0%A5%D1%80%D0%B8%D1%81%D1%82%D0%B8%D0%B0%D0%BD%D1%81%D1%82%D0%B2%D0%BE_%D0%B8_%D0%A1%D1%80%D0%B5%D0%B4%D0%BD%D1%8F%D1%8F_%D0%90%D0%B7%D0%B8%D1%8F_%D0%90_%D0%9D_%D0%9A%D1%83%D1%80%D1%8F%D1%88%D0%BA%D0%B8%D0%BD?source=swp_share

Methodology

Based on the objectives and tasks, an expedition was organized, comprising several specialized groups and experts responsible for conducting the scheduled types of work:

- Archaeological group. The task of this group included conducting a range of scientific research activities focused on the clearance and identification of burial constructions, aiming for detailed documentation of cultural strata and archaeological materials, as well as the identification and recording of anthropological material;

- Documentation group. This group conducted documentation of the entire process of the planned scientific research activities, with analysis of the results obtained through the use of advanced geodetic equipment. The outcome of this group's work was the construction of 3D models of excavation areas, the creation of orthophotoplans and stratigraphic profiles, detailed excavation plans, the conducting of microtopography, and the preparation of plans showing the locations of discovered materials.

Documentation at the excavation was conducted using a Leica total station, with subsequent data processing in the AutoCAD and ArcGIS environments. In addition, this year, both a handheld laser scanner and a stationary laser scanner were employed to document burials, rock inscriptions, and caves.

- Laboratory processing group. The responsibilities of this group included the processing of recovered anthropological materials. All materials were meticulously processed, encoded, and described, with an individual label assigned to each unit of material. All obtained data are presented in the appendices to this report.

The comprehensive approach applied during scientific archaeological research enabled the acquisition of substantial information on the historical and cultural processes of the region, and elucidated the causal relationships in cultural interactions and the economic activities of the local population.

The primary priority in conducting these types of work was the recording and documentation of the materials discovered during the archaeological investigations.

The materials uncovered as a result of the aforementioned works were assigned a special identification number using a theodolite-total station; coordinates in the UTM system were obtained, which were used to plot the discovered materials on the plan of this excavation. All materials discovered as a result of the research were carefully processed and cleaned under laboratory conditions.

Following the identification and clearing of the structural elements, work proceeds with the description of the revealed components and the preparation of design and drawing documentation.

This type of work is undertaken by specialist documentarians who possess proficiency in the latest methods and contemporary technologies in the fields of geodesy and planigraphy. During this type of work, drawings are produced of the identified elements, as well as the overall type of the excavation.

The methodological basis of the conducted scientific research comprises the following components:

- large-scale area excavation;
- stratigraphic and elevation-based documentation of ongoing work;
- preparation of detailed plans of identified structures using electronic total stations;
- photogrammetric methods for documenting stratigraphic and planigraphic contexts;
- the integration of archaeological objects into a geographic information system for precise spatial positioning relative to each other and to the landscape background.

The documentation system employed is that developed by specialists at the University of Aachen under the guidance of Professor Michael Jansen and Dr. Thomas Urban. The system is based on the completion of specially designed forms, by means of which a certain Level of data collection is achieved. While the presence of a field diary does not constitute the basis for attaining the desired Level, the researcher is provided with a series of forms, the so-called “main form,” which offers a general description of the site or a particular excavation, along with an outline of plans, goals, objectives, and methods for their achievement;

- the “action sheet” is a type of field diary in which the researcher enters information on the activities carried out each day, as well as on the objects found, their dimensions, etc.; “element sheet”

- each discovered structure, excavated layer, specific noted feature, etc. is designated as an “element” with a subsequently assigned ordinal number; “find tag” – a form created specifically for certain artefacts that are clearly distinct from the main body of excavated material; “photograph index” – a type of database, cataloguing photographs taken during the course of the excavations, indicating the location, direction, brief description, and so forth.

Each form contains designated fields for recording levels, as well as the geographic coordinates of the object. The designation of all features of the excavation is reflected in the definition of elements, which have sequential numbering. Each form is logically connected by element numbers and code designations.

Upon completion of all activities and detailed examination of the identified elements of this excavation, the next stage in the archaeological process is the conservation and reclamation of the excavation.

Results of the Work

Excavation at the Necropolis

In 2025, work was conducted in area ST-3, 4; the objective was to investigate burials identified but not excavated in 2024, as well as to examine new burials discovered in 2025. Eight burials were excavated: Nos. 31, 32, 35, 37, 38, 41, 42, and 44.

Description of Burials

Burial No. 31

The burial consists of:

1. Entrance chamber (element No. 23)
2. Burial chamber (element No. 32)
3. Passage laying (element No. 29)
4. Skeleton (element No. 52)

Location:

Coordinates – 42S 348600 4360154 UTM

The burial is located in the eastern part of Excavation 3, between burials Nos. 34 and 36, which were excavated in 2024. The burial chamber of Burial No. 34 overlaps (is located higher on the slope than) the burial chamber of Burial No. 31; Burial No. 36 (of a later date) also cuts into the northern part of the burial chamber of Burial No. 31.

Description:

Burial No. 31

Element 23. Entrance chamber (grave 31)

The entrance chamber of rectangular form is situated to the northwest of the burial chamber (32). During the excavation, prior to soil removal, the entrance corridor was identified as a rectangular grey patch at the 1149.400 level.

The chamber is oriented in a northwest–southeast direction. In the southeastern part, there is an arched entrance to the burial chamber (31), constructed of sun-dried bricks (29).

Entrance chamber, 1.27 m in length and 80 cm in width, with even walls and an even floor. The depth of the entrance chamber in the western part is 60–70 cm; in the eastern part, at the opening into the chamber, the depth is 75 cm. The bottom of the entrance chamber consists of compacted loam, Level W 1147.379, C 1147.293, E 1147.226.

Element 29. Installation of adobe bricks for the entrance passage into burial chamber 32.

While clearing the burial corridor—the entrance chamber on the western side, at Level 1147.327—an entrance passage into burial chamber (31) was identified, blocked by a construction of adobe bricks and fragments. The deposit consisted of four rows of masonry, comprising seven unfired bricks of rectangular form, measuring 34×20×8 cm, which have survived intact. The remaining eight bricks, measuring 14–16×14×8 cm, have survived in fragments. The bricks of the deposit lay on the level unfired floor of the entrance threshold, at an elevation of 1147.268, and were bonded with a clay mortar. The length of the masonry and the entrance opening is 49 cm. The height of the brick masonry and the entrance opening is 40 cm. The space between the bricks and the entrance opening was sealed with a thick layer of clay plaster.

Burial chamber (32) and skeleton (52)

<i>Category</i>	<i>Parameter</i>	<i>Characteristics and dimensions (cm)</i>
I. Burial structure	Type and form	Earthen pit, anthropomorphic (narrowed towards the feet)
	Pit length	≈ 215
	Width (shoulders / feet)	80 / 45
	Orientation	Longitudinal axis NW–SE
	Fill	Light brown sandy loam, organic material at the feet
	Lower mark	1146,74
II. Position of the Skeleton	Type of Burial	Decedent's position on the back (supination)
	Skull	Turned to the right (facing southeast), jaw slightly open

	Arms	Crossed on the chest (right over left)
	Legs	Extended parallel, knee joints closed
III. General Body Measurements	Skeleton length (L)	168–171 (from parietal bone to heels)
	Torso length	85–88 (parietal bone to pelvis)
	Shoulder width	38 – 42
	Pelvic width (max.)	30 – 32
IV. Osteometry (long bones)	Femur	46 – 48
	Tibia	36 – 38
	Humerus	32 – 34
	Forearm (rad/uln)	24 – 26
	Foot / Hand	25 / 19

Burial No. 32

The burial consists of:

1. Entrance chamber (element No. 25)
2. Burial chamber (element No. 34)
3. Passage laying (element No. 33)
4. Skeleton (element No. 48)

Location:

Coordinates – 42S 348601 4360147 UTM

The burial is located in the southeastern part of excavation 3, north of Burial No. 33, which was excavated in 2024.

Description:

Element 25. Entrance chamber (grave 32)

The entrance chamber of grave 32 is situated in the eastern part of excavation 3. The described entrance corridor was identified during the excavation of a layer of loose, cloddy, light grey loam with whitish carbonate veins and concretions (3). The spot was identified at the level: NW: 1148.787; C: 1148.809; SE: 1148.808.

The entrance chamber, appearing as a light, rectangular spot, is located 80 cm west of the eastern stratigraphic wall. The length of the spot is 1.60 m. The width of the entrance chamber is 90 cm. On the eastern side, a brick passage laying and burial chamber are visible. The lower mark is 1148.59.

Element 33. Passage laying (Grave 32)

The passage to the burial chamber is constructed with sun-dried blocks in a single row, with blocks measuring 22 x 22 cm and approximately 10 cm in height. The blocks completely seal the passage. The upper mark is 1148.71.

Burial chamber (34) and skeleton (48)

<i>Category</i>	<i>Parameter</i>	<i>Characteristics and dimensions (cm)</i>
I. Burial structure	Type and form	Earthen pit, anthropomorphic (narrowed towards the feet)
	Pit length	≈ 220
	Width (shoulders / feet)	≈ 75 / 40
	Orientation	Longitudinal axis West–East
	Fill	Light, homogeneous sandy loam; At the feet—traces of dark decay.
	Lower mark	1148.33
II. Position of the Skeleton	Type of Burial	Decedent's position on the back (supination)

	Skull	Turned to the right (face to the south), lower jaw closed.
	Arms	Strongly flexed at the elbows, crossed over the lower part of the chest.
	Legs	Extended parallel, knee joints brought together.
III. General Body Measurements	Skeleton length (L)	$\approx 172-175$ (from parietals to feet).
	Torso length	≈ 90 (parietal bone to pelvic articulation).
	Shoulder width	$\approx 40 - 43$
	Pelvic width (max.)	$\approx 32 - 34$
IV. Osteometry (long bones)	Femur	$\approx 48 - 50$
	Tibia	$\approx 38 - 40$
	Humerus	$\approx 33 - 35$
	Forearm (rad/uln)	$\approx 25 - 27$
	Foot / Hand	$\approx 26 / 19$

Burial No. 35.

The burial consists of:

1. Entrance chamber (element No. 37).
2. Burial chamber (element No. 39).
3. Passage laying (element No. 38).
4. Skeleton (Element No. 47)

Location:

Coordinates – 42S 348597 4360149 UTM

The burial is situated in the southeastern part of Excavation 3, near the southwestern edge.

Description:

Element 37. Entrance chamber (Grave 35)

The entrance chamber of Burial 35 is located to the east of the southern stratigraphic wall of Excavation 3. The described entrance chamber was identified through excavation and clearing of a layer of loose, cloddy light gray loam with whitish carbonate veins and concretions (3).

The entrance chamber, appearing as a light rectangular spot, is situated 1.48 m east of the southern stratigraphic wall. The chamber measures 1.2 meters in length and 0.8 meters in width, with a rectangular shape. The lower elevation is 1149.09.

Element 38. Laying of mud bricks in the crawlway to the burial chamber of grave (35).

The laying of mud bricks in the entrance opening to the burial chamber of grave (35) is situated 1.59 m east of the southern stratigraphic wall of Excavation 3. A brick structure was revealed following the clearance of the surface at elevation 1149.602. The course of adobe bricks is situated on the eastern side of the entrance chamber and blocks the entrance opening to the burial chamber (39).

Burial chamber (39) and Skeleton (47)

<i>Category</i>	<i>Parameter</i>	<i>Characteristics and dimensions (cm)</i>
I. Burial structure	Type and form	Earthen pit, sub-rectangular, widened at the upper part.
	Pit length	≈ 210
	Width (shoulders / feet)	≈ 95 / 55 (broad area in the region of the elbows)
	Orientation	Longitudinal axis NW–SE
	Fill	Homogeneous sandy loam with a grayish-brown hue.
	Lower mark	1148.82

II. Position of the Skeleton	Type of Burial	Decedent's position on the back (supination)
	Skull	Turned to the right (face directed southward), the lower jaw is markedly lowered.
	Arms	Right: bent at an angle, hand on the pelvis. Left: extended along the body.
	Legs	Extended parallel, feet slightly apart.
III. General Body Measurements	Skeleton length (L)	≈ 165–168 (from parietals to heels).
	Torso length	≈ 82 (parietal bone to pubic symphysis).
	Shoulder width	≈ 38 – 40
	Pelvic width (max.)	≈ 28 – 30
IV. Osteometry (long bones)	Femur	≈ 45 – 47
	Tibia	≈ 35 – 37
	Humerus	≈ 31 – 32
	Forearm (rad/uln)	≈ 23 – 25
	Foot / Hand	≈ 24 / 18

Burial No. 37.

The burial consists of:

1. Entrance chamber (element No. 46).
2. Burial chamber (element No. 50).

3. Passage laying (element No. 49).

4. Skeleton (element No. 51).

Location:

Coordinates – 42S 348596 4360159 UTM.

The burial is situated in the northern part of excavation 3, near the north-eastern edge.

Description:

Element 46. Entrance chamber (grave 37).

The entrance chamber is rectangular with rounded corners, oriented with its corners toward the cardinal directions, measuring 1.45 x 0.9 meters. The lower elevation is 1147.2.

Element 49. Passage laying.

The passage to the burial chamber is blocked by mudbrick blocks in two rows; the dimensions of the blocks are 25 x 25 x 10 cm. The upper elevation is 1147.44.

Burial chamber (50) and skeleton (51).

<i>Category</i>	<i>Parameter</i>	<i>Characteristics and dimensions (cm)</i>
I. Burial structure	Type and form	Earthen pit, widened in the region of the elbows.
	Pit length	≈ 215
	Width (shoulders / feet)	≈ 85 / 45
	Orientation	West–East
	Lower mark	1146,67
II. Position of the Skeleton	Type of Burial	Extended on the back
	Skull	Turned to the left (face to the north)

	Arms	Hands folded on the abdomen: wrists brought together at the center in the pelvic region
	Legs	Legs extended, ankle joints joined
III. Dimensions of the skeleton	Skeleton length (L)	≈ 170 – 173
	Femur	≈ 47 – 49
	Tibia	≈ 37 – 39

Burial No. 38

The burial consists of:

1. Entrance chamber (element No. 52)
2. Burial chamber (element No. 06)
3. Skeleton (element No. 04)

Location:

Coordinates – 42S 348590 4360153 UTM

The burial is located in the western part of Excavation 3, at the southwestern edge.

Description:

Element 52. Entrance chamber (grave 38)

The entrance chamber is located in the western part of excavation 3. It is rectangular in shape, oriented with its corners aligned to the cardinal directions, and measures 1 x 0.86 meters. The lower elevation is 1150.62. It is preserved at floor level.

Element 6. Burial chamber.

During the clearing of the third layer of loose, cloddy light gray loam with whitish carbonate veins and concretions, at the level of W: 1150.307, C: 1150.329, E: 1150.146, along the southern stratigraphic wall of excavation 3, a light gray loamy spot of oval shape was discovered on the wall and partially on the floor. The stain was identified as a possible burial chamber (26). The dimensions of the burial chamber are 1.89 × 0.75 meters; the lower reference point is 1150.01.

Burial chamber (06) and skeleton (04).

<i>Category</i>	<i>Parameter</i>	<i>Characteristics and dimensions (cm)</i>
I. Burial structure	Type and form	Earthen pit with distinct boundaries at the head end, 'narrow'.
	Pit length	≈ 205
	Width (shoulders / feet)	≈ 70 / 40
	Orientation	Longitudinal axis West–East
	Fill	Light continental sand/sandy loam.
	Lower mark	1150,01
II. Position of the Skeleton	Type of Burial	Decedent's position: supine.
	Skull	Turned onto the left side (face oriented north).
	Arms	Arms bent at the elbows at an acute angle, with the hands brought together at the clavicles.
	Legs	Extended parallel
III. Dimensions of the skeleton	Skeleton length (L)	≈ 162 – 165
	Shoulder width	≈ 36 – 38
	Femur	≈ 44 – 46
	Tibia	≈ 34 – 36

Burial No. 41

The burial consists of:

1. Entrance chamber (element No. 53)
2. Passage laying (element No. 54)
2. Burial chamber (element No. 55)
3. Skeleton (element No. 71)

Location:

Coordinates: 42S 348583 4360161 UTM

The burial is located in the central part of excavation 4, near the southwestern edge.

Description:

Element 53. Entrance chamber (grave 41)

The entrance chamber is located in the western part of the grave, has a rounded shape, is oriented west–east, and measures 1.4×0.9 meters. The lower elevation is 1149.33.

Element 54. Passage laying.

The passage from the entrance chamber to the grave was constructed with unfired blocks of various shapes and sizes. Upper level 1149.5.

Element 55 – Burial chamber, 71 – skeleton.

<i>Category</i>	<i>Parameter</i>	<i>Characteristics and dimensions (cm)</i>
I. Burial structure	Type and form	Earthen pit, widened in the area of the shoulder girdle, narrowing toward the feet.
	Pit length	≈ 210.
	Width (shoulders / feet)	≈ 85 / 40.
	Orientation	Longitudinal axis west–east.
	Fill	Light yellow, dense sandy loam.
	Lower mark	1148,95

II. Position of the Skeleton	Type of Burial	Extended on the back (supination).
	Skull	Turned to the right (facing south), with the lower jaw slightly displaced.
	Arms	Right: bent at an acute angle, hand at the shoulder. Left: bent at a right angle, forearm on the abdomen.
	Legs	Extended parallel, knee joints closely adjoined.
III. Dimensions of the skeleton	Skeleton length (L)	≈ 170 – 173
	Femur	≈ 47 – 49.
	Tibia	≈ 37 – 39.
	Pelvic width	≈ 32.

Burial No. 42

The burial consists of:

1. Entrance chamber (element No. 56)
2. Passage laying (element No. 56)
2. Burial chamber (element No. 56)
3. Skeleton (element No. 72)

Location:

Coordinates: 42S 348588 4360159 UTM

The burial is located in the southeastern part of excavation 4, at the southwestern edge.

Description:

Element 56. Entrance chamber (grave 42)

The entrance chamber is situated in the western part of the grave, has a rounded shape, is oriented west–east, and measures 2.2 × 1.4 meters. The lower elevation is 1149.26.

Element 54. Passage laying.

The passage from the entrance chamber to the grave is blocked with two rows of adobe blocks, each measuring 25 × 25 × 10 cm. Upper level: 1149.33.

Element 58 – burial chamber, 72 – skeleton.

<i>Category</i>	<i>Parameter</i>	<i>Characteristics and dimensions (cm)</i>
I. Burial structure	Type and form	Earthen pit with a pronounced anthropomorphic shape and a distinct narrowing towards the foot end.
	Pit length	≈ 200 – 210.
	Width (shoulders / feet)	≈ 75 / 35.
	Orientation	Longitudinal axis West–East (head to the west).
	Fill	Homogeneous light sandy loam. The boundaries of the pit in the natural soil are clearly delineated.
	Lower mark	1149,29
II. Position of the Skeleton	Type of Burial	Decedent's position on the back in an extended posture.
	Skull	Located in the western part of the pit, turned onto the left side (face oriented north).
	Arms	Arms bent at the elbows at an acute angle, forearms crossed over the lower part of the rib cage.
	Legs	Legs extended parallel, knee joints together, feet brought together.
III. Dimensions of the skeleton	Skeleton length (L)	≈ 165 – 168
	Femur	≈ 44 – 46.

Tibia	≈ 34 – 36.
Shoulder width	≈ 36 – 38.

Burial No. 44

The burial consists of:

1. Entrance chamber (element No. 62)
2. Passage laying (element No. 63)
2. Burial chamber (element No. 64)
3. Skeleton (element No. 73)

Location:

Coordinates: 42S 348588 4360161 UTM

The burial is located in the eastern part of Excavation 4. Oriented along the west–east axis.

Description:

Element 62. Entrance chamber (Grave 44)

The entrance chamber is located in the western part of the grave, has a rectangular shape with rounded corners, is oriented west–east, and measures 1.46 × 0.76 meters. Lower level: 1149.06.

Element 63. Passage laying.

The passage from the entrance chamber to the grave was constructed with adobe blocks arranged in a single row, with block dimensions of 25 × 25 × 10 cm. Upper level: 1149.12.

Element 64 – Burial chamber, 73 – Skeleton.

<i>Category</i>	<i>Parameter</i>	<i>Characteristics and dimensions (cm)</i>
I. Burial structure	Type and form	Earthen pit of subrectangular form with rounded corners.
	Pit length	≈ 210 – 220.
	Width (shoulders / feet)	≈ 75 / 45.

	Orientation	Longitudinal axis: NW–SE.
	Fill	Homogeneous sandy loam, in color closely resembling the subsoil layer.
	Lower level.	1148,85
II. Position of the Skeleton	Type of Burial	Decedent's position on the back in an extended posture.
	Skull	Located in the northwestern part of the pit, with the facial section facing upwards.
	Arms	Bent at the elbows at an acute angle, the hands are crossed over the sternum.
	Legs	Extended parallel, with the knee joints together.
III. Dimensions of the skeleton	Skeleton length (L)	≈ 165 – 168
	Femur	≈ 45 – 47.
	Tibia	≈ 35 – 37.
	Shoulder width	≈ 38 – 40.

List of elements identified in 2025.

Element 47 – Skeleton (grave 35).

Element 48 – Skeleton (grave 32).

Element 49 – Passage laying (grave 37).

Element 50 – Burial chamber (grave 37).

Element 51 – Skeleton (grave 37).

Element 52 – Skeleton (grave 31).

Element 53 – Entrance chamber (grave 41).

Element 54 – Passage laying (grave 41)

Element 55 – Burial chamber (grave 41)
Element 56 – Entrance chamber (grave 42)
Element 57 – Passage laying (grave 42)
Element 58 – Burial chamber (grave 42)
Element 59 – Entrance chamber (grave 43)
Element 60 – Passage laying (grave 43)
Element 61 – Burial chamber (grave 43)
Element 62 – Entrance chamber (grave 44)
Element 63 – Passage laying (grave 44)
Element 64 – Burial chamber (grave 44)
Element 65 – Entrance chamber (grave 45)
Element 66 – Passage laying (grave 45)
Element 67 – Burial chamber (grave 45)
Element 68 – Entrance chamber (grave 46)
Element 69 – Passage laying (grave 46)
Element 70 – Burial chamber (grave 46)
Element 71 – Skeleton (grave 41)
Element 72 – Skeleton (grave 42)
Element 73 – Skeleton (grave 44)
Element 74 – Entrance chamber (grave 47)
Element 75 – Passage laying (grave 47)
Element 76 – Burial chamber (grave 47)
Element 77 – Entrance chamber (grave 48)
Element 78 – Passage laying (grave 48)
Element 79 – Burial chamber (grave 48)

Description of elements from 2025 not included in the description of excavated burials

Burial No. 43 (not excavated) is located in the central part of excavation 4 and consists of three elements: entrance chamber (59), passage laying (60), and burial chamber (61).

Coordinates 42S 348584 4360164 UTM

Upper level 1149.11

Element 59 – Entrance chamber measuring 1.3×0.78 meters, oriented west–east.

Element 60 – Passage laying measuring 0.7×0.3 meters blocks the passage between the entrance chamber and the burial chamber.

Element 61 – Burial chamber measuring 1.3×0.9 meters, oriented west–east.

Burial No. 45 (not excavated) is located in the eastern part of excavation 4, consisting of three elements: entrance chamber (65), passage laying (66), and burial chamber (67).

Coordinates 42S 348590 4360162 UTM

Upper level 1149.02

Element 65 – Entrance chamber measuring 0.9×0.76 meters, oriented west–east.

Element 66 – Passage laying measuring 0.65×0.27 meters, blocking the passage between the entrance and burial chambers.

Element 67 – Burial chamber measuring 1.48×0.73 meters, oriented west–east.

Burial No. 46 (not excavated) is located in the eastern part of excavation 4 and consists of three elements: entrance chamber (68), passage laying (69), and burial chamber (70).

Coordinates 42S 348592 4360163 UTM

Upper level 1148.43

Element 68 – The entrance chamber partially extends into the step of the excavation terrace; the identified dimensions are 0.9×0.9 meters, and it is elongated along the west-east axis.

Element 69 – Passage laying, measuring 0.73×0.25 meters, obstructs the passage between the entrance chamber and the burial chamber.

Element 70 – Burial chamber, measuring 1.43×0.88 meters, elongated along the west-east axis.

Burial No. 47 (not excavated) is situated in the western part of excavation 4 and consists of three elements: entrance chamber (74), passage laying (75), and burial chamber (76). The burial extends partially into the southern edge of the excavation.

Coordinates: 42S 348578 4360162 UTM

Upper level: 1149.8

Element 74 – The entrance chamber partially extends into the southern edge of the excavation; the identified dimensions are 1.89×0.29 meters, oriented west–east.

Element 75 – Passage laying partially extends into the southern edge of the excavation; the dimensions are 0.22×0.26 meters, overlapping the passage between the entrance and burial chambers.

Element 76 – The burial chamber partially extends into the southern edge of the excavation; the dimensions are 1.65×0.25 meters, oriented west–east.

Burial No. 48 (not excavated) is located in the western part of excavation 4 and consists of three elements: entrance chamber (77), passage laying (78), and burial chamber (79).

Coordinates 42S 348577 4360165 UTM

Upper level 1149.57

Element 77 – Entrance chamber measuring 0.8 x 0.7 meters, oriented west–east.

Element 78 – Passage laying measuring 0.6 x 0.69 meters, blocking the passage between the entrance and burial chambers.

Element 79 – Burial chamber measuring 1.14 x 0.8 meters, oriented along the west-east axis.

Anthropological Report

The present report is devoted to the primary study of the skeletal remains discovered, specifically to the data that may be obtained under field conditions: determination of sex, age, and other observations.

Sex determination on skeletal remains was carried out on the basis of the following methodological sources: Workshop of European Anthropologists – "Recommendations for Age and Sex Diagnoses" (1980), Buikstra J.E., and Ubelaker D.H. – "Standards for Data Collection from Human Skeletal Remains" (1994), Schaefer M., Black S., Scheuer L. – "Juvenile Osteology: A Laboratory and Field Manual" (2009), as well as "Methodology for Working with Paleoanthropological Materials in Field Conditions" (2020).

The following methods were used to determine age at death: McKern T.W. and Stewart T.D. – "Skeletal Age Changes in Young American Males" (1957), AlQahtani S.J., Hector M.P., Liversidge H.M. – "Brief communication: The London Atlas of Human Tooth Development and Eruption" (2010), Buikstra J.E. and Ubelaker D.H. – "Standards for Data Collection from Human Skeletal Remains" (1994), Workshop of European Anthropologists – "Recommendations for Age and Sex Diagnoses" (1980), and "Methodology for Working with Paleoanthropological Materials in Field Conditions" (2020). Age categories for adult individuals were described according to the classification of Buikstra and Ubelaker (1994) as YOUNG ADULT, MIDDLE ADULT, and OLD ADULT.

For the identification and documentation of specific pathological features observed in the field, the following manuals were employed: Buikstra J.E. (ed.) – "Ortner's Identification of Pathological Conditions in Human Skeletal Remains" (2019) and Waldron T. – "Palaeopathology" (2009).

Burial No. 38, element 04

Number of individuals: 1

General description: The upper part of the burial was removed during earthworks. The burial is oriented along the west–east axis. The eastern part of the burial was exposed during the 2024 archaeological excavations, at which time a portion of the skeleton in the area of the lower leg bones was documented. During the 2025 field season, the burial was fully excavated. The grave pit is slightly oval in shape. The skeleton is in an extended supine position, oriented with the head to the west, the skull slightly elevated. The occipital part of the skull is destroyed and fragmented. The right arm of the skeleton is positioned on the chest, the left on the abdominal region. The legs are extended to the east. The overall preservation of the skeleton is good, with only minor

destruction observed in certain epiphyseal areas of the bones. The skeleton is anatomically complete, with the exception of the bones of the toes (Fig. 1).

Sex:Male.

Age:20–35 years.

Individual pathological conditions and anomalies recorded on the skeleton:Pathological conditions that can be determined in the field were not identified in this skeleton.



Fig. 1. Position of the skeleton in the burial.

Burial No. 35, Element 47

Number of individuals: 1

General description:The burial pit is oriented along the northwest–southeast axis. A burial niche (lahad) is situated on the southeastern side of the burial pit. The passage between the lahad and the main burial pit was filled with unfired bricks. The northwestern side of the lahad is angular in shape, whereas the southeastern side is excavated in an oval form. The skeleton lies extended on its back, in accordance with the grave's orientation, with the head to the northwest. No elevated position of the skull is observed. As a result of taphonomic processes, the mandible was separated from the maxilla. The right arm of the skeleton is positioned over the abdominal region, while the left arm rests on the left shoulder. The legs are extended. The overall preservation of the skeletal bones is good; destructive processes are noted only on the ribs, scapulae, and some vertebrae. Most of the bones of the fingers and toes were lost during the postmortem period. The remaining bones may be regarded as anatomically complete (Fig. 2).

Sex:Male.

Age:20–35 years.

Certain pathological conditions and anomalies observed on the skeleton:Signs of osteoarthritis are present on the articular surfaces of the jaw bones. For this reason, the teeth—especially the molars—exhibit a very high degree of wear (Fig. 3).



Fig. 2. Position of the skeleton in the burial.



Fig. 3. Lesion of the articular surfaces of the mandible and pronounced dental wear.

Burial No. 32, element 48

Number of individuals: 1

General description:Orientation of the burial: northwest–southeast. The burial niche (Lahad) is situated on the southeastern side of the grave pit. Between the Lahad and the grave pit, there is a

narrow passage constructed of adobe bricks. The grave pit is rectangular in shape, while the Lahad is excavated in an oval form. The deceased was placed in the grave in an extended supine position, oriented with the head to the west, but with a slight deviation from the burial axis toward the west. The Skull may be slightly elevated. The facial region of the Skull is slightly turned to the right and oriented upwards. The right arm of the Skeleton lies on the chest, while the left rests in the abdominal region. The legs of the Skeleton are extended towards the east. Destruction of certain bones has been observed: in the area of the upper jaw (maxilla), ribs, scapulae, bones participating in the formation of the elbow joint, and the epiphyseal regions of the bones forming the knee joint. The overall preservation of the bones is good. The skeleton is anatomically complete (Fig. 4).

Sex: Male.

Age: 20–35 years.

Individual pathological conditions and anomalies recorded on the skeleton: No pathological conditions that can be identified in the field were observed on this skeleton.



Fig. 4. Position of the skeleton in the burial.
Burial No. 37, element 51

Number of individuals: 1

General description: The grave pit is oval in shape. There is a narrow passage between the burial niche (Lahad) and the grave pit, which, as in other burials, was filled with adobe bricks. The skeleton lies in an extended position on its back, in accordance with the orientation of the burial. The Skull is slightly elevated. The facial region of the Skull is slightly turned to the left and directed upward. The skeleton's arms are crossed over the abdominal region. The legs are

extended, with the bones of the toes deviated to the left. The preservation of the skeleton is very good; it is in a complete anatomical state (Fig. 5).

Sex: Male.

Age: 35–50 years.

Certain pathological conditions and anomalies recorded on the skeleton:No pathological changes identifiable in field conditions were observed on this skeleton.



Fig. 5. Position of the skeleton in the burial.

Burial No. 31, element 52

Number of individuals: 1

General description:The grave pit is rectangular in shape; the Lahad is oval. The Lahad is situated on the southern and southeastern side of the grave pit. The space between the Lahad and the grave pit is filled with unbaked bricks. The deceased was placed in the grave in an extended supine position, oriented with the head toward the northwest. The Skull is slightly elevated, with the facial region turned to the left. The Skull is partially destroyed. The jaw region of the Skull is destroyed; the preservation of the jaw bones is poor. The right arm of the skeleton is positioned on the abdomen, while the left arm lies on the left shoulder. The legs of the skeleton are extended. The ribs, scapulae, and vertebrae are somewhat destroyed. The overall preservation of the skeleton is good (Fig. 6).

Sex: Male.

Age:35–50 years.

Individual pathological conditions and anomalies recorded on the skeleton:Pathological changes that could be identified in field conditions were not observed on this skeleton.



Fig. 6. Position of the skeleton in the burial.

Burial No. 41, element 71

Number of individuals: 1

General description:The burial is oriented along the west–east axis. The burial niche (Lahad) is located in the eastern part of the grave pit. The grave pit is rectangular in shape, while the lahad is oval. The deceased was placed in the lahad in an extended supine position, oriented with the head to the west. The skull is slightly elevated, with the facial region directed to the east. The arms of the skeleton are positioned in the abdominal area, with the right arm situated somewhat lower than the left. The legs are extended to the east. The overall preservation of the bones is good; the skeleton is in complete anatomical condition (Fig. 7).

Sex:Male.

Age:20–35 years.

Individual pathological conditions and anomalies recorded on the skeleton:Pathological changes that could be identified in field conditions were not observed on this skeleton.



Fig. 7. Position of the skeleton in the burial.

Burial No. 42, Element 72

Number of individuals: 1

General description: Burial orientation: east-west. The burial niche (lahad) is oval in shape. The grave pit may not have been preserved due to earthworks. The deceased was placed in the grave in an extended supine position, oriented with the head to the west. The Skull is slightly elevated, with the head inclined toward the left shoulder and the face turned to the left. The hands of the skeleton are folded on the abdomen. The legs are extended to the east. Overall preservation is poorer compared to other skeletons discovered during this field season. Destructive changes are observed on the bones of the fingers and toes, the ribs, the scapulae, as well as on the epiphyseal regions of the long bones (Fig. 8).

Sex: Male.

Age: 20–35 years (35–50?).

Individual pathological conditions and anomalies recorded on the skeleton: Craniometric measurements have not been conducted on this skull at present. However, this skull differs from the other skulls found during the 2025 field season by its narrow facial section and elongated cranial vault (dolichocranial?). Although this feature is not considered a pathological condition, further laboratory studies, particularly craniological analysis, may provide valuable information (Fig. 9).



Fig. 8. Position of the skeleton in the burial.



Fig. 9. Lateral view of the Skull (showing features of a dolichocranial type?).
Burial No. 44, Element 73

Number of individuals: 1

General description: The burial is oriented along the west–east axis. The grave pit is rectangular in shape; an oval burial niche (lahad) was excavated on its eastern side. As in other burials, the mouth of the lahad was sealed with unfired bricks. The deceased was placed in an extended supine position, with the head oriented to the west. The Skull is slightly elevated. The hands of the skeleton are folded over the abdomen, and the legs are extended to the east. The eastern side of the

lahad was partially damaged as a result of earthworks, and the bones of the toes became detached from the skeleton. The occipital part of the Skull is destroyed; the Vertebrae, Ribs, Scapulae, and some articular surfaces are poorly preserved. The overall preservation of the Skeleton is average; almost all bones are present, except for the bones of the toes (Fig. 10).

Sex:Male.

Age: 20–35 years (35–50?).

Individual pathological conditions and anomalies recorded on the Skeleton:The Skull exhibits preservation of the metopic suture (sutura metopica). This condition is an anomaly, also observed in adult individuals (Zdilla, et al. 2018) (Fig. 11).



Fig. 10. General view of the Skeleton in the burial.



Fig. 11. Metopic suture on the Skull.

Conclusion

During the 2025 field season at the Suleyman-Tepe necropolis, a total of eight burials were excavated and anthropological materials belonging to eight individuals were studied. Most skeletons are anatomically complete and well preserved.

All identified individuals are of the male sex. The majority of individuals fall within the age interval of 20–35 years (Young Adult – adult). In two cases, the age category of 35–50 years (Middle Adult – mature) was determined or assumed.

Most burials are oriented along the west–east or northwest–southeast axis and follow the tradition of interment in a niche (lahad). The interred are typically found in an extended supine position, with their feet oriented to the east and their hands placed on the abdomen or chest.

Overall, the degree of preservation of the skeletons is good or moderate. In some cases, damage to the Skull, ribs, scapulae, and epiphyseal regions of the bones was recorded, resulting from taphonomic processes.

In most skeletons, no pathological conditions identifiable in the field were detected. In only one individual were clear indications of osteoarthritis in the temporomandibular joints and marked tooth wear identified. In addition, in one Skeleton, the persistence of the metopic suture was recorded, while in another case, a tendency toward a dolichocranial form of the Skull was noted; These characteristics are significant for subsequent laboratory and craniological research.

The obtained anthropological materials possess considerable scientific potential for more in-depth craniological, paleodemographic, and paleopathological research under laboratory conditions.

The orientation of the burials, the location of the entrance chamber, and the relative positioning of the burials cannot be clearly structured. In most cases, this is still related to the location of the burial relative to the terrain. As mentioned in the 2024 report, the burials are arranged so that the orientation of the body is approximately west-east, the location of the entrance chamber is not fundamental, and was most often arranged lower down the slope, while the burial chamber was dug into the slope itself. If we analyze all the burials excavated to date, it becomes clear that they were arranged parallel to the slope and, accordingly, their orientation also varied slightly. Despite this, there are a few burials with a sharply different orientation, which is most likely due not to a new burial system, but to individual cases that do not affect the general order.

Table 1. Data on the Sex and Age of the Skeletons

#	Element number	Sex	Age
1.	4	M	20-35
2.	47	M	20-35
3.	48	M	20-35
4.	51	M	35-50
5.	52	M	35-50
6.	71	M	20-35
7.	72	M	20-35 (35-50?)
8.	73	M	20-35 (35-50?)

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Table 1 – List of samples transferred to the Samarkand Archaeological Institute named after Ya. Gulyamov for subsequent laboratory processing

№	Code	Type of materials	Preliminary dating	Type of analyses
1	ST_25_3_4	Anthropological material from burial No. 38	9th–11th centuries	Anthropological analysis
2	ST_25_3_47	Anthropological material from burial No. 35	9th–11th centuries	Anthropological analysis
3	ST_25_3_48	Anthropological material from burial No. 32	9th–11th centuries	Anthropological analysis
4	ST_24_3_51	Anthropological material from burial No. 37	9th–11th centuries	Anthropological analysis
5	ST_24_3_52	Anthropological material from Burial No. 31	9th–11th centuries	Anthropological analysis
6	ST_25_4_71	Anthropological material from Burial No. 41	9th–11th centuries	Anthropological analysis
7	ST_25_4_72	Anthropological material from Burial No. 42	9th–11th centuries	Anthropological analysis
8	ST_25_4_73	Anthropological material from Burial No. 44	9th–11th centuries	Anthropological analysis

Appendix – Drawing Documentation

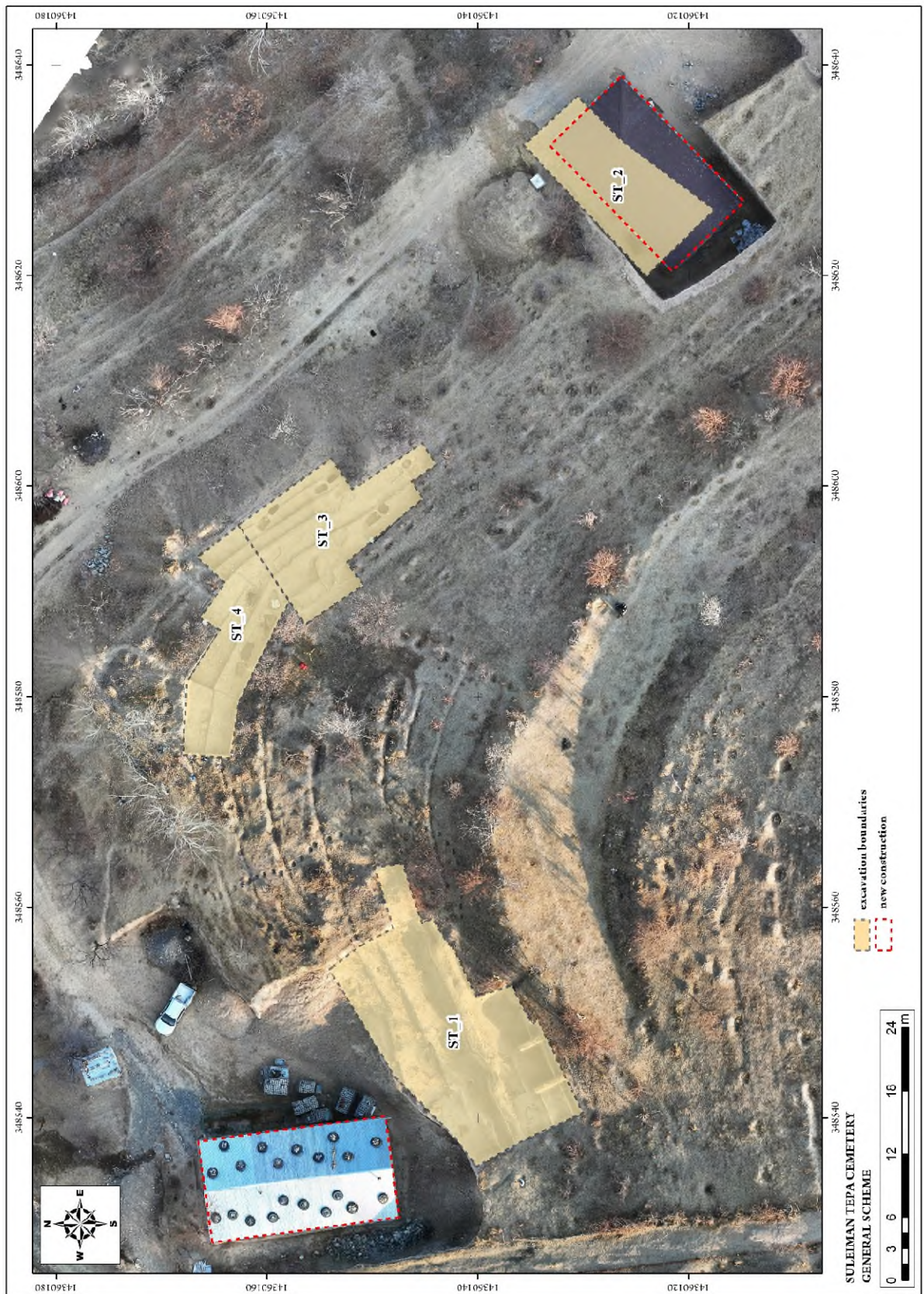


Figure 1 – General scheme of excavation locations. Orthophotoplan

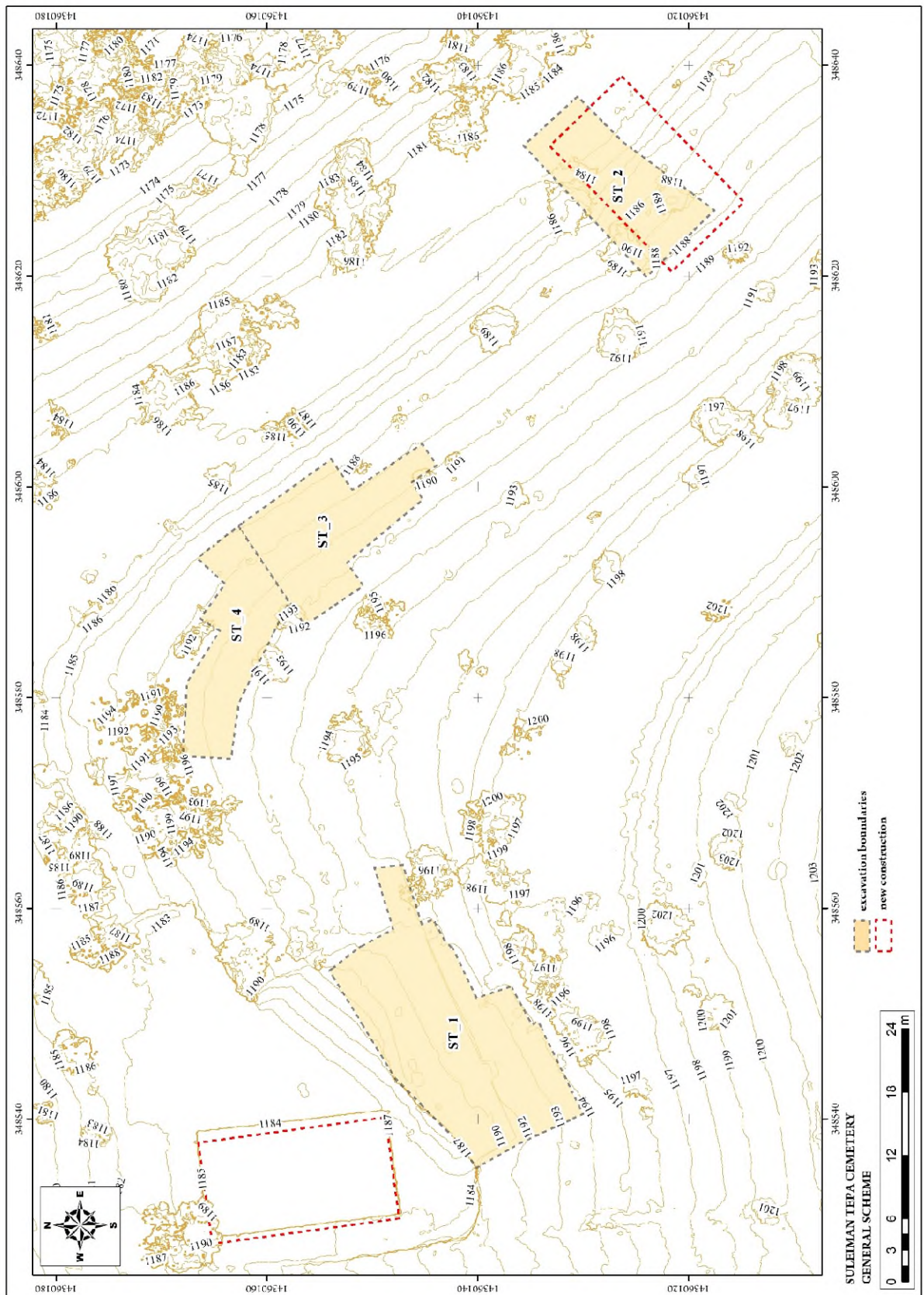


Figure 2 – General scheme of excavation locations. Topography

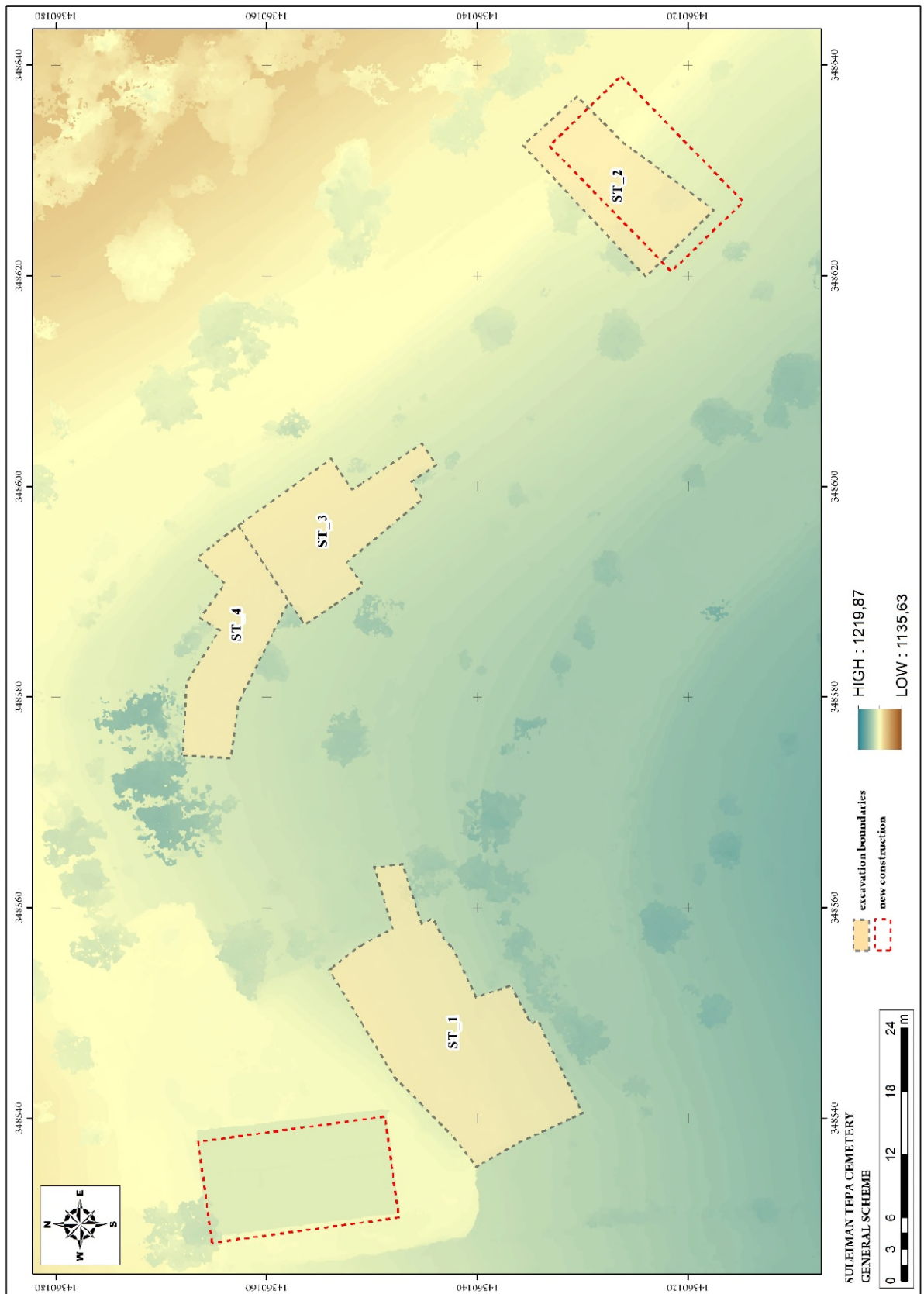


Figure 3 – General scheme of excavation locations. Digital elevation model

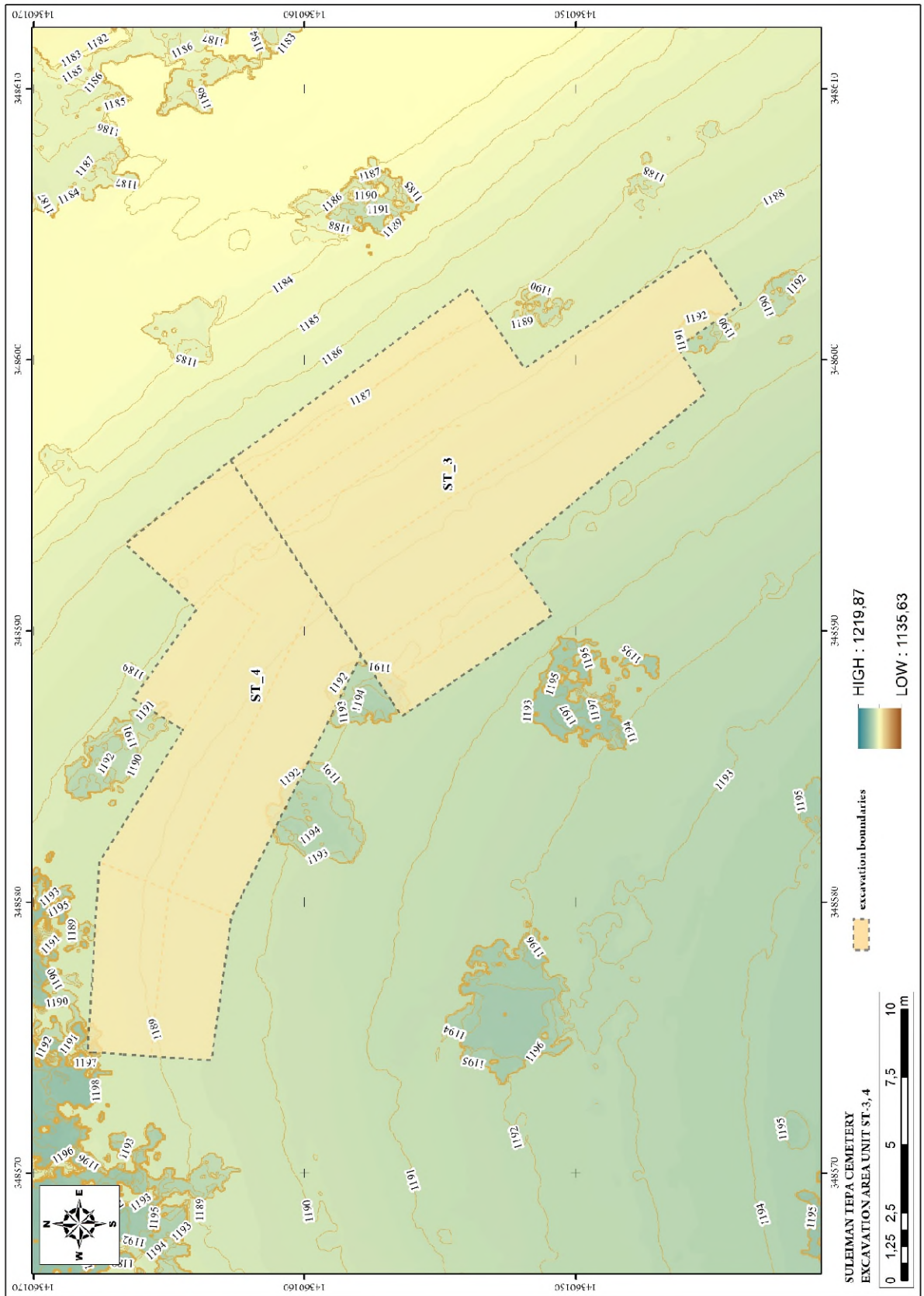


Figure 4 – Plan of Excavations No. 3 and 4. Digital elevation model

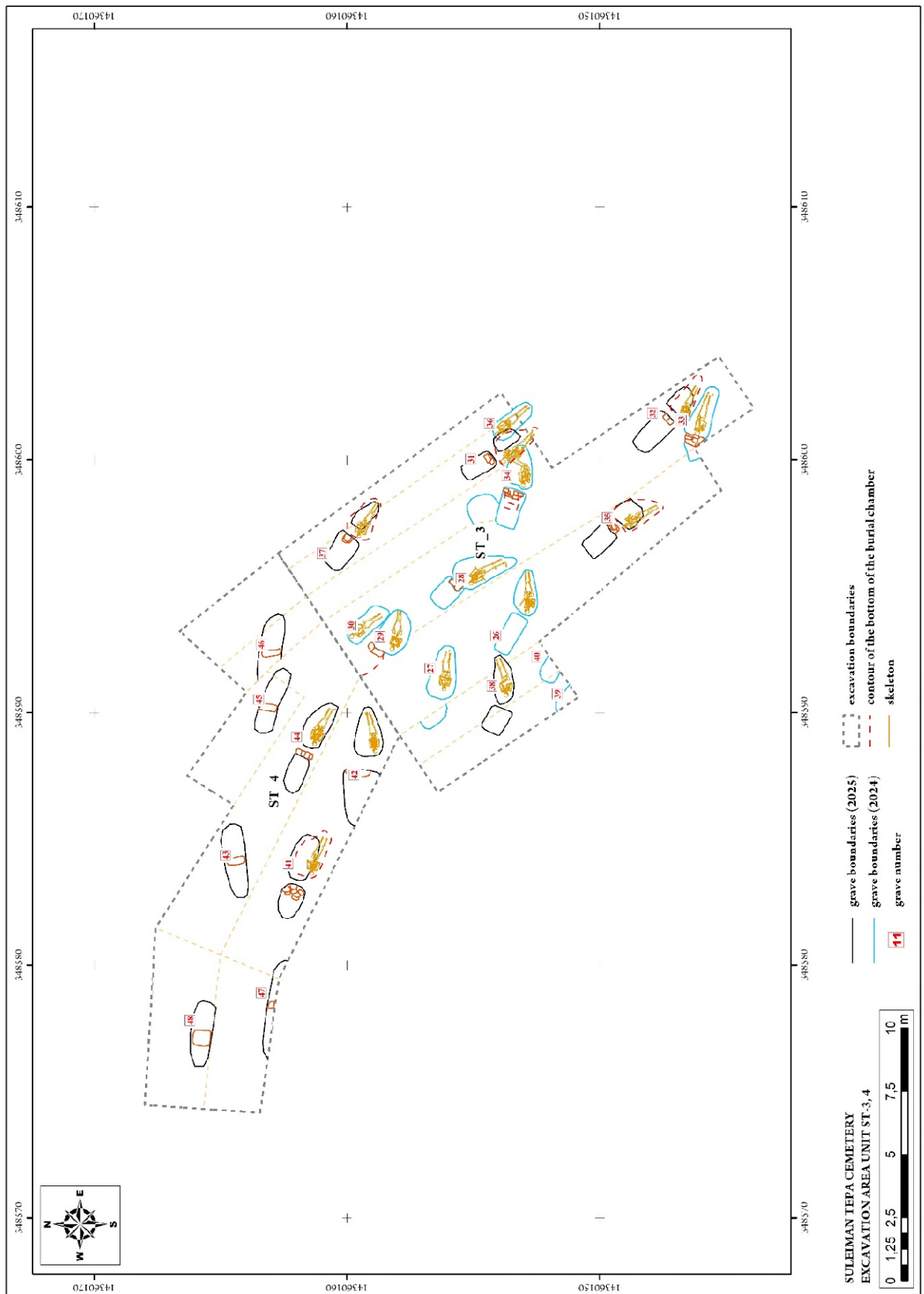


Figure 5 – Plan of Excavations No. 3 and 4



Figure 6 – Plan of Excavations No. 3 and 4. Orthophotoplan

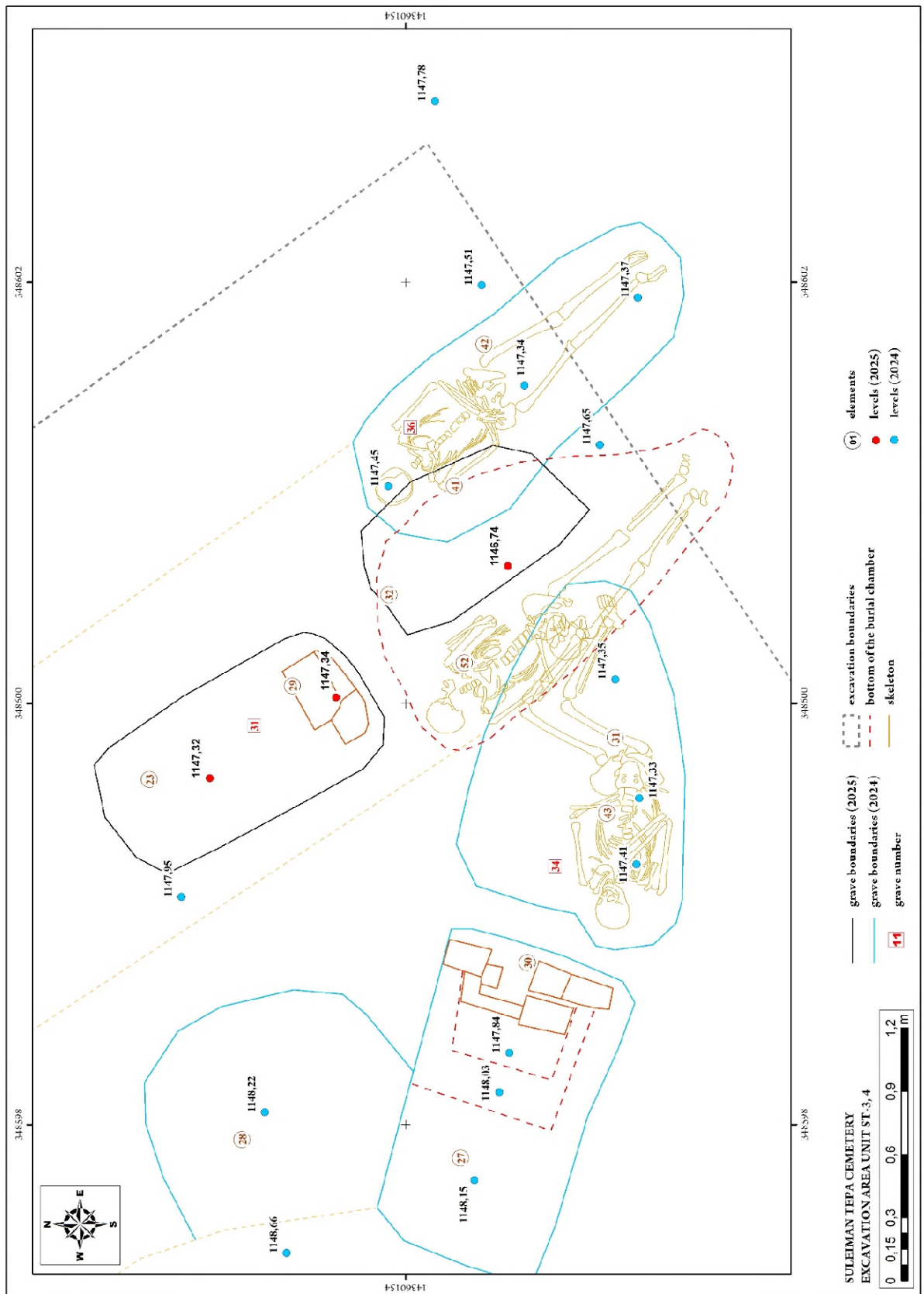


Figure 7 – Plan of Burial No. 31

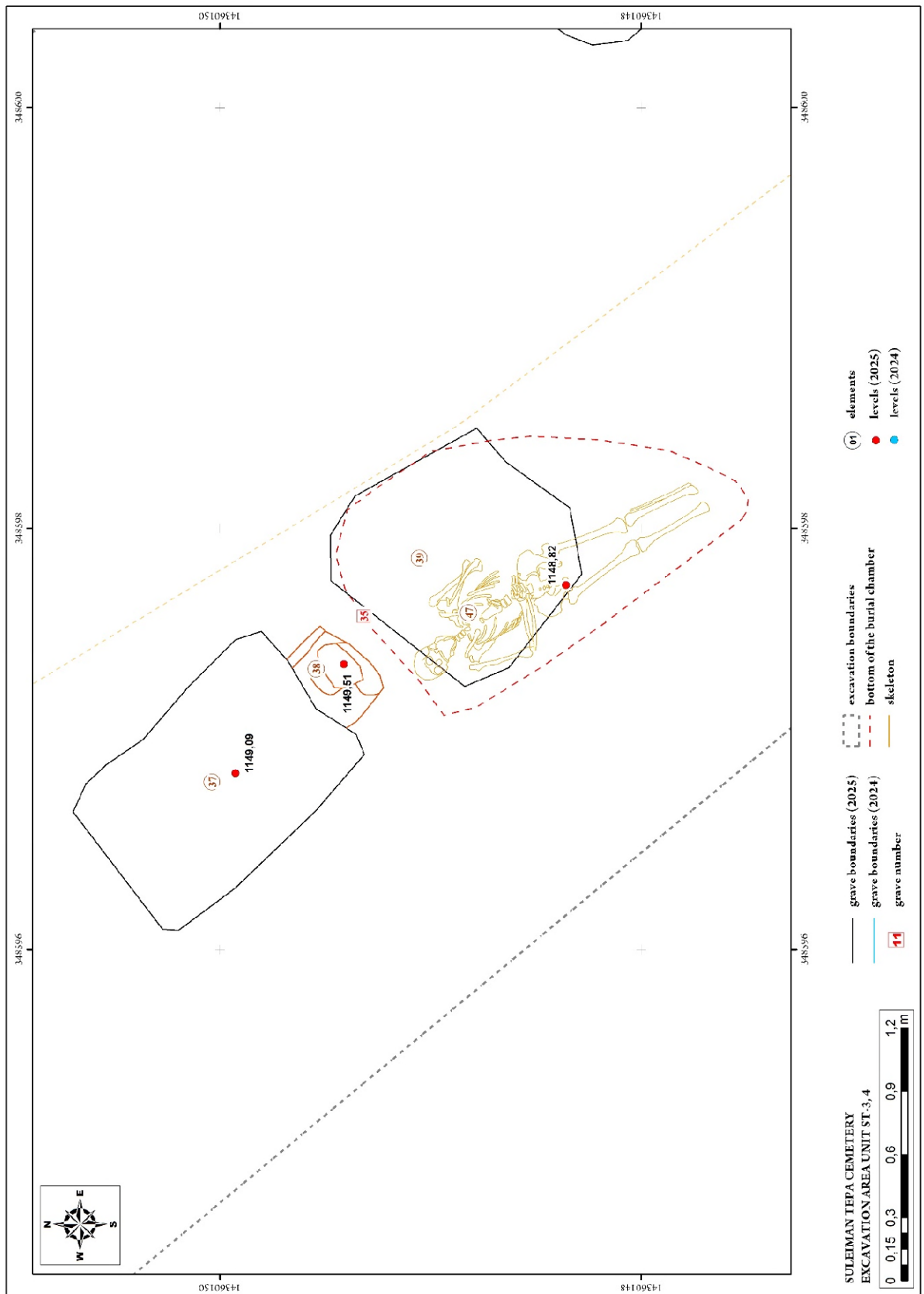


Figure 9 – Plan of Burial No. 35

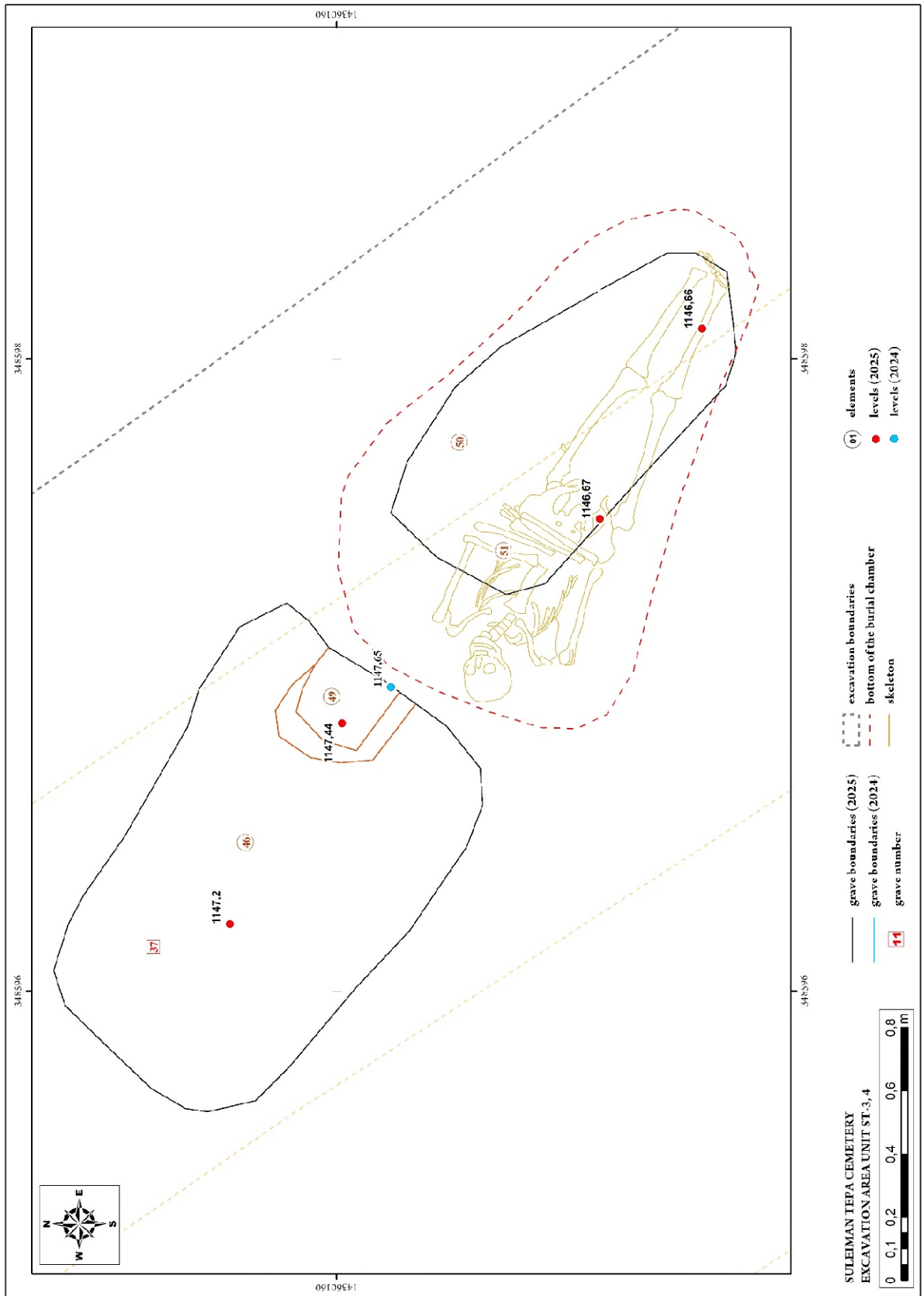


Figure 10 – Plan of Burial No. 37

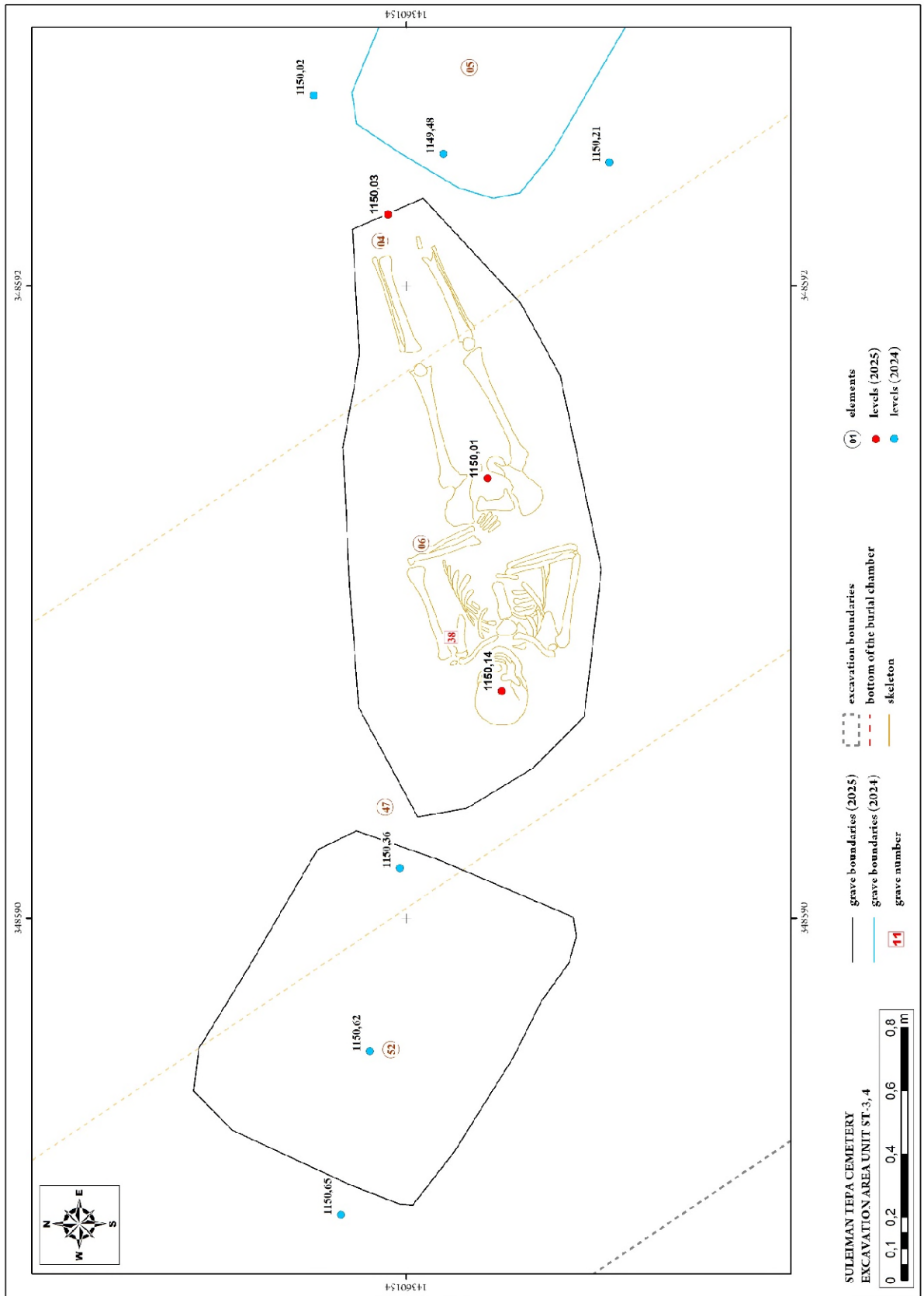


Figure 11 – Plan of Burial No. 38

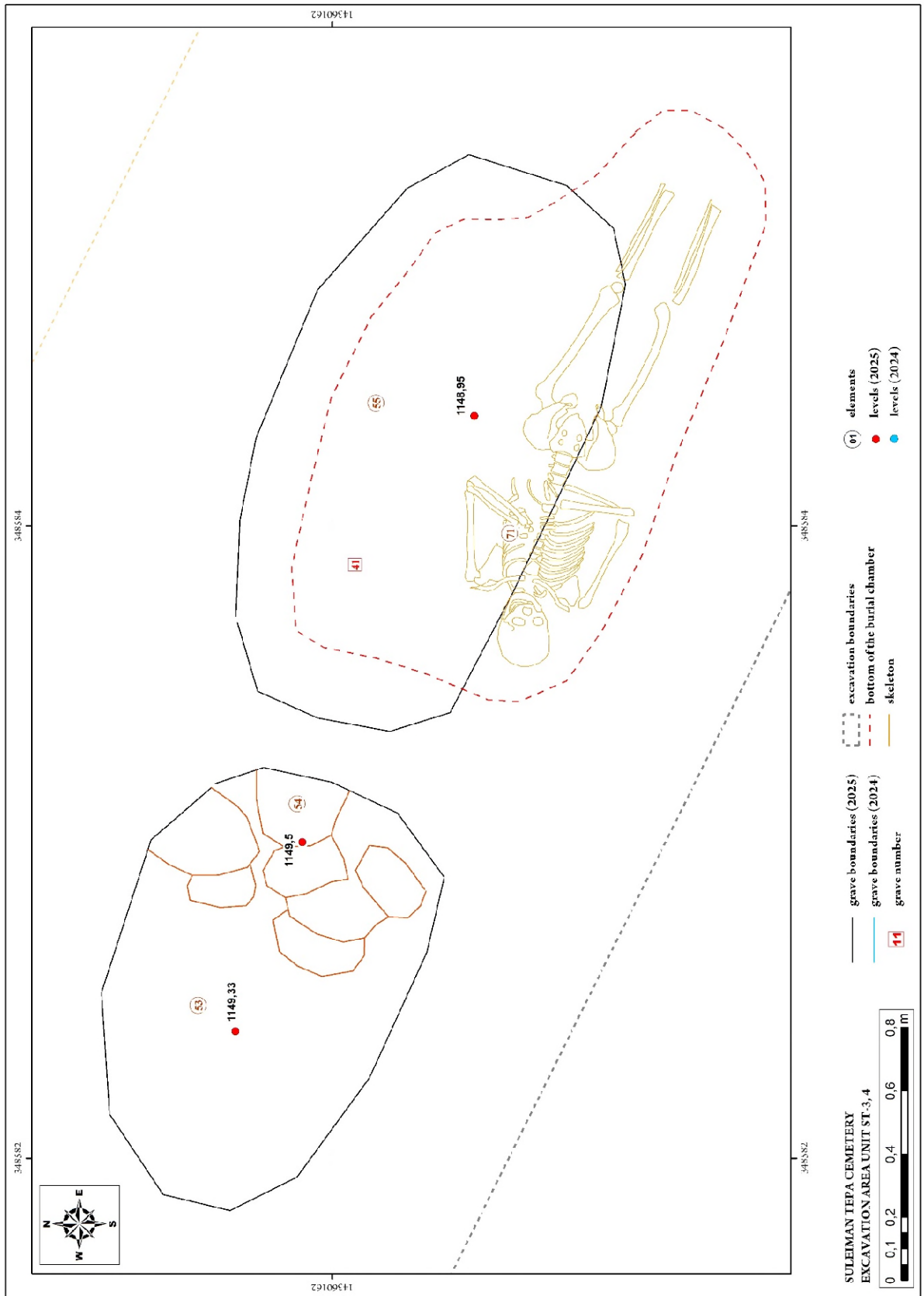


Figure 12 – Plan of Burial No. 41

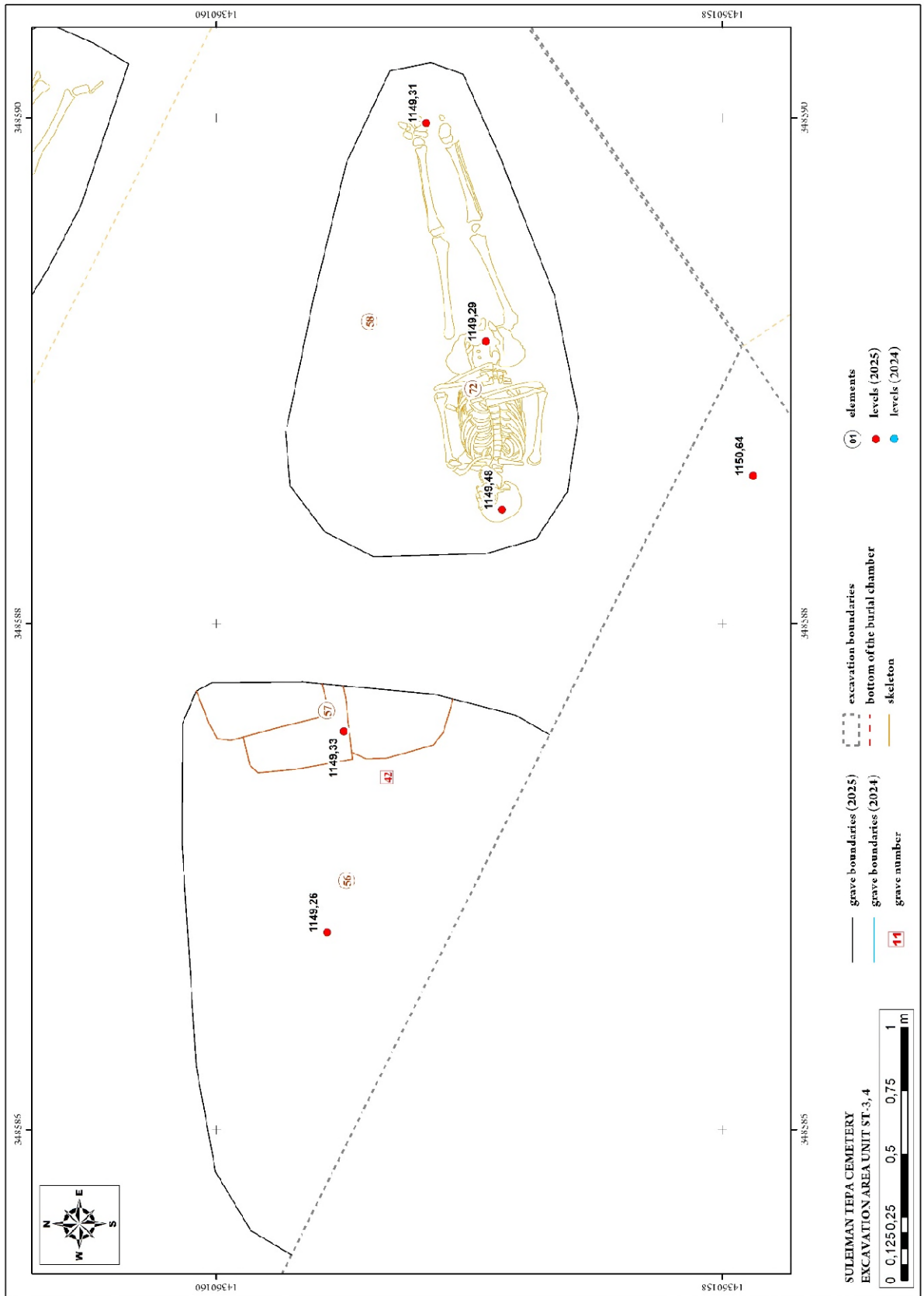


Figure 13 – Plan of Burial No. 42

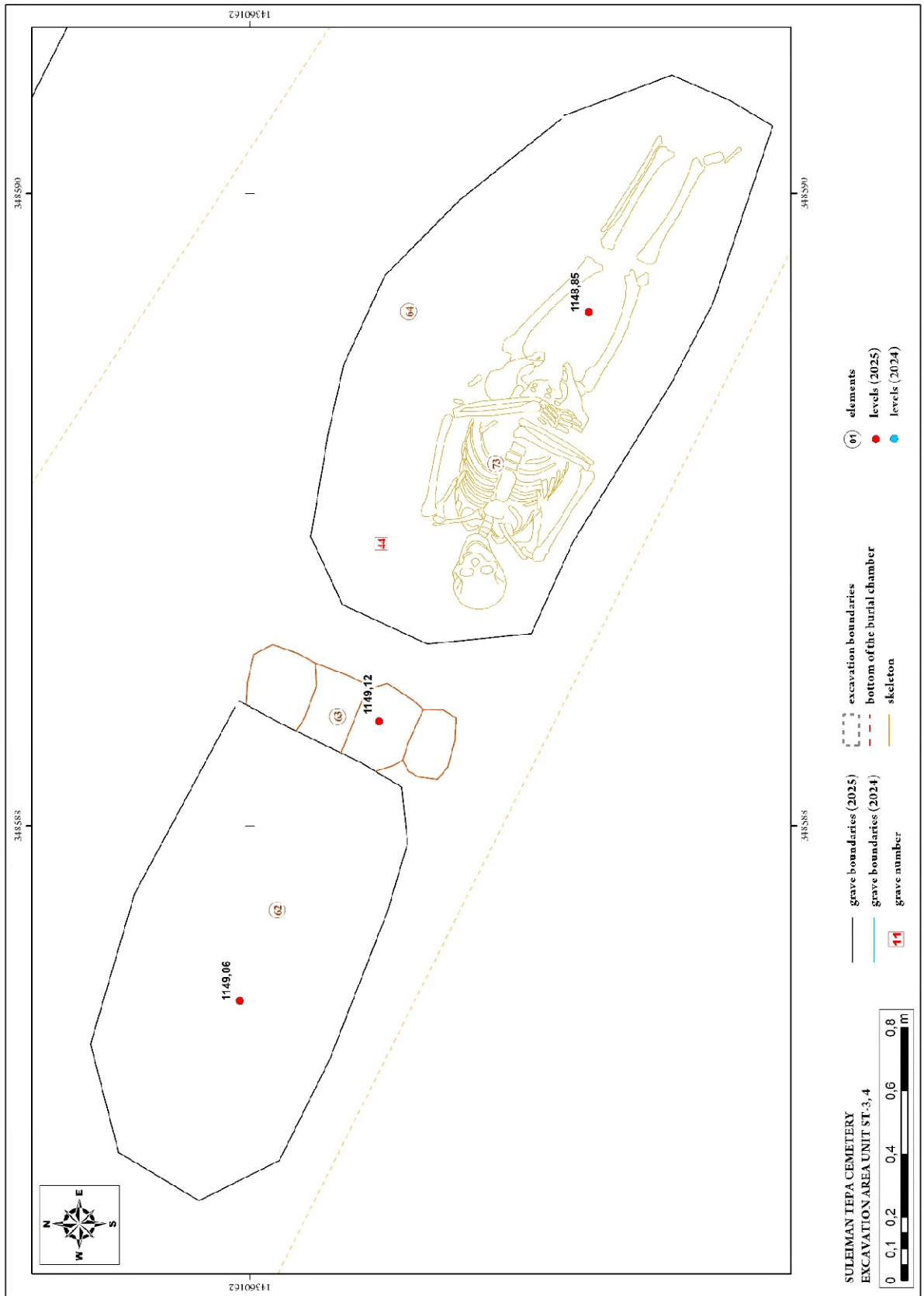


Figure 14 – Plan of Burial No. 44

Appendix – Photographs



Figure 1 – General view of the excavation prior to the commencement of work (Excavation 3).

View to the east.



Figure 2 – General view of the excavation prior to the commencement of works (Excavation 4). View to the east.



Figure 3 – General view of the excavation prior to the commencement of works (Excavation 4). View to the north.



Figure 4 – General view of the excavation prior to the commencement of works (Excavation 3). View to the east.



Figure 5 – General view of the excavation prior to the commencement of works (Excavation 4). View to the west.



Figure 6 – General view of the excavation prior to the commencement of works (Excavation 4). View to the northwest.



Figure 7 – Removal of the upper layer (Excavation 4). Work process.



Figure 8 – Opening of the upper layer (Excavation 4). Work in progress.



Figure 9 – Cleaning of Burial No. 35. Work in progress.



Figure 10 – Cleaning of Burial No. 35. Work in progress.



Figure 11 – Cleaning of Burial No. 38. Work in progress.



Figure 12 – Cleaning of Burial No. 32. Work in progress.



Figure 13 – Burial No. 38. General view after cleaning. View to the north.



Figure 14 – Burial No. 38. General view after cleaning. View to the west.



Figure 15 – Burial No. 38. General view after cleaning. View to the south.



Figure 16 – Burial No. 38. General view after cleaning. View to the east.



Figure 17 – Burial No. 38. Lower part of the skeleton after cleaning.



Figure 18 – Burial No. 38. Pelvic part of the skeleton after cleaning.



Figure 19 – Burial No. 38. Upper part of the skeleton after cleaning.



Figure 20 – Burial No. 38. Upper part of the skeleton after cleaning. Skull.



Figure 21 – Burial No. 38. Packing of the skeleton. Work in progress.



Figure 22 – Burial No. 38. General view after removal of the skeleton.



Figure 23 – Burial No. 37. General view after cleaning. View to the southwest.



Figure 24 – Burial No. 37. General view after cleaning. View to the south.



Figure 25 – Burial No. 37. Skeleton. General view after cleaning.



Figure 26 – Burial No. 37. Skeleton, upper part. General view after cleaning.



Figure 27 – Burial No. 37. Skeleton, lower part. General view after cleaning.



Figure 28 – Burial No. 35. General view after cleaning. View to the southwest.



Figure 29 – Burial No. 35. General view after cleaning. View to the southwest.



Figure 30 – Burial No. 35. General view after cleaning. View to the southeast.



Figure 31 – Burial No. 35. Skeleton after cleaning. View to the southwest.



Figure 32 – Burial No. 35. Skeleton after cleaning, upper part.



Figure 33 – Burial No. 35. Skeleton after cleaning, lower part.



Figure 34 – Burial No. 35. Burial after removal of the skeleton.



Figure 35 – Burial No. 32. General view of the burial after cleaning. View to the northwest.



Figure 36 – Burial No. 32. General view of the burial after cleaning. View to the southwest.



Figure 37 – Burial No. 32. General view of the burial after cleaning. View to the east.



Figure 38 – Burial No. 32. Skeleton after cleaning, upper part.



Figure 39 – Burial No. 32. Skeleton after cleaning, lower part.



Figure 40 – Burial No. 31. General view of the burial after cleaning. View to the southwest.



Figure 41 – Burial No. 31. General view of the burial after cleaning. View to the south.



Figure 42 – Burial No. 31. General view of the burial after cleaning. View to the east.



Figure 43 – Burial No. 31. Skeleton after cleaning, upper part.



Figure 44 – Burial No. 31. Skeleton after cleaning, middle portion.



Figure 45 – Burial No. 31. Skeleton after cleaning, lower part.



Figure 46 – Burial No. 43. General view after cleaning the excavation. View to the southeast.



Figure 47 – Burial No. 43. General view after cleaning the excavation. View to the northeast.



Figure 48 – Burial No. 43. General view after cleaning the excavation. View to the north.



Figure 49 – Burial No. 43. General view after cleaning the excavation. View to the northwest.



Figure 50 – Burial No. 44. General view after cleaning the excavation. View to the east.



Figure 51 – Burial No. 44. General view after cleaning the excavation. View to the northeast.



Figure 52 – Burial No. 44. General view after cleaning the excavation. View to the south.



Figure 53 – Burial No. 44. General view after cleaning the excavation. View to the west.



Figure 54 – Burial No. 45. General view after cleaning the excavation. View to the east.



Figure 55 – Burial No. 45. General view after cleaning the excavation. View to the northeast.



Figure 56 – Burial No. 45. General view after cleaning the excavation. View to the north.



Figure 57 – Burial No. 45. General view after cleaning the excavation. View to the west.



Figure 58 – Burial No. 46. General view after cleaning the excavation. View to the north.



Figure 59 – Burial No. 46. General view after cleaning the excavation. View to the southeast.

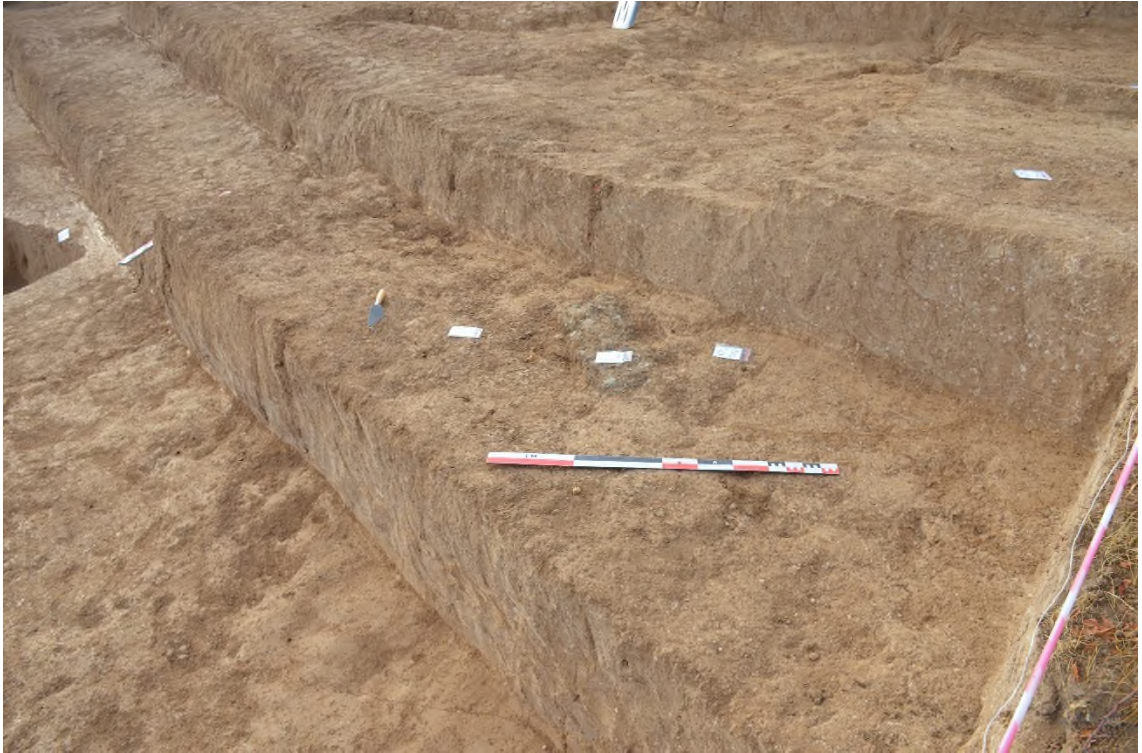


Figure 60 – Burial No. 46. General view after cleaning the excavation. View to the south.

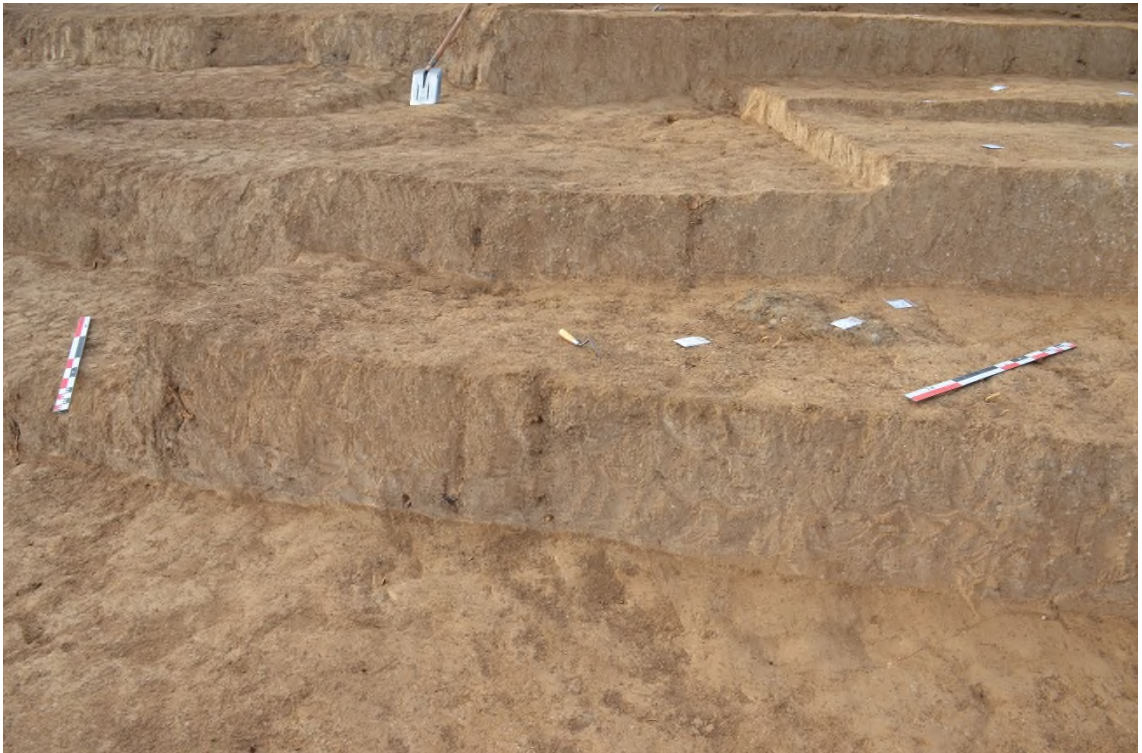


Figure 61 – Burial No. 46. General view after cleaning the excavation. View to the southeast.



Figure 62 – Burial No. 41. General view of the burial after cleaning. View to the west.



Figure 63 – Burial No. 41. General view of the burial after cleaning. View to the east.



Figure 64 – Burial No. 41. General view of the burial after cleaning. View to the south.



Figure 65 – Burial No. 41. Skeleton after cleaning, upper part.



Figure 66 – Burial No. 41. Skeleton after cleaning, lower part.



Figure 67 – Burial No. 41. Burial after removal of the skeleton.



Figure 68 – Burial No. 42. Burial after cleaning. Type facing west.



Figure 69 – Burial No. 42. Burial after cleaning. Type facing east.



Figure 70 – Burial No. 42. Burial after cleaning. Type facing south.



Figure 71 – Burial No. 42. Skeleton after cleaning, upper part.



Figure 72 – Burial No. 42. Skeleton after cleaning, middle portion.



Figure 73 – Burial No. 42. Skeleton after cleaning, lower part.



Figure 74 – Burial No. 44. Burial after cleaning. Type facing south.



Figure 75 – Burial No. 44. Burial after cleaning. Type facing west.



Figure 76 – Burial No. 44. Burial after cleaning. Type facing east.



Figure 77 – Burial No. 44. Skeleton after cleaning.



Figure 78 – Burial No. 44. Skeleton after cleaning, upper part.



Figure 79 – Burial No. 44. Skeleton after cleaning, middle portion.



Figure 80 – Burial No. 44. Skeleton after cleaning, lower part.



Figure 81 – Burial No. 48. General view after cleaning the excavation. View to the south.



Figure 82 – Burial No. 48. General view after cleaning the excavation. View to the west.



Figure 83 – Burial No. 48. General view after cleaning the excavation. View to the east.



Figure 84 – Burial No. 47. General view after cleaning the excavation. View to the south.



Figure 85 – Excavation reclamation process.



Figure 86 – Excavation reclamation process.



Figure 87 – Process of excavation reclamation



Figure 88 – General view after reclamation



Figure 89 – General view after reclamation



Figure 90 – General view after reclamation



Figure 91 – General view after reclamation



Figure 92 – General view after reclamation



Figure 93 – General view after reclamation



Figure 94 – General view after reclamation

Appendix – Three-Dimensional Scanning of Rock Inscriptions Methodology

In 2025, as part of comprehensive scientific research undertaken at the Suleyman-Tepe site, documentation of rock inscriptions located at two sites was carried out:

1. Kyzyl-Kiya Rock, located 1,800 meters east of the necropolis
2. Bo-Kuron Mountain, located 400 meters south of the necropolis



Figure 1 – Scheme of the location of rock inscriptions

Methodology of digital three-dimensional documentation of rock inscriptions at the Suleyman-Tepe site (2025)

1. General information and hardware-software complex

To record rock epigraphy at the Kyzyl-Kiya and Bo-Kuron sites, a non-contact optical scanning method was employed. The primary tool employed was the Creality Otter handheld 3D scanner, which operates using structured light technology (infrared and visible spectrum).

Technical advantages of this selection:

Accuracy: up to 0.05 mm, enabling the recording of the microrelief of incised marks.

Adaptability: the capability to work with both small details (inscriptions) and extensive rock surfaces.

Texturing: equipped with two RGB cameras, allowing the creation of photorealistic models that preserve the natural color of the patina.

2. Field Phase: Data Collection Algorithm

The works were conducted in two stages, depending on the topography of the sites:

2.1. Preparation of the Surface and Environment

A visual inspection was conducted prior to scanning. To ensure the proper functioning of optical sensors in open areas (the Kyzyl-Kiya rock surface), shading was employed to prevent sensor saturation by direct sunlight. Under the conditions of the Bo-Kuron caves and grottoes, the standard LED fill light of the scanner was used.

2.2. Scanning Process

Calibration: Conducted prior to each session to account for the temperature regime and air humidity at the locations.

Data Capture: Scanning was performed using the 'free movement' method at a distance of 250–400 mm from the rock surface.

Overlap: To ensure the accuracy of stitching individual fragments into a unified model (particularly in extensive locations such as the 'Rock Surface' at Kyzyl-Kiya), the frame overlap coefficient was no less than 35%.

Local features:

Grottos and caves (Bo-Kuron): The Small Object mode was employed to capture fine inscription details, while the Large Object mode was utilized to document the geometry of the cave vaults.

Kyzyl-Kiya Rock: The primary focus was on recording the spatial arrangement of inscriptions on the plane in relation to the rock's relief.

3. Laboratory stage: Processing and visualization

Post-processing of the collected data was carried out using specialized software (Creality Scan, MeshLab, CloudCompare) and included the following steps:

Point cloud cleaning: Removal of 'noise' (vegetation, dust particles, and random objects).

Triangulation and Mesh model construction: Generation of a high-resolution polygonal mesh.

Texturing: Overlaying photogrammetric data onto 3D geometry to create a full-color replica.

Analytical relief analysis: Application of 'shaded relief' and ambient occlusion algorithms. This method allows for artificial alteration of the angle of light incidence on the digital model, thereby

revealing poorly legible and heavily weathered fragments of inscriptions that are indiscernible under ordinary inspection.

4. Documentation Results

As a result of the work, a digital archive was created, which includes:

High-polygon 3D models of five locations in .OBJ and .PLY formats.

Orthophotoplans of inscriptions with a scale bar for epigraphic analysis.

Digital Elevation Models permitting precise measurement of the depth of incised marks.

Alongside the manual micro-relief scanning of inscriptions, the high-performance Leica RTC360 terrestrial laser scanner was utilized in 2025 to capture the overall spatial structure of objects (grottos, caves, and the surrounding landscape).

Technical Specifications and Purpose:

System Type: A high-speed 3D laser scanner with an integrated HDR imagery system.

Measurement Speed: The device captures data at a rate of up to 2 million points per second, enabling the rapid documentation of the expansive "Kyzyl-Kiya" and "Bo-Kuron" locations.

VIS (Visual Inertial System) Technology: Equipped with five built-in cameras, the scanner automatically tracks its position in space. This simplifies the registration of point clouds from different cave chambers into a single coordinate system.

Accuracy: The ranging accuracy is approximately 1.9 mm at a distance of up to 10 meters, ensuring the creation of a reliable architectural foundation for the site.

Field Control: Process management and preliminary data stitching were conducted via the device's touchscreen and a tablet running Leica Cyclone FIELD 360 software.

[Results of the Work](#)

In 2025, documentation work was carried out at two locations: 1. Kyzyl-Kia, where two sites were documented, and 2. Mount Bo-Kuron, where three caves were documented.

1. Two sites were surveyed at site No. 1:

Site No. 1 – an upper cave with a large number of inscriptions;

Site No. 2 – a large open rock face with inscriptions and large crosses. 2.

2. Three caves were surveyed at site No. 2;

Lower cave – inscriptions outside and inside the cave were examined.

Middle cave – inscriptions outside and inside the cave were examined.

Upper cave – one inscription and an image of a cross inside the cave were examined.

A preliminary correlation of the discovered and documented inscriptions with the data published by Mark Dickens suggests that all previously discovered inscriptions have been documented. In total, more than 160 rock art images were examined.

Future Data Processing and Rock Inscription Documentation Plans

Currently, a large volume of digital data has been collected, including point clouds, high-poly models, high-resolution textures, and photographs. Based on this data, it is necessary to catalog all rock carvings, assigning a unique identification number to each inscription and cross-referencing this information with previous research. This stage of work will provide a more comprehensive and up-to-date understanding of the rock inscriptions and facilitate their systematic study and analysis. Furthermore, this material will enable condition monitoring of the site and allow the "virtual twin" to be used as a primary tool for laboratory-based analysis.

Objectives for 2026:

Data Refinement: Efforts will continue to refine and verify the data collected during the 2025 season.

Direct Documentation: Due to the poor preservation and low legibility of certain inscriptions, it is critical to perform on-site documentation using the contact copying method (tracing/rubbing).

This integrated approach will ensure the most detailed documentation possible and support the subsequent in-depth study of all rock art at the site.

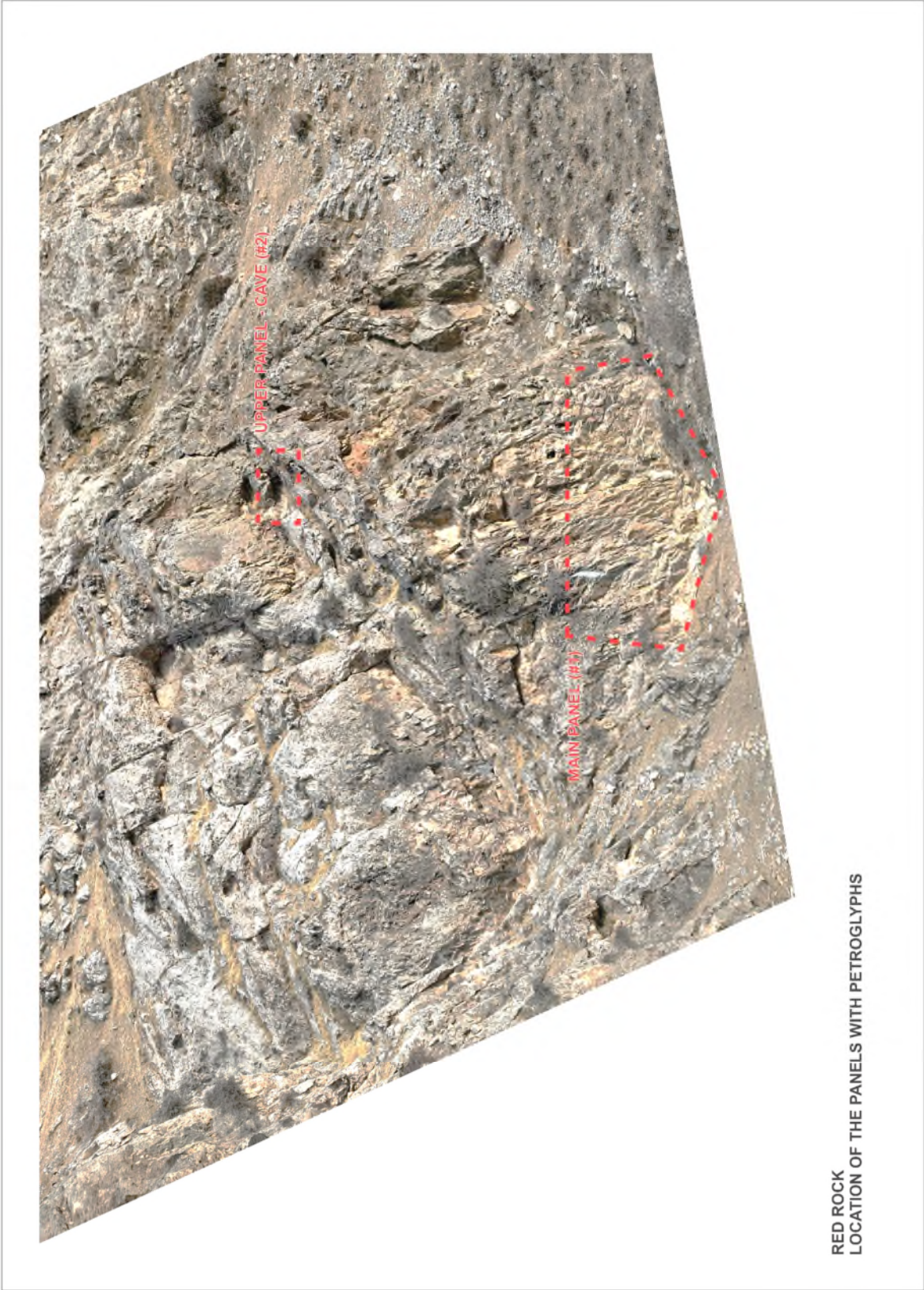


Figure 2 – Diagram of the location of the scanning areas ST-1



Figure 3 – Upper platform (grotto). General view



Figure 4 – Upper platform (grotto). General view



Figure 5 – Upper platform (grotto). Lower surface of the grotto



Figure 6 – Upper platform (grotto). Lower plane of the grotto, central part.



Figure 7 – Upper platform (grotto). Upper vertical plane of the grotto.



Figure 8 – Upper platform (grotto). Upper vertical plane of the grotto.



Figure 9 – Upper platform (grotto). Photographic documentation process.



Figure 11 – Upper platform (grotto). Scanning process.



Figure 12 – Lower platform. Scanning process.



Figure 13 – Lower platform. Photographic documentation process



Figure 14 – Lower platform. Image of a cross and inscription



Figure 15 – Lower platform. Inscriptions

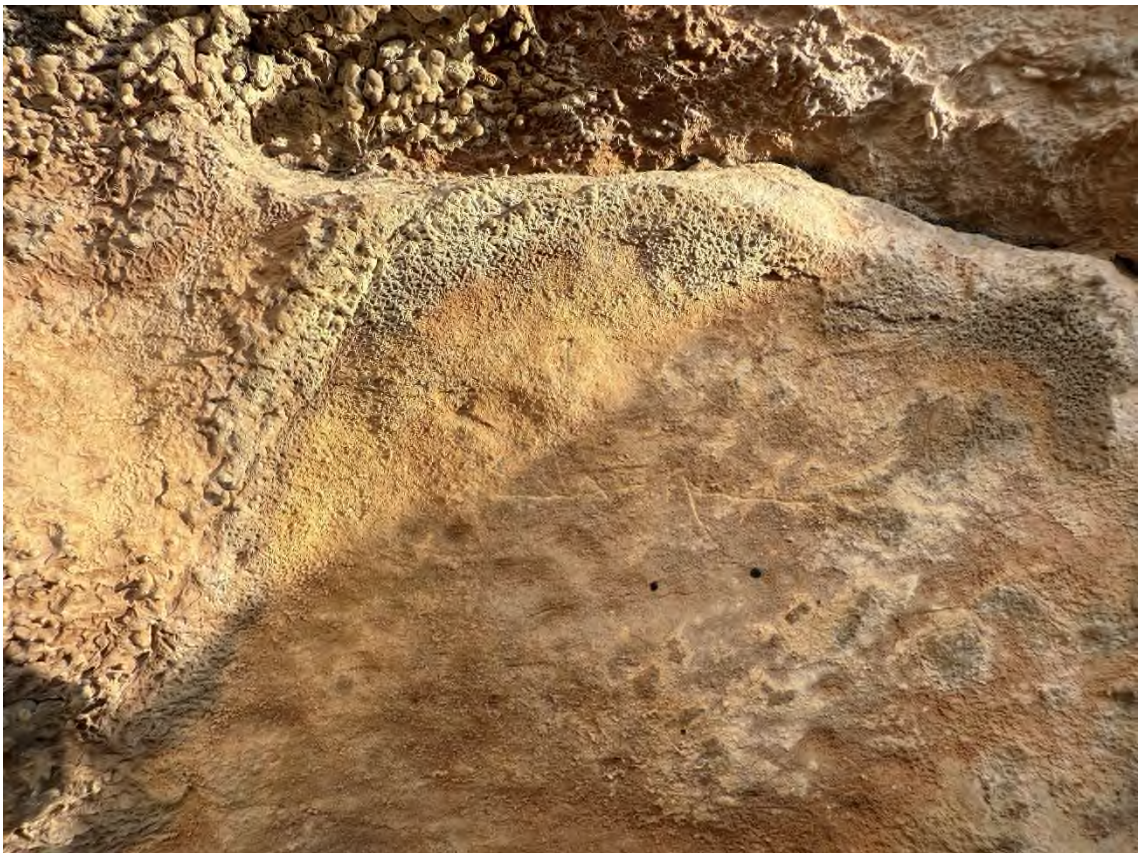


Figure 16 – Lower platform. Inscriptions



Figure 17 – Lower platform. Inscriptions



Figure 18 – Lower platform. Inscriptions



Figure 19 – Lower platform. Inscriptions



Figure 20 – Lower platform. Inscriptions



Figure 21. Lower platform. Inscriptions



Figure 22. Lower platform. Inscriptions



Figure 23. Lower platform. Inscriptions



Figure 24. Lower platform. Inscriptions



Figure 25. Lower platform. Inscriptions



Figure 26. Lower platform. Inscriptions



Figure 27. Lower platform. Inscriptions



Figure 28. Lower platform. Inscriptions



Figure 29. Lower platform. Inscriptions



Figure 30 – Lower platform. Image of the cross



Figure 31 – Lower platform. Image of a cross and inscription



Figure 32 – Lower platform. Image of a cross and inscription



Figure 33 – Lower platform. Image of inscriptions



Figure 34 – Lower platform. Image of inscriptions



Figure 35 – Lower platform. Image of the cross



Figure 36 – Lower platform. General view



Figure 37 – Kzy-Kiya. Textured model

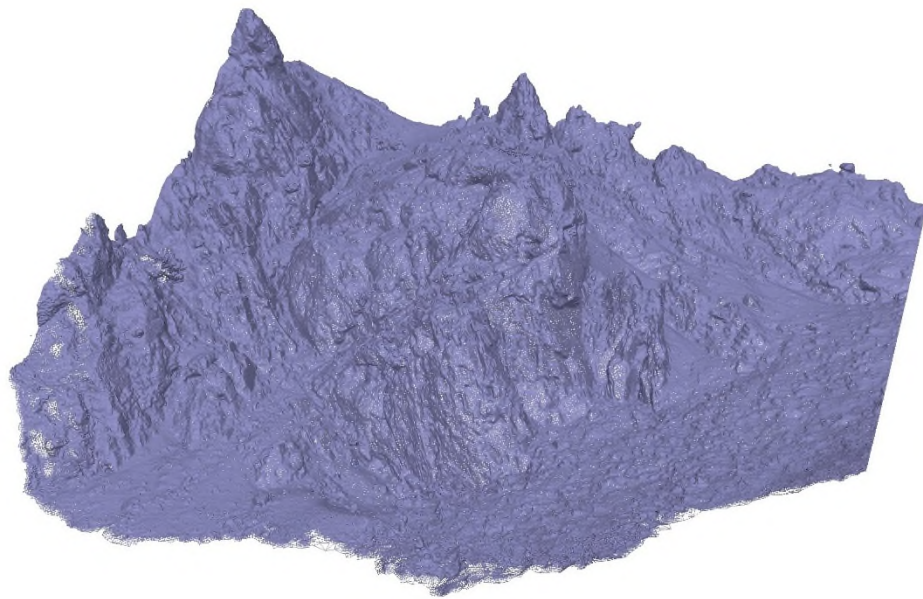


Figure 38 – Kyzyl-Kiya. High-polygon model

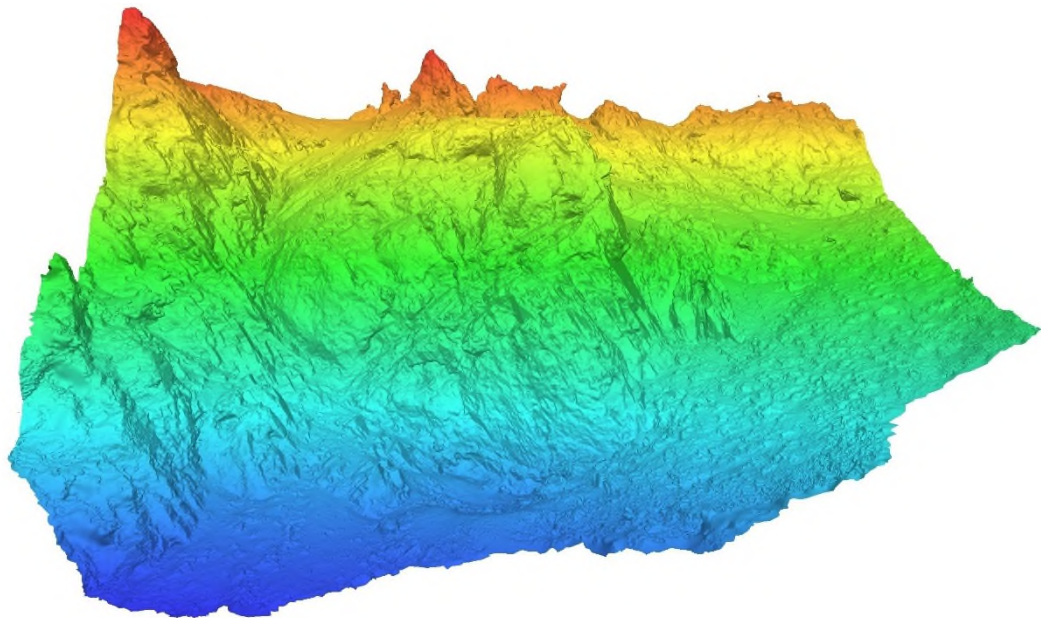


Figure 39 – Kyzyl-Kiya. DEM model

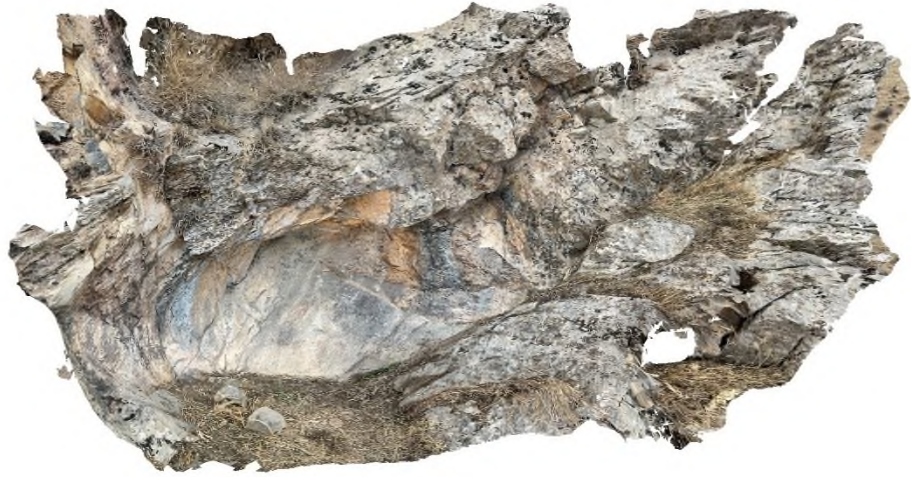


Figure 40 – Upper platform (grotto). Textured model

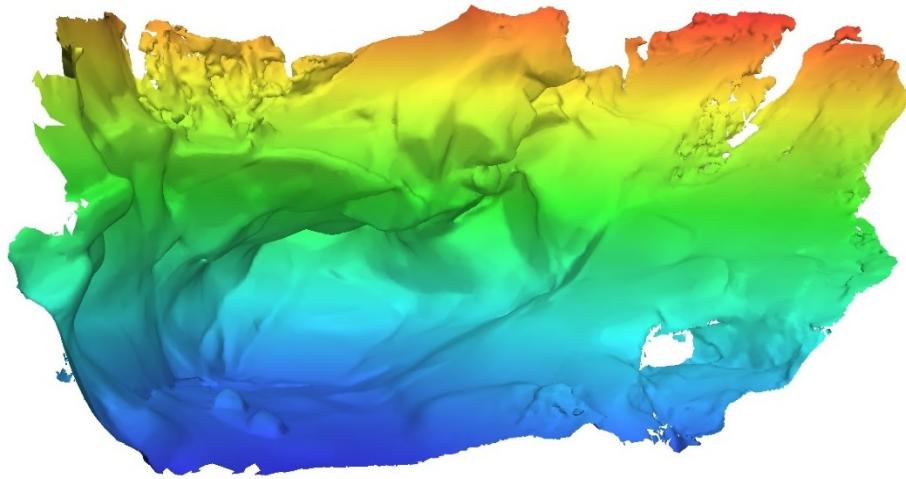


Figure 41 – Upper platform (grotto). DEM model

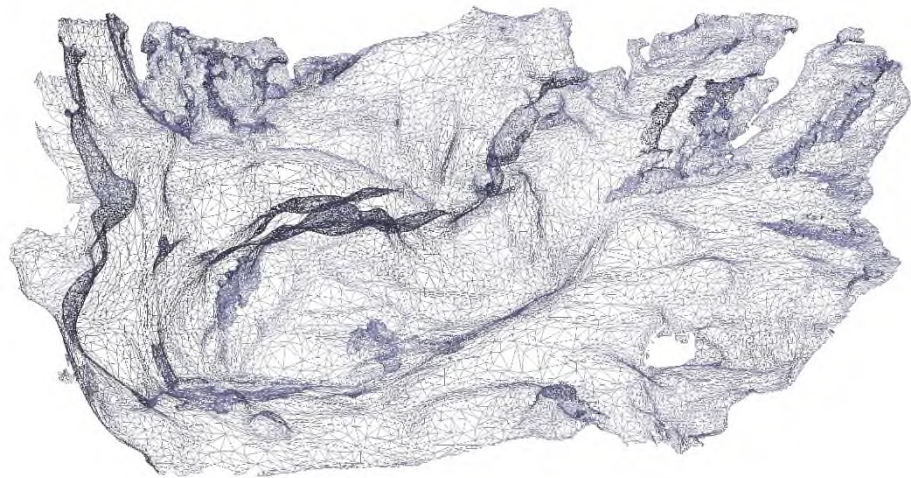


Figure 42 – Upper platform (grotto). High-polygon model



Figure 43 – Lower platform. Textured model

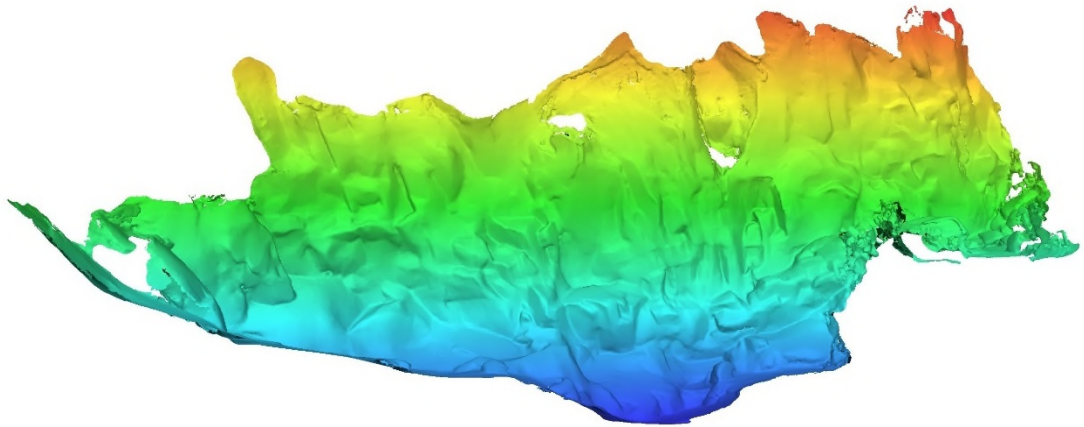


Figure 44 – Lower platform. DEM model

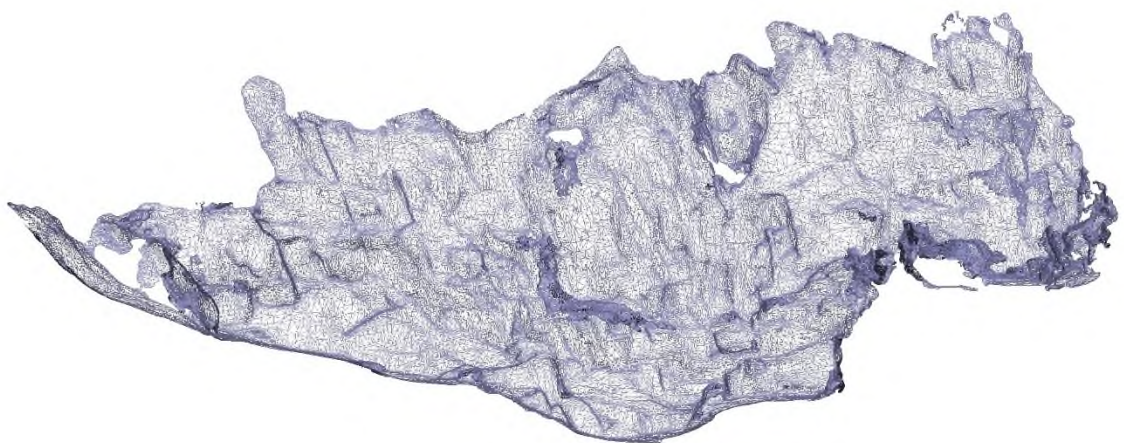


Figure 45 – Lower platform. High-polygon model

Results of the Work

Scanning in Area-2 (Bo-Kuron) was carried out at three locations:

1. Lower Cave
2. Middle Cave
3. Upper Cave



Figure 46 – Lower Cave. General view



Figure 47 – Lower Cave. General view



Figure 48 – Lower Cave. General view – panorama



Figure 49 – Lower Cave. Inscription inside the cave



Figure 50 – Lower Cave. Inscription outside the cave



Figure 51 – Lower Cave. Inscription outside the cave



Figure 52 – Lower cave. Inscription on the exterior of the cave.



Figure 53 – Lower cave. Inscription on the exterior of the cave.



Figure 54 – Lower cave. Inscription on the exterior of the cave.



Figure 55 – Lower cave. Textured model.

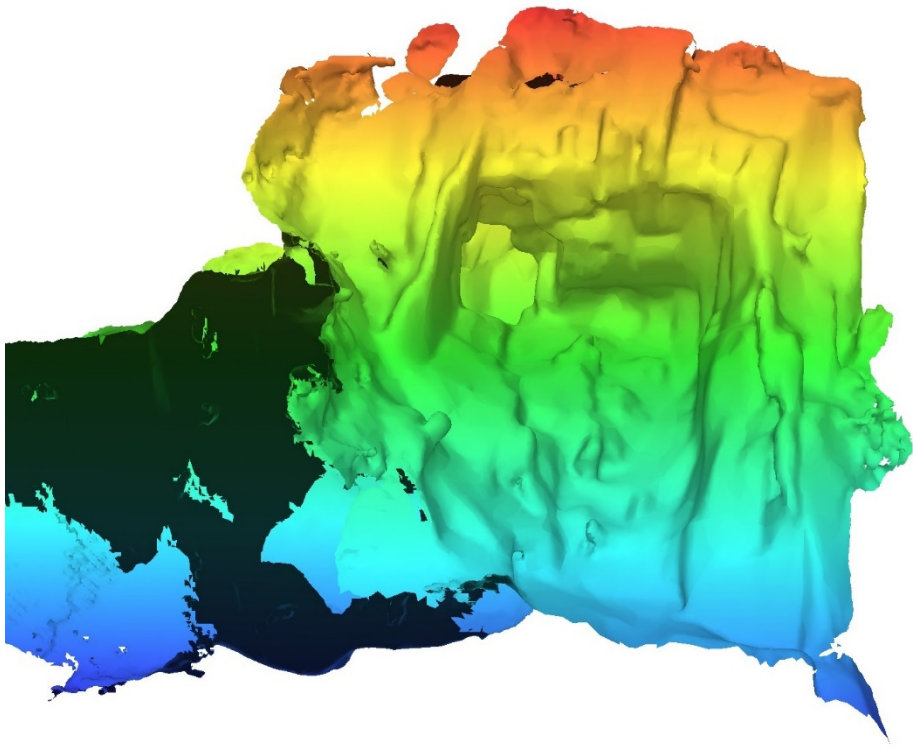


Figure 56 – Lower cave. DEM model.



Figure 57 – Lower cave. Cross-section. Textured model.

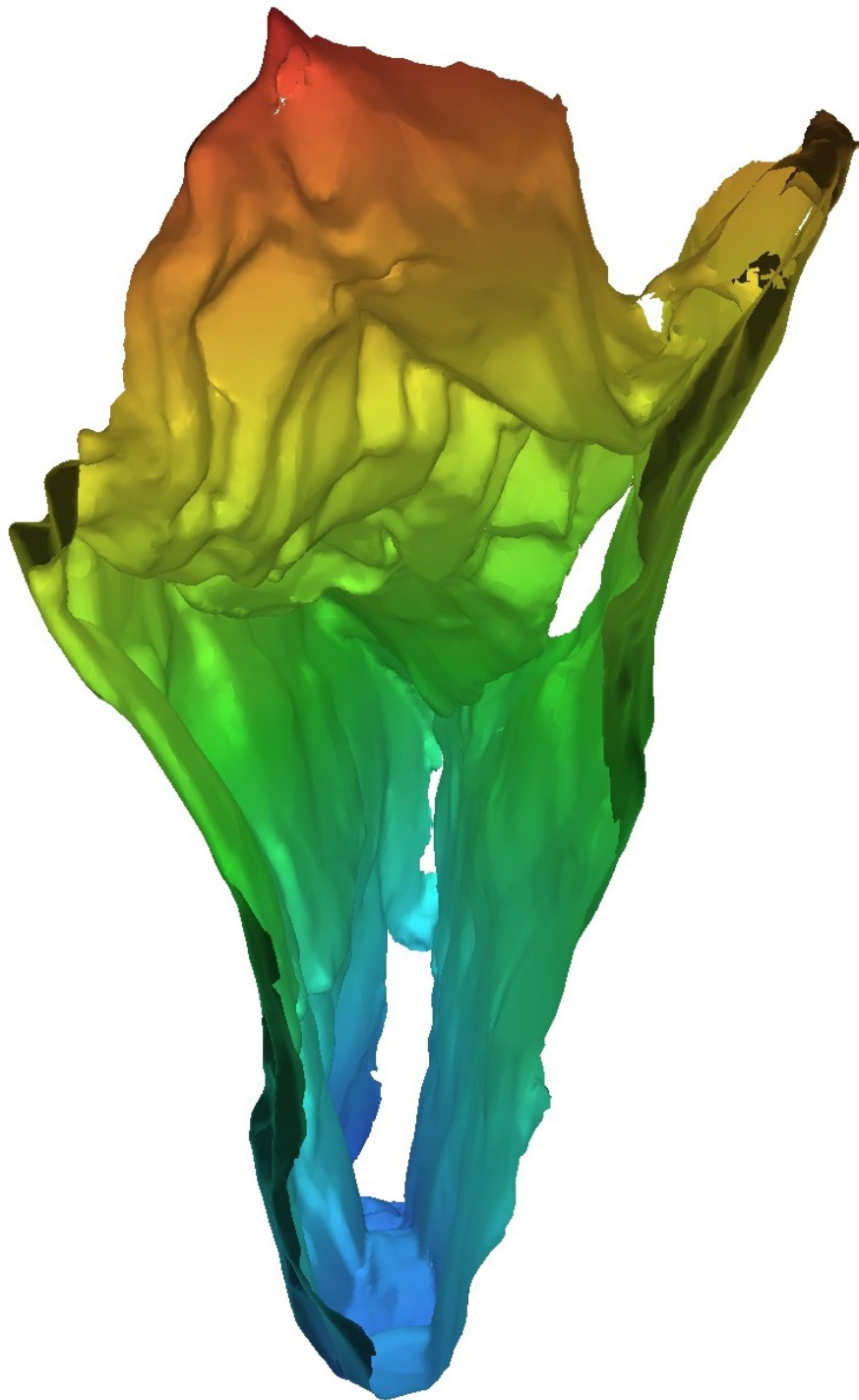


Figure 58 – Lower cave. Cross-section. DEM model.

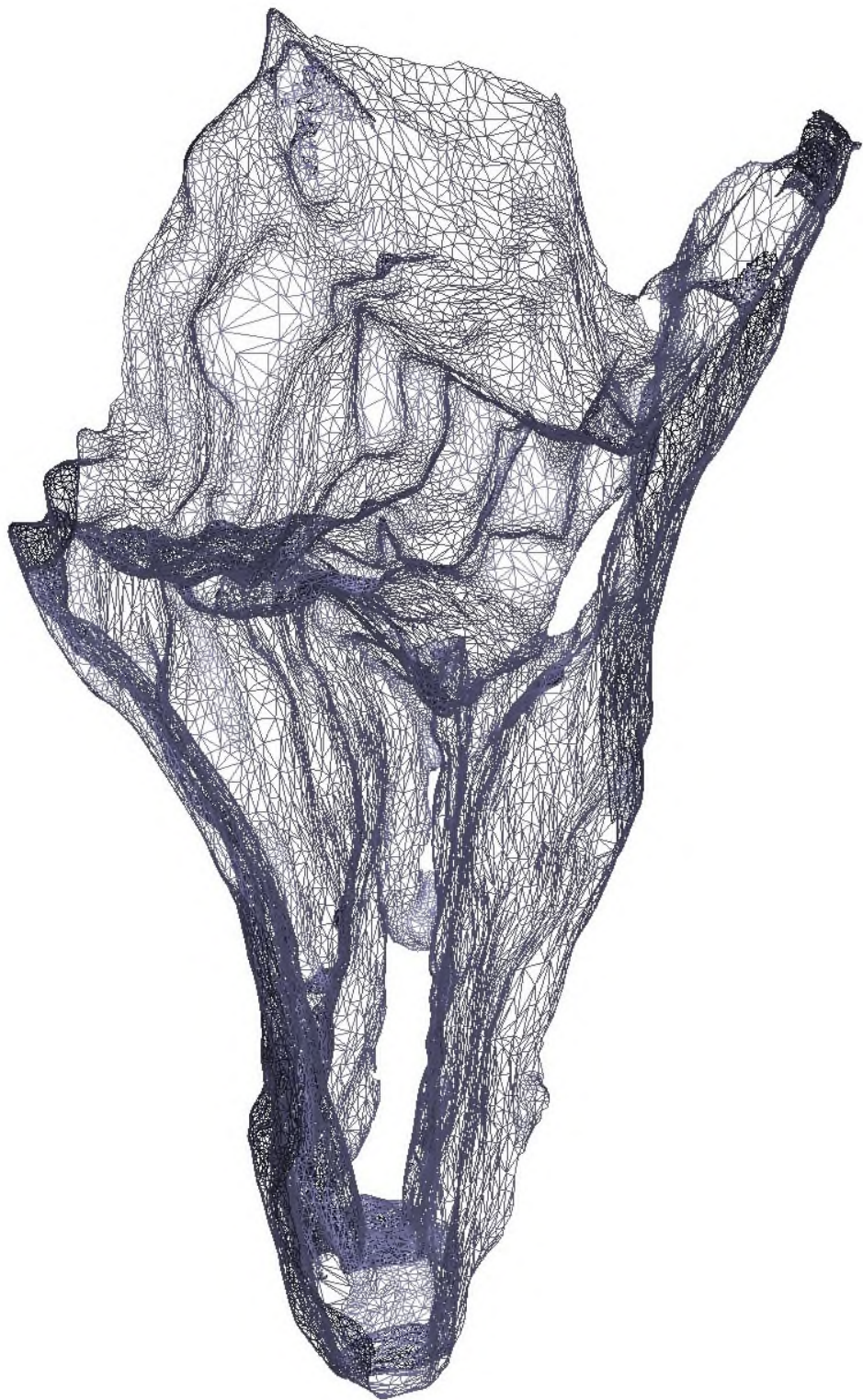


Figure 59 – Lower cave. Transverse section. High-polygon model



Figure 60 – Middle cave. General view.



Figure 61 – Middle cave. General view.



Figure 62 – Middle cave. Inscription outside the cave.



Figure 63 – Middle cave. Inscription outside the cave.



Figure 64 – Middle cave. Inscription inside the cave.



Figure 65 – Middle cave. Inscription and cross inside the cave.



Figure 66 – Middle cave. Scanning process.



Figure 67 – Middle Cave. Photographic documentation process



Figure 68 – Middle Cave. Textured model

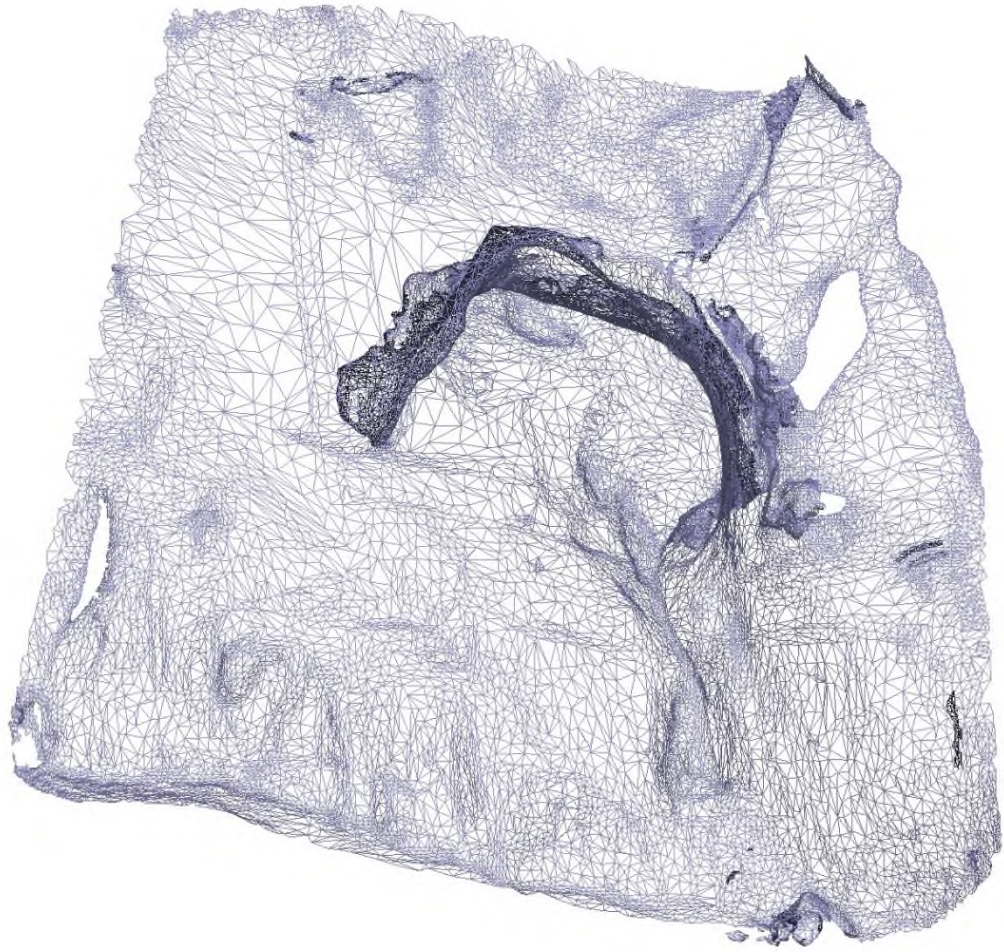


Figure 69 – Middle Cave. High-polygon model

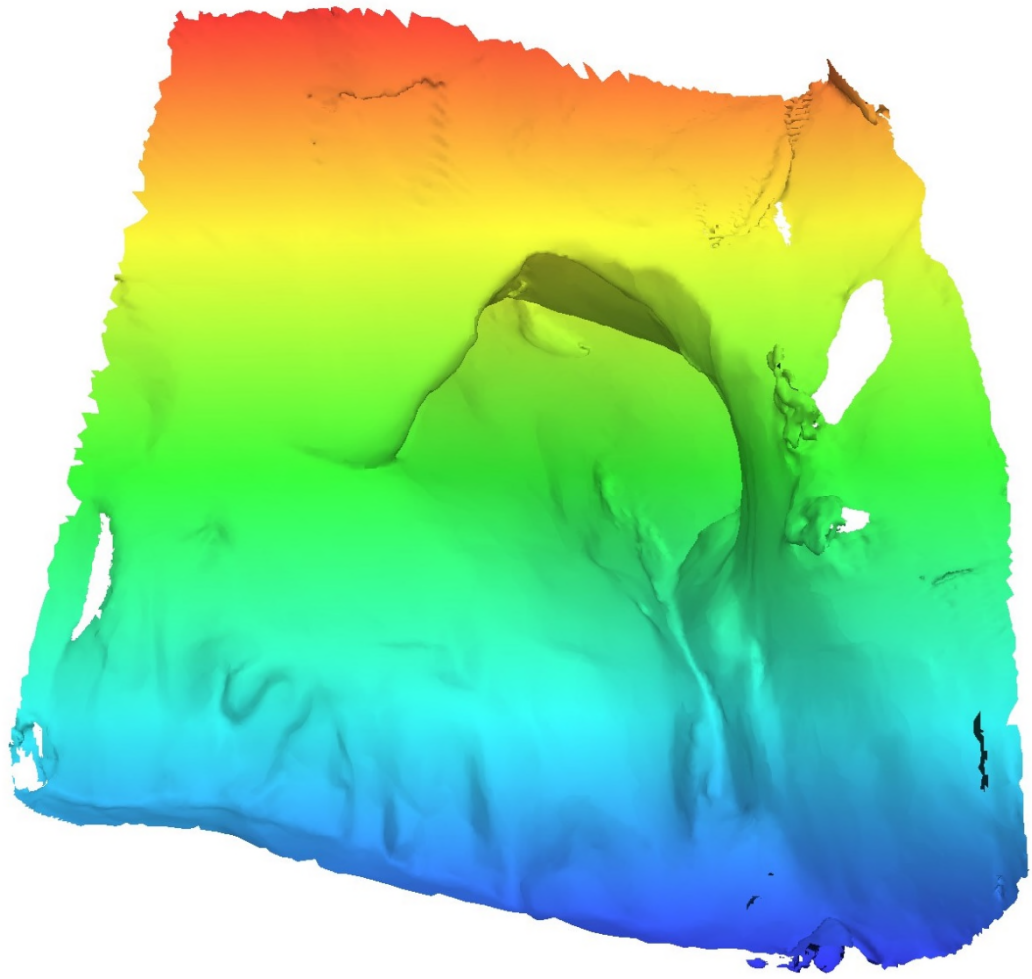


Figure 70 – Middle Cave. DEM model



Figure 71 – Middle Cave. Cross-section. Textured model

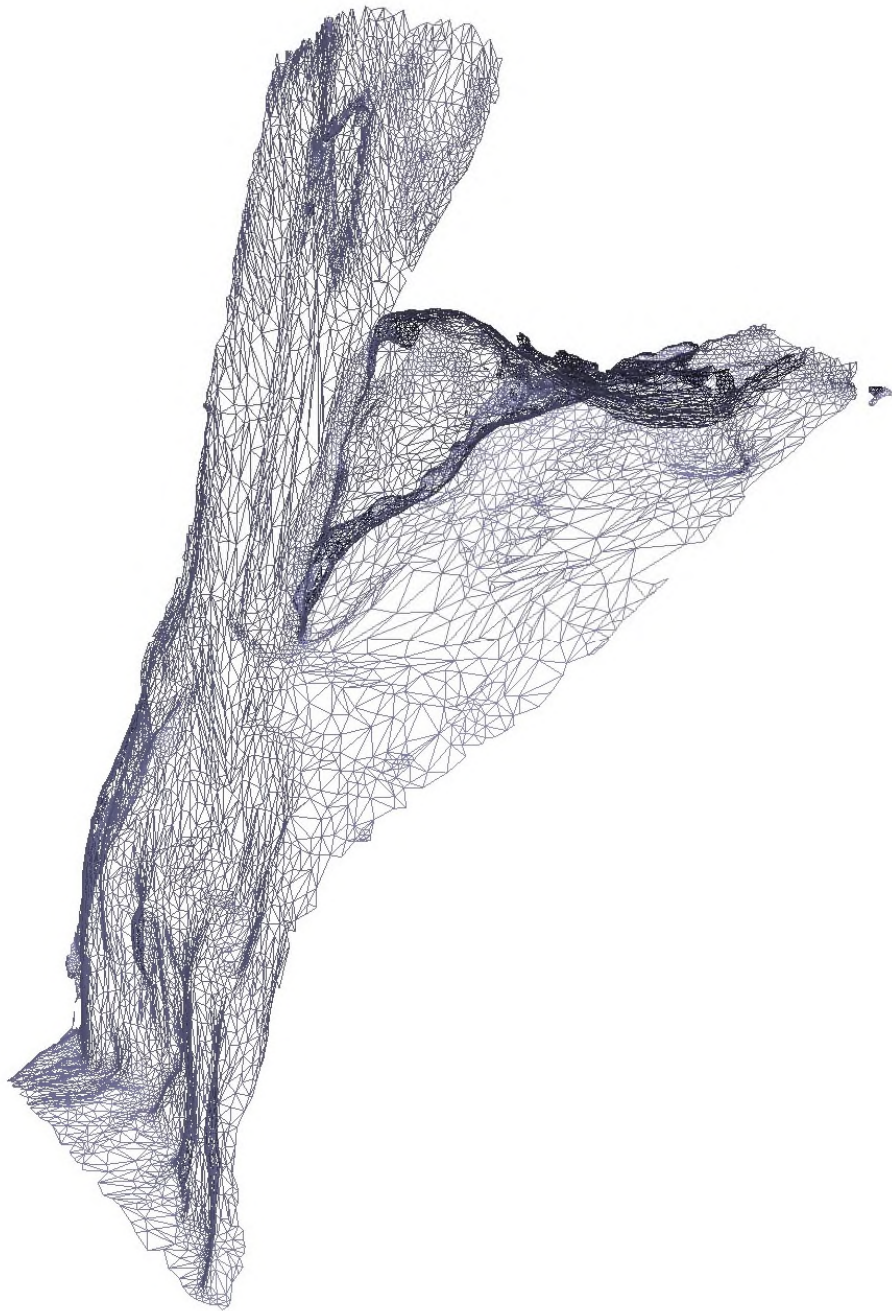


Figure 72 – Middle Cave. Cross-section. High-polygon model

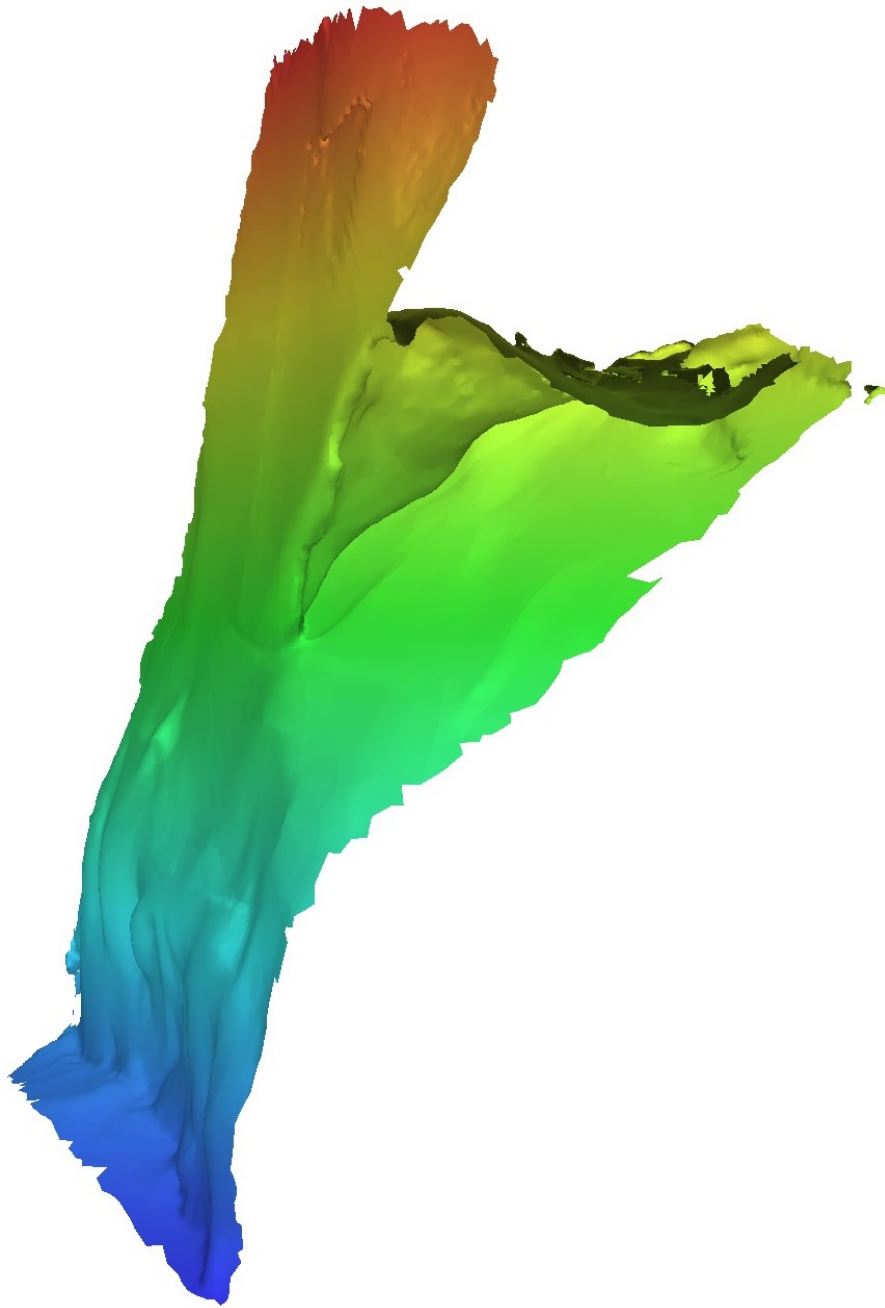


Figure 73 – Middle Cave. Cross-section. DEM model



Figure 74 – Upper Cave. General view



Figure 75 - Upper Cave. General view



Figure 75 - Upper Cave. Inscription

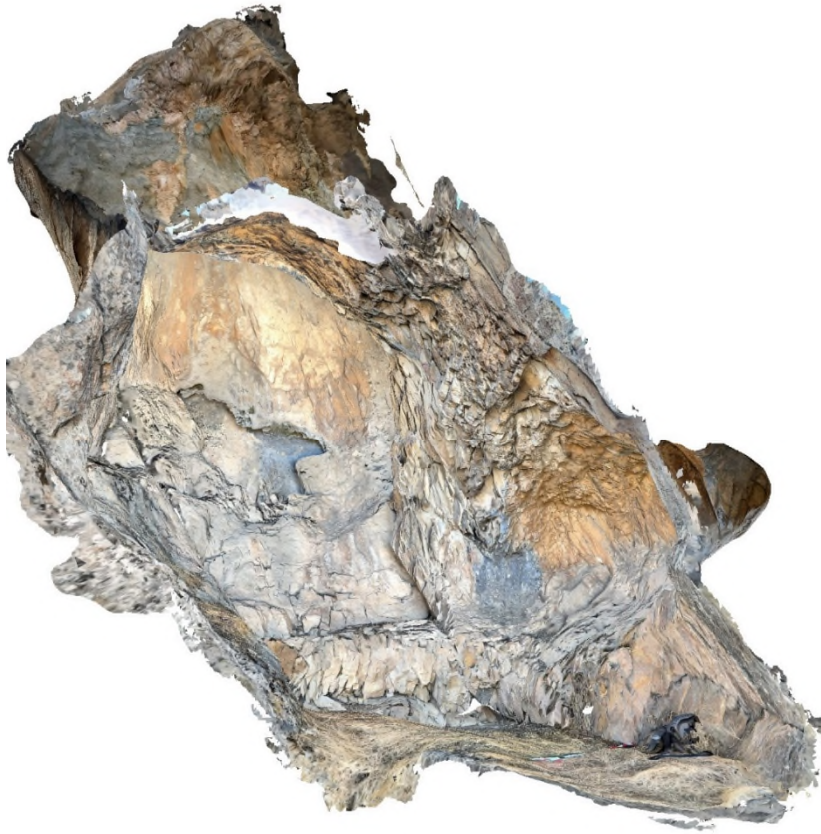


Figure 76 - Upper Cave. Textured model

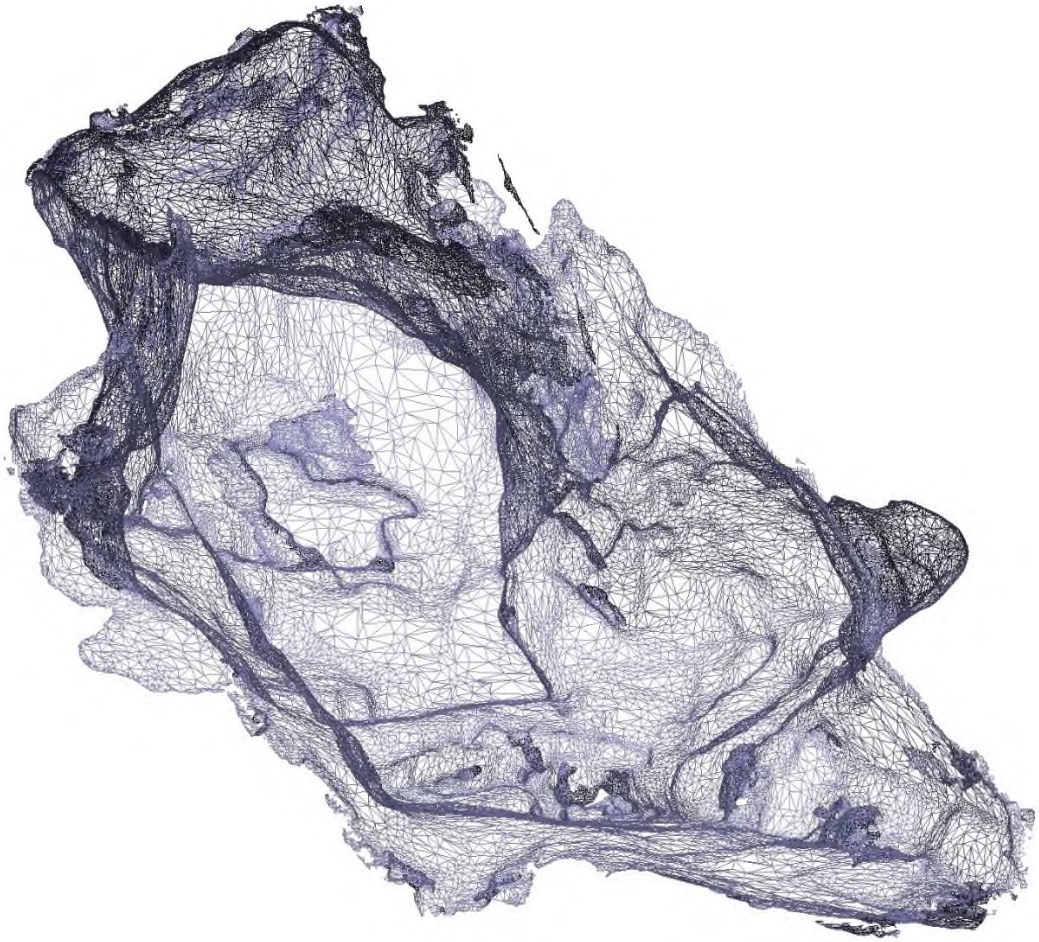


Figure 77 - Upper Cave. High-polygon model

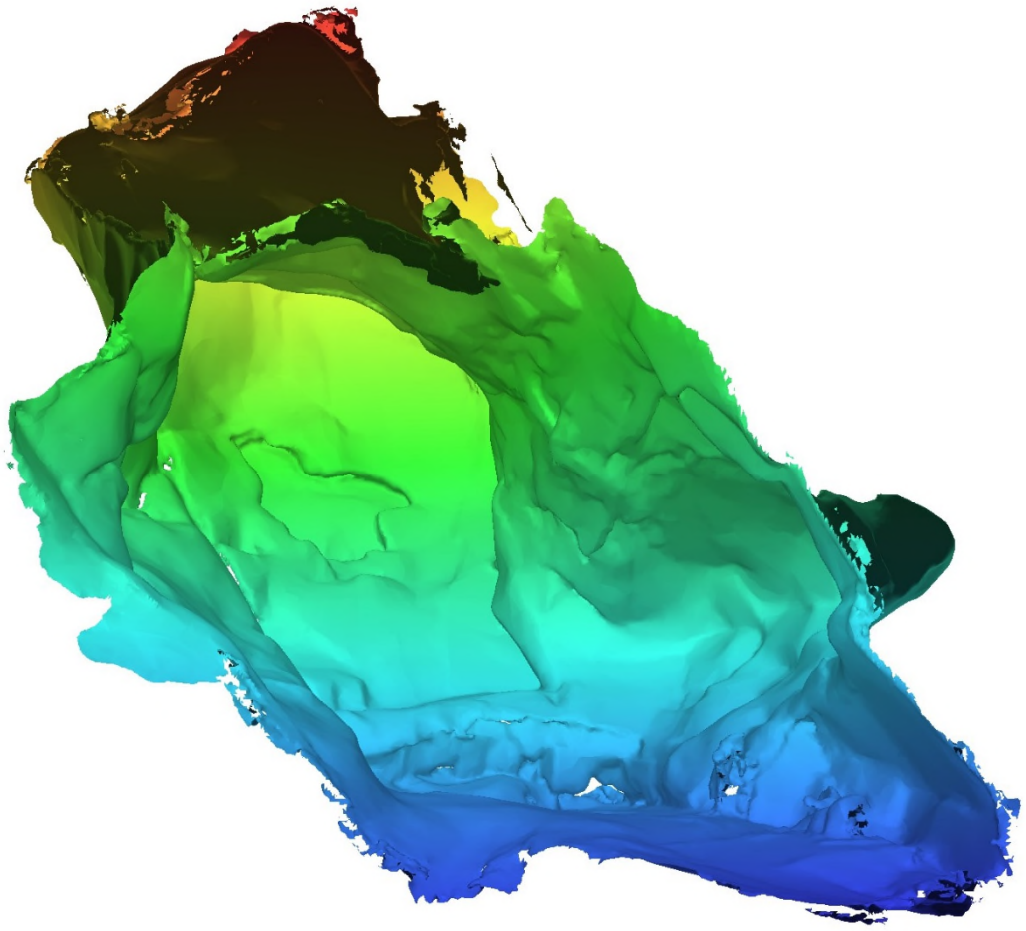


Figure 78 - Upper Cave. DEM model

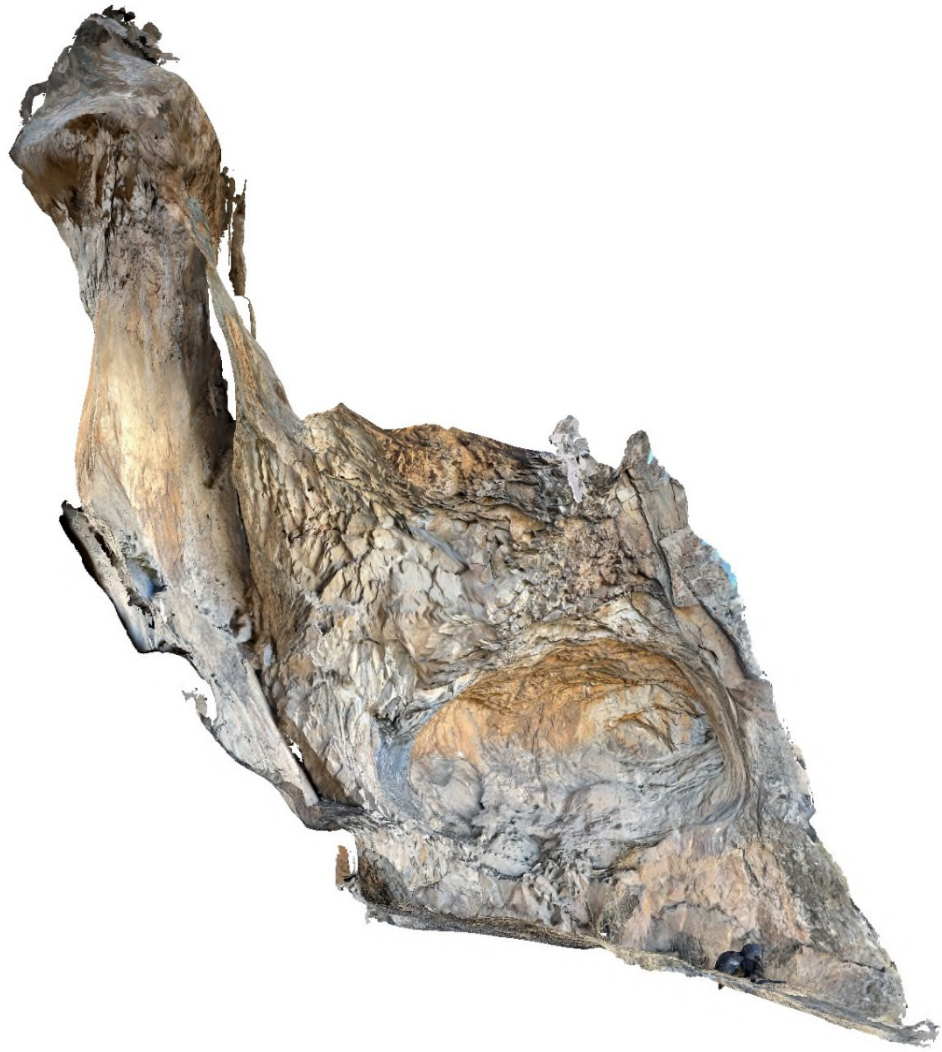


Figure 79 - Upper Cave. Cross-section. Textured model

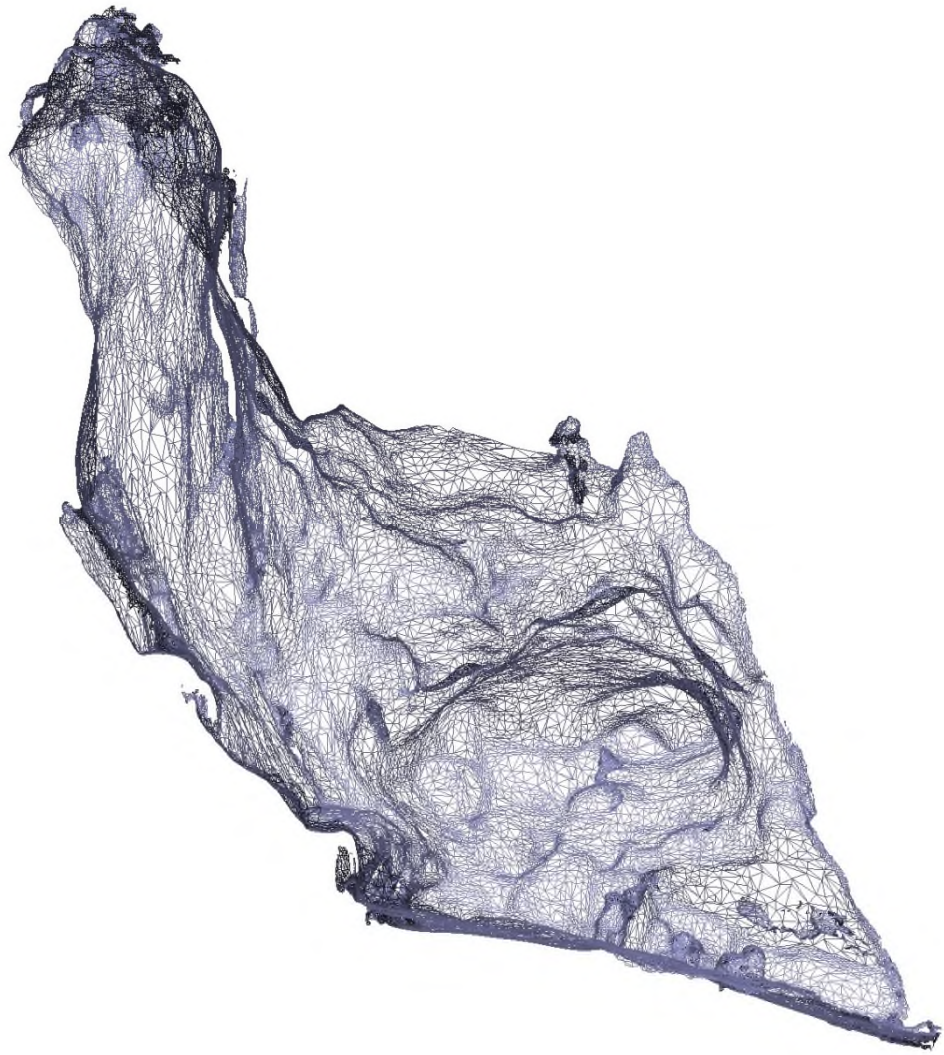


Figure 80 - Upper Cave. Cross-section. High-polygon model

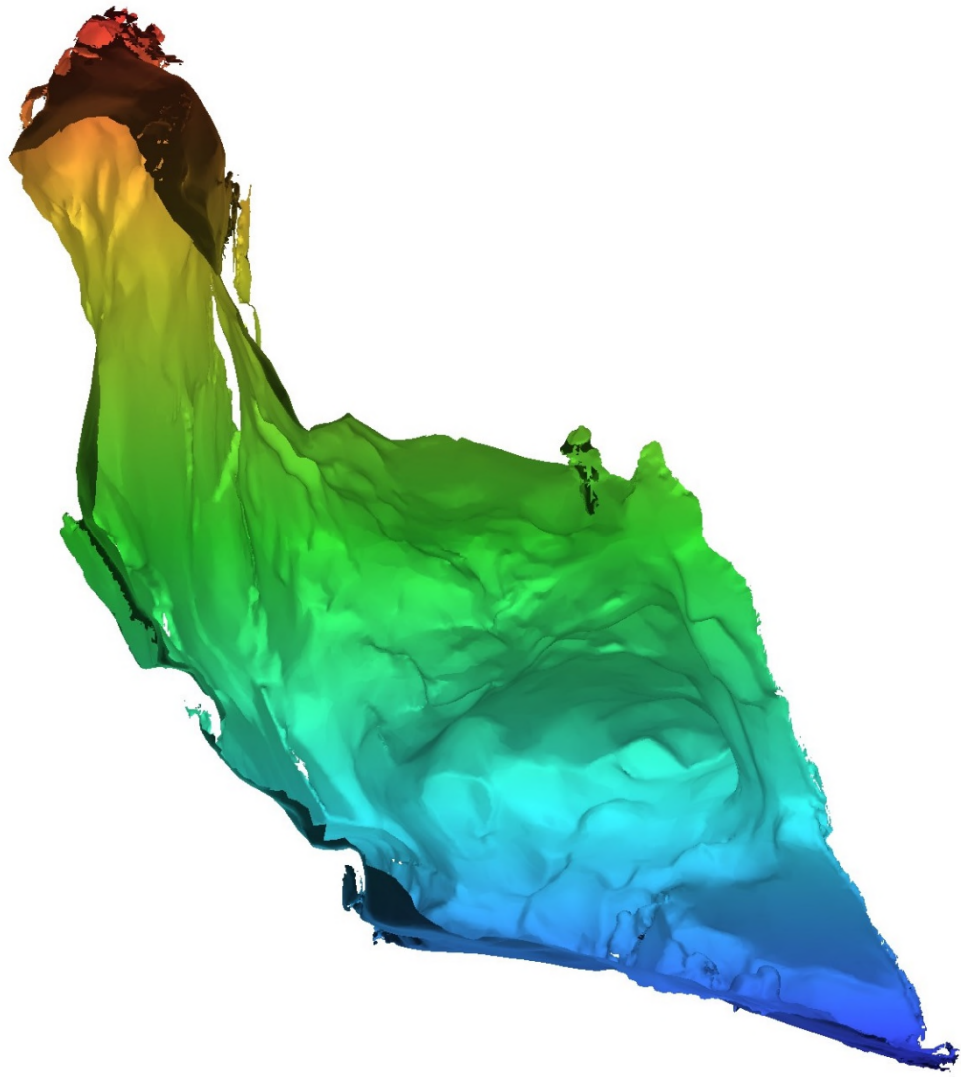


Figure 81 - Upper Cave. Cross-section. DEM model



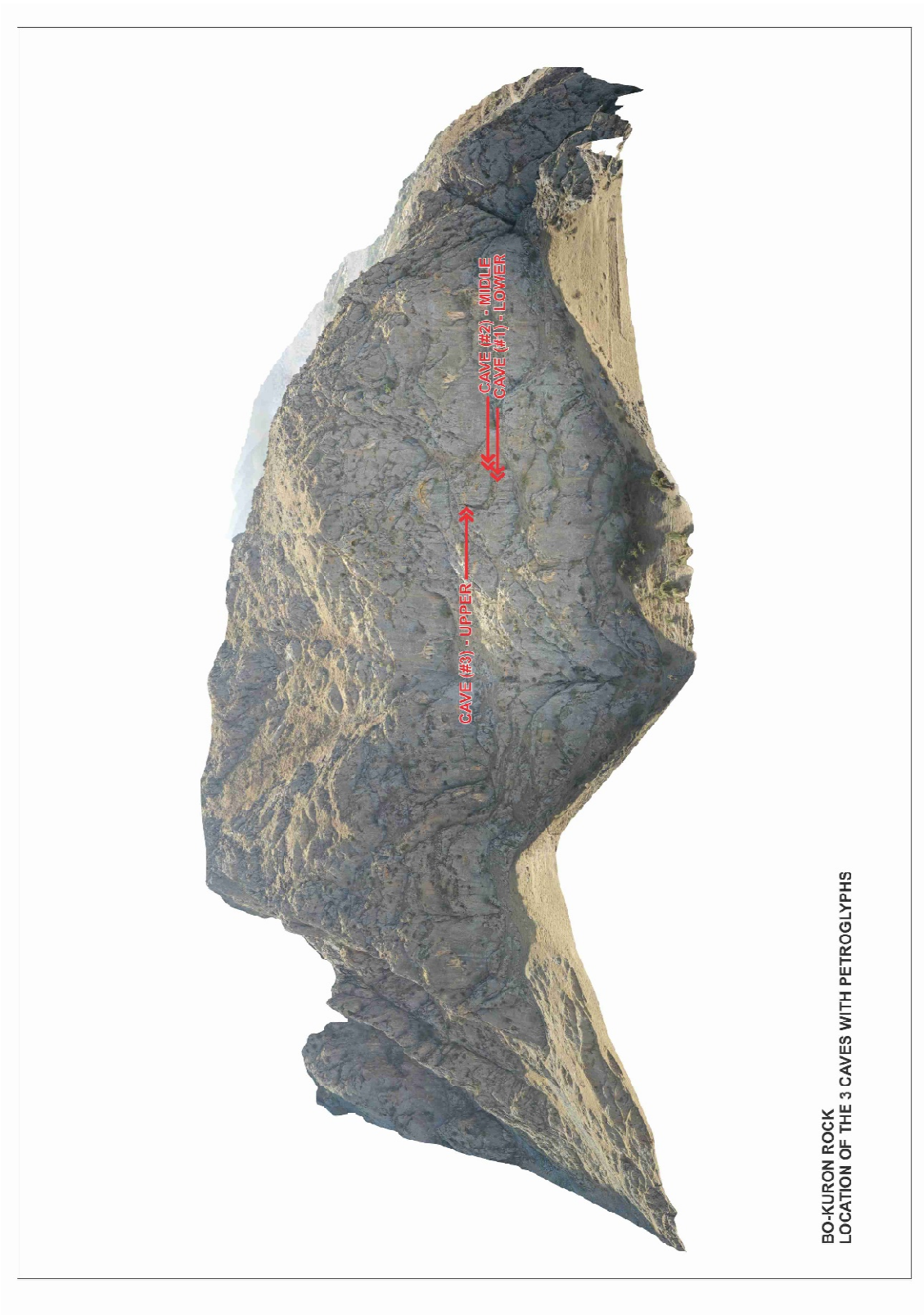
Figure 82 – Upper Cave. Photographic documentation process



Figure 83 – Upper Cave. Panorama



Figure 84 – Upper Cave. Scanning process



BO-KURON ROCK
LOCATION OF THE 3 CAVES WITH PETROGLYPHS

Figure 85 – Diagram of cave locations on the Bo-Kuron cliff



Figure 86 –Bo-Kuron cliff. Textured model



Figure 87 –Bo-Kuron cliff. High-polygon model

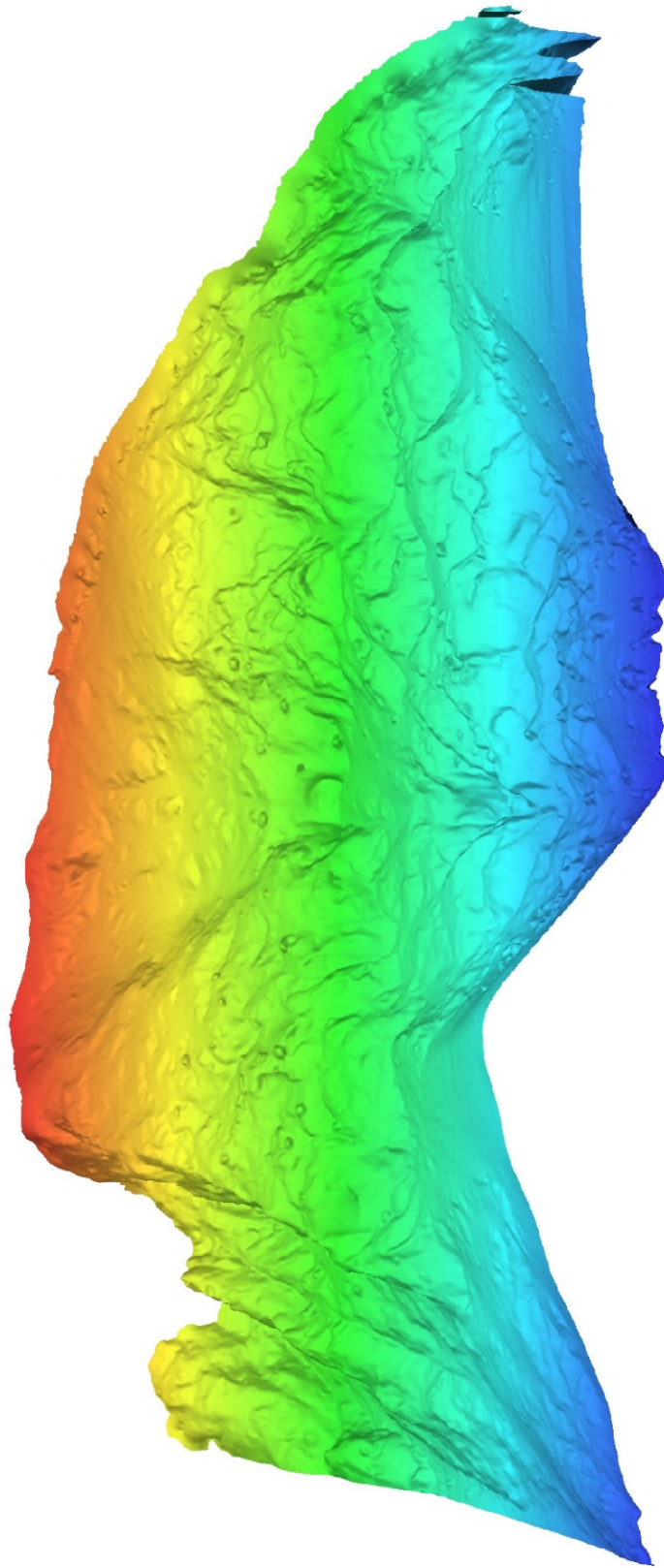


Figure 88 –Bo-Kuron cliff. DEM model



Figure 89 – Process of documenting the excavation using a laser scanner



Figure 90 – Process of documenting rock inscriptions at Kyzyl-Kiya using a laser scanner