Nahal Mahanayeem Outlet Excavation

Report on the 2011 Excavation Season

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Introduction

The fifth excavation season at Nahal Mahanayeem Outlet (NMO) lasted four weeks and took place between August 28 and September 24, 2011. The excavation team was relatively large, roughly 25 excavators, and included students and volunteers from the UK, France, Germany, Italy, Spain, Poland, Holland, Canada and Israel. The goals of the season were to continue excavating in the main excavation area – Area D, in particular towards the north where the excavated squares are rich in finds and to the south, where contact with Area C was to be established. An additional goal was to dig deep "geological" trenches using a tractor in order to clarify the general stratigraphy of the Jordan Bank in the site vicinity. Finally, we planned to open a test pit at the northern-most section of the study area in order to explore the finds of the previous season (see below).

Excavation methodology

Excavation grid and datum were based on the data from the previous season. The use of a Leyca total station device enabled us to return to the same grid and datum with very high precision.

The total station was also used for the recording of all finds, samples, trenches and other reference points and data at the site. Each find and sample has its spatial data recorded and organized within the site's database. Different numbering is used for the recording of flint artifacts, bones, wood and soil samples. The additional category of "other" is used for different raw materials (such as basalt) and for finds that fall outside the above categories.

The water level of the Jordan River was relatively high during the 2011 season. This affected mainly the excavation squares at the west section of Area D. At these squares, the afternoon water level resulted in covering the excavated surface by water. This limited the possible excavation time to mornings only (Fig. 1). During the second half of the excavation, the water level at night rose to the point where water flooded over the lower excavation surface at the north of the site and filled the site. As a result, the first hour or so of each morning was spent by bucket chains to empty water back into the river (Fig. 2)

Figure 1: Area D west squares – morning and afternoon water level

Figure 2: Draining the site after Jordan River flooding.

The 2011 season report by excavation areas

For general location of the areas and trenches see Fig. 3. General stratigraphy of the site is presented in Fig. 4 for additional reference.

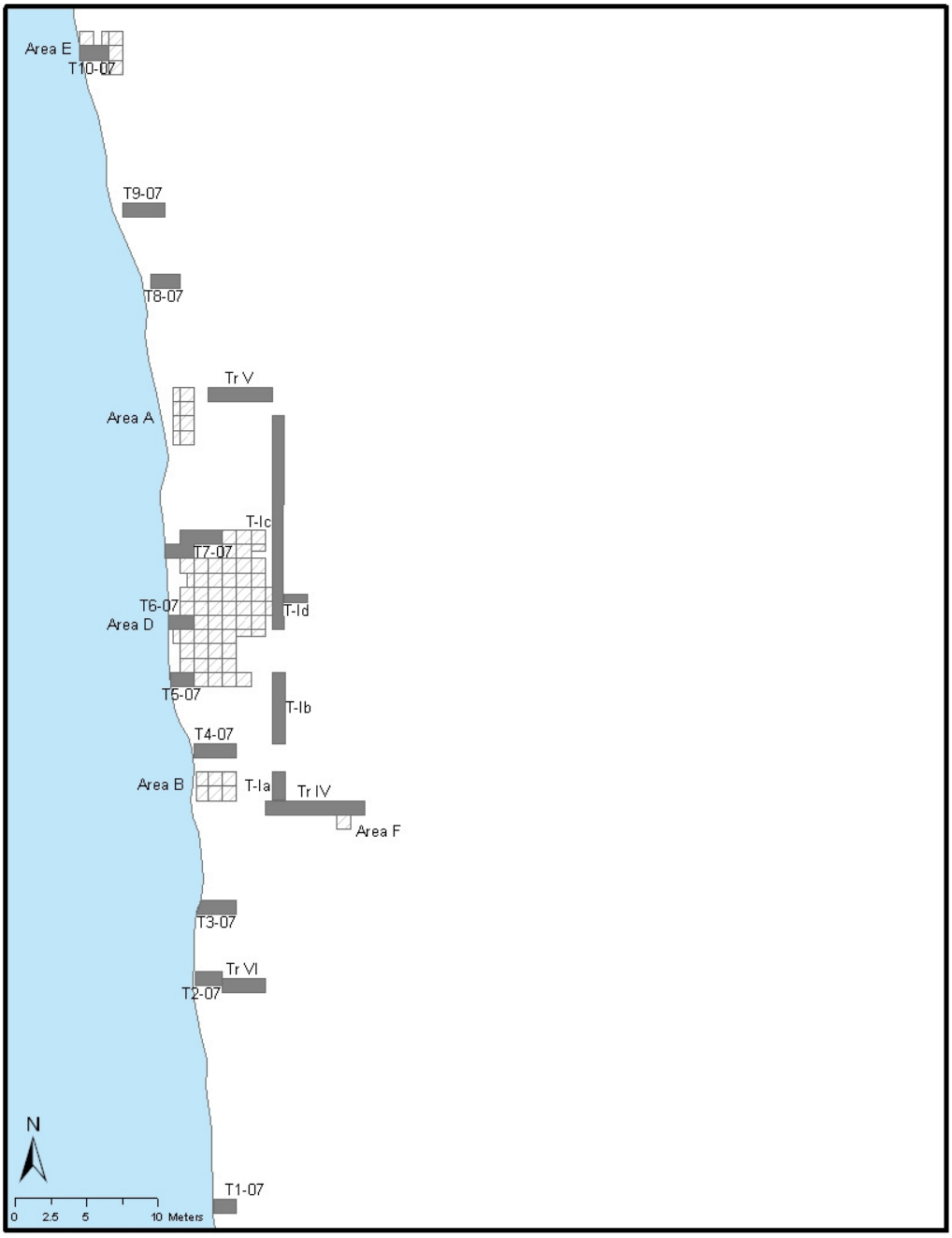

Figure 3: Excavation Location map after the 2011 season

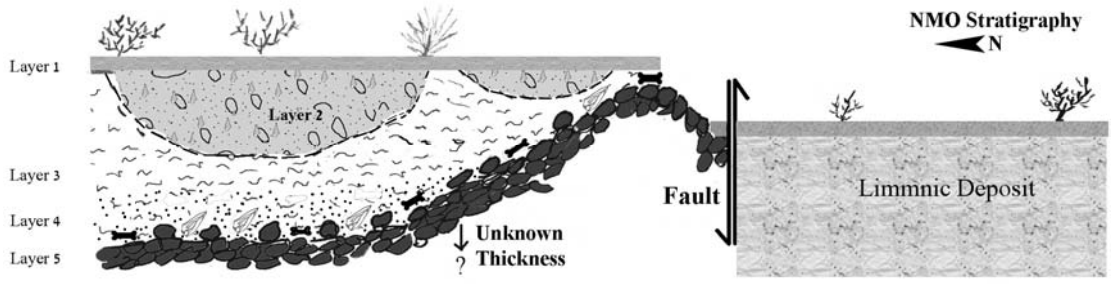

Figure 4: General hypothetical stratigraphy of NMO site.

Trench IV

This geological trench was opened south of the main excavation area D in an attempt to clarify the general geological setting of the site, which has been unclear since the opening of Trench I during the 2007 season (see previous IAA reports). The trench was opened vertically to the Jordan River bank in a 90^{O} angle to the location of the southernmost reach of Trench I. The trench was dug to depth of ca. 3 meters. The different layers were recorded, drawn and sampled. The north face of the trench is presented in Fig. 5.

The Trench IV opening proved to be very helpful in understanding the mysteries of the observations of the 2007 season. As can be seen in Fig. 3, the 2007 Trench I (#6 in the Fig. 5), by chance, hit the contact between the basalt boulders and cobbles (#2) and the light color limmenic deposit (#1). This sharp vertical to surface contact was interpreted as resulting from a fault-line that lifted the much older limmenic deposit (dated by OSL to be ca. 400000 years old or older) to lay in the same level as the Mousterian bearing layers of the Jordan bank. As a result, the west face of Trench Ic (2007) showed only white limmenic sediments, while the east face of the same trench, located only 80 cm to the east, revealed over a meter of basalt cobbles above the white sediment. The opening of Trench IV resolved this question and supported the tectonic fault line hypothesis for this contact.

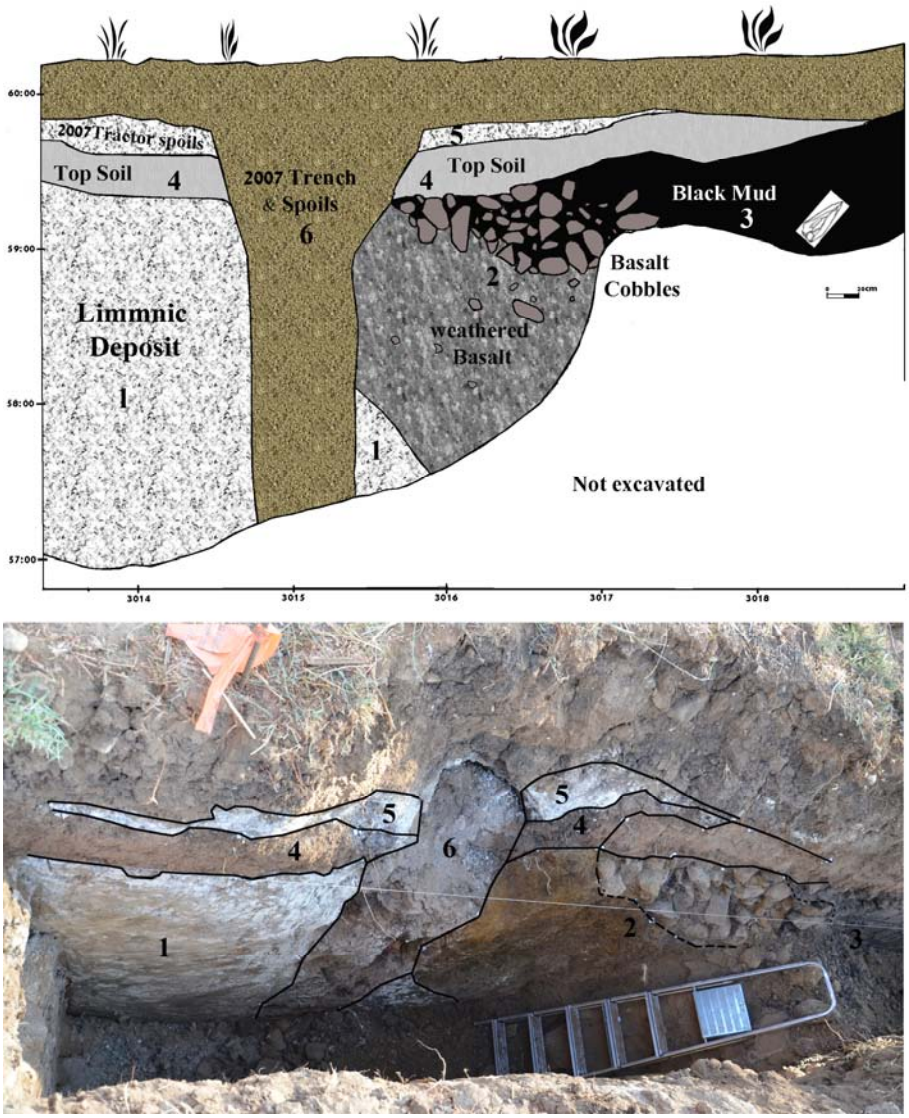

Figure 5: North Face of Trench IV 2011, photograph and section drawing

In addition, the trench clarified the nature of the basalt layer 5 at the base of the excavated sequence of Area D (Fig. 3). It is now clear that this basalt layer, probably deposited by fluvial processes at an unknown date, is more and more weathered as one follows it downward (Fig. 6). This observation, originally made in small scale in a shallow test pit dug in Area D 2008 (see previous reports), is now confirmed.

Figure 6: Weathered basalt at Trench IV

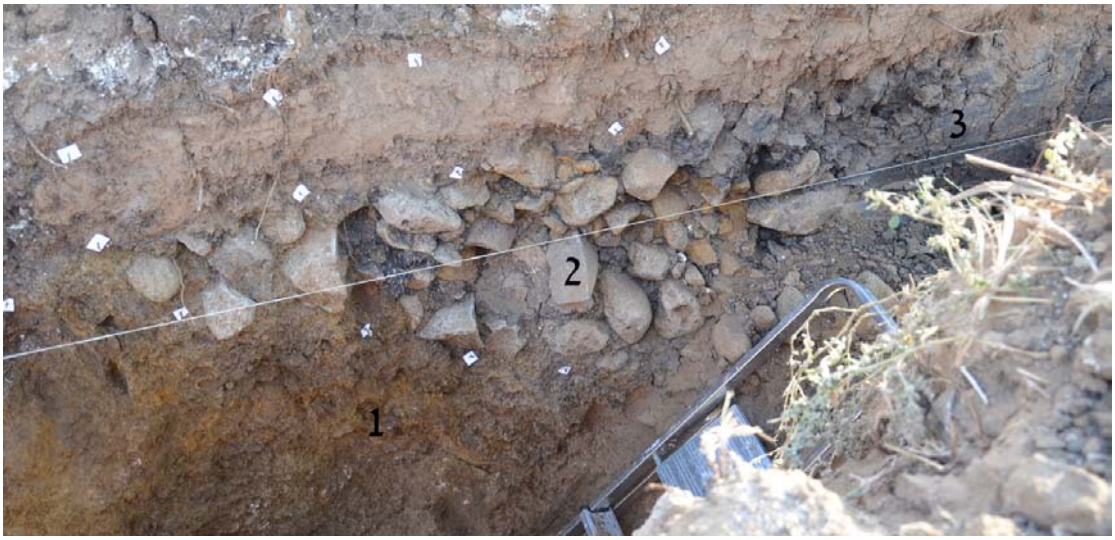

Figure 7: Stratigraphy of basalt and mud in Trench IV. Basalt cobbles and pebbles of Layer b (#2) are weathering into orange clay (#1) downward while protected and preserved upward by the black mud #3.

The upper part of the basaltic layer 5 is covered by the black mud of layer 4. This is the same depositional situation as in Area D. Strong support for this observation comes from the presence of Mousterian flint tools, similar to those of Layer 4 found within this black mud. The excavation of Trench IV has shown that the basalt "hill" at the base of the site's stratigraphic sequence is indeed a hill, covered from the north and east by the black mud of the archaeological finds bearing Layer 4 (Fig. 4). The black clay is removed by the

Jordan River to the west (see below discussion of Area D) and to the south is truncated by the geological fault and the light color limmenic deposit.

At the bottom of Trench IV, at the west section where the trench reaches the deepest part of the white deposit visible, the limmnic deposit shows some interesting features (Fig.8). Some botanical remains were observed as well as shells and possibly some bones. This may indicate a richer environment than what was evident from upper sections of this deposit. Analysis of these layers is ongoing.

Figure 8: Limmnic deposit at the bottom of Trench IV.

To the west the trench cuts into sediment that is lighter in color than the black mud and is spotted with light grey dots. When tested with HCI the white dots are evidently comprised by almost pure carbonate. This origin indicates that they are not the result of basaltic weathering. This spotted clay is similar to the clay observed in the upper layers of Area D and probably indicates younger sediment in comparison to the dark mud of Layer 4.

Area F

As a result of the exposure of the slack mud at the eastern section of Trench IV, and due to the finding of lithic artifacts at this place, a one square meter test pit was excavated into the black mud south of Trench IV in Square T142 (Figs. 3 & 9).

Figure 9: Location of Area F

One and a half meters of sediments were excavated in an attempt to explore the presence of an archaeological layer similar to layer 4 at the contact with the basaltic layer 5 (add the square names and the elevations starting and finish). During the entire excavation, basalt cobbles and boulders were removed, mostly "floating" within the mud (Figs. 10-11). When the basalt layer 5 was reached, and according to the elevation recorded from the section of Trench IV, it become evident that there is only a 50 cm difference in elevation between this basalt (level---) and the highest point exposed in Area D (find level). This mild slanting over ca. 15 meters, from the highest point to Area F, suggests that the "head" of the basalt hill is much flatter than its surface in the northern, western and eastern parts of Area D. We intend to excavate the top of the hill in upcoming

seasons in an attempt to see if this flat surface was used differently by the site's inhabitants.

Figure 10: three excavation stages at Area F

Figure 11: Flint in situ in Area F. Scale 10 cm.

The nature of the sediment was somewhat similar to that of layer 4 but the mud seemed to be thicker, with less sand and small particles. Almost no botanical remains were recovered and bones were also very rare. From the scarcity of lithic artifacts it is evident that this part of the site is of low density. Yet, it is likely that the high elevation of the finds and their relatively long distance from the river dictated drier preservation conditions (maybe only in the years since the drainage operation in 2000) that caused the loss of organic remains.

Trench VI

This short trench (Fig. 12) was dug vertically to the Jordan River next to the basalt boulders exposed on the river bank south of the excavation area. It was dug into the white limmenic sediment forming the bank at this section of the site (see previous reports). The aim was to explore the nature of the white sediment here and to understand the contact between it and the large basalt boulders believed to represent a basalt flow.

As in previous attempts to study this section of the Jordan Bank the geology of Trench VI exposed only white limmnic sediment with lenses of grey clay. This material was described in past reports and the primary contribution of this trench to our knowledge of the site was that it confirmed that the basalt boulders at the bank of the Jordan River are "floating" within the limmnic sediment. An additional contribution is the observation by Johannes of very long vertical cracks in the sediment. These are penetrating into a depth of more than 2 meters (the original thickness of the layer, removed by tractors, is of course unknown) and were filled with clay (Fig 12). This hypothesis still needs to be proven.

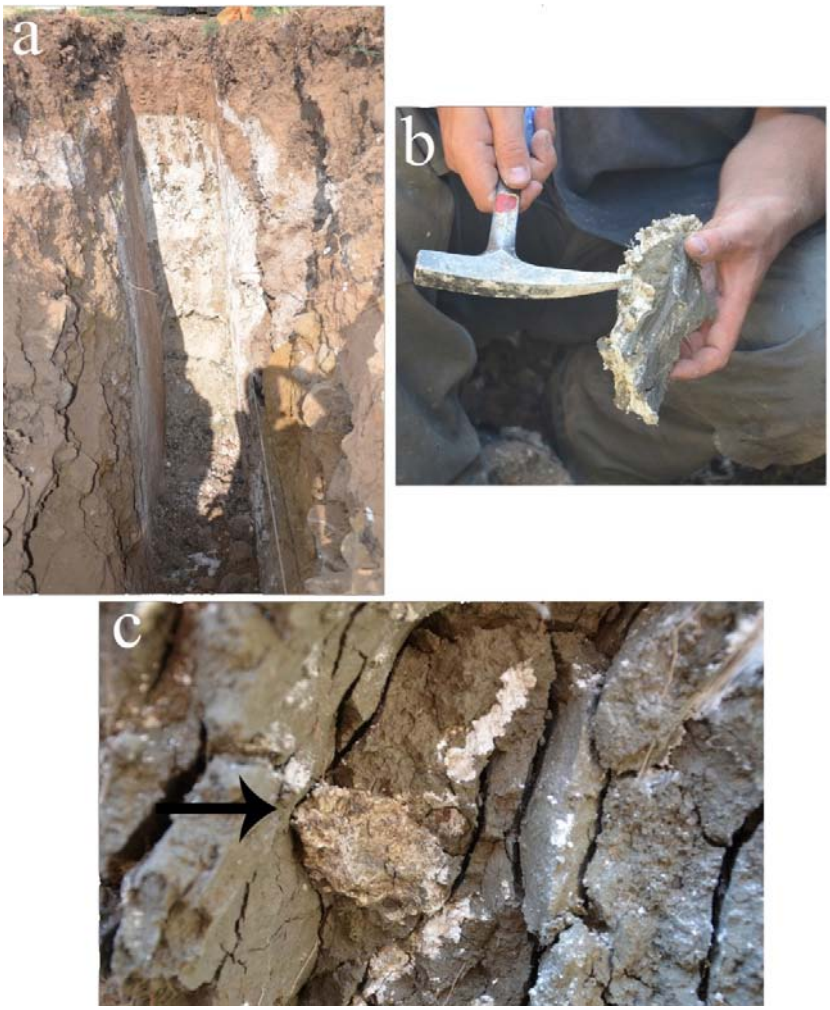

Figure 12: Trench VI. a. general look of the trench to the east; b. carbonate within clay; c. carbonate lens in situ.

Trench V

This Trench was dug north of Area D in an attempt to identify the channel holding the lithic assemblage of Area A excavated in 2007. It was dug perpendicularly to the Jordan River bank (Fig. 3) to a depth of ca. 3 meters. The results are series of clays in different colors, showing very nice slick & slide surfaces (mirror surfaces or shpigel surfaces in the German term), somewhat similar to the clays excavated near Area A in 2007. However, no traces of the channel were found and only a single flake (not indicative of archaeological tradition) was collected from the bottom of the trench.

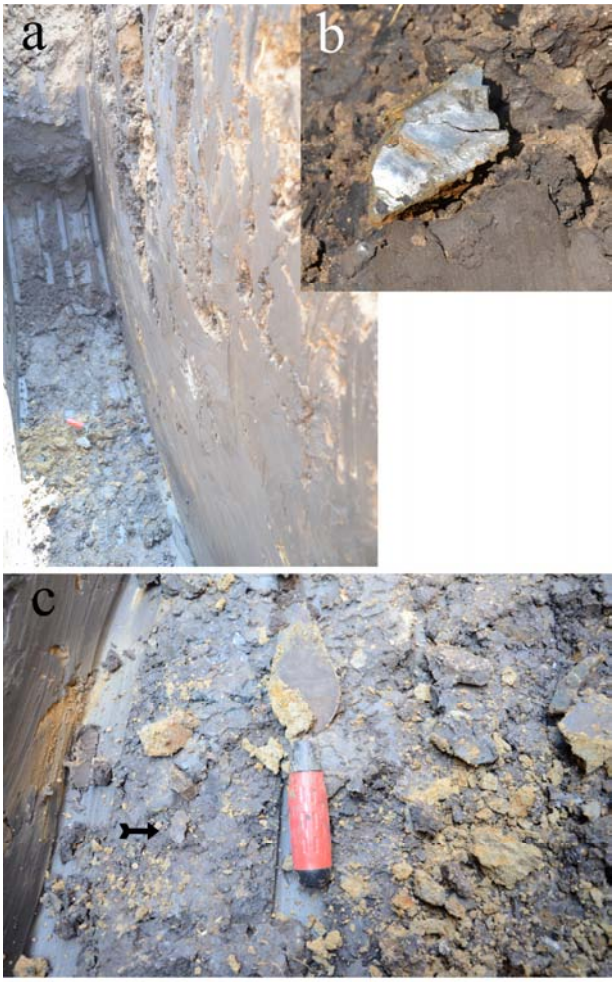

Figure 13: Trench V sediments: a. a general look at trench section; b. "mirror" surface of clay sliding; c. close-up of the Trench V lower point. Arrow indicates location of flint flake.

Area E

Six one-square meter excavation squares were opened on the bank of the Jordan River in the location where promising finds were exposed at Section 10-07 in previous seasons (Fig. 14). In order to enable excavation below water level at these squares, as water level in the Jordan was changing at a range of ca. 50 cm during the day, the squares actually excavated were primarily the C squares while the B line squares were left as a wall between the excavation area and the river. The study of Section 10-07 in previous seasons indicated the presence of an archaeological layer at water level, some 100 cm below the excavation starting level (Fig. 15). Hence, the top layers, formed primarily of dark mud, were excavated using 20 cm spits.

Figure 14: Excavation squares of Area E

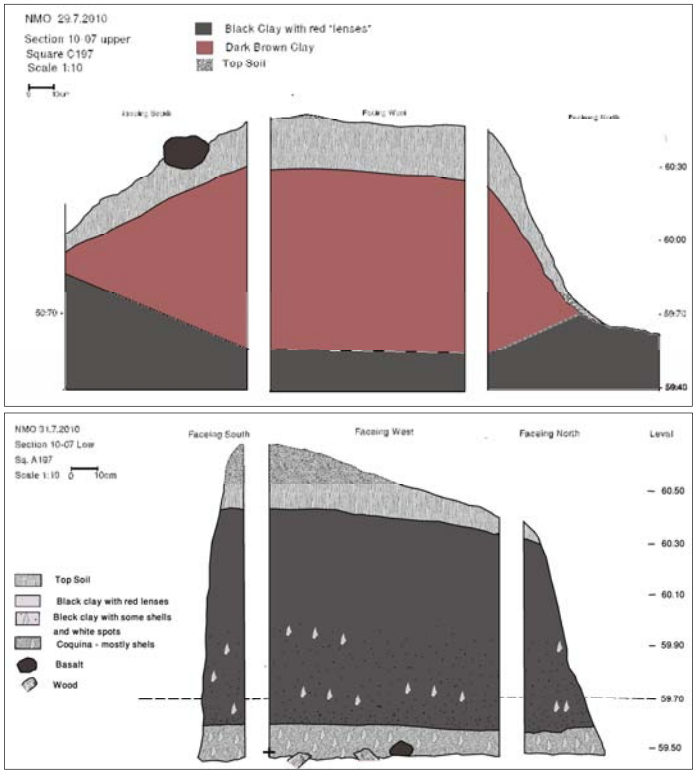

Figure 15: Drawing of the Section 10-07 2010 test pit upper and lower parts (see 2010 IAA report)

Excavation at Area E, C squares upper section exposed grey mud that showed a sharp contact with black mud (Figs. 15 & 16). This is similar to the contact exposed in the test excavation during the 2010 season. This contact may represent the contact between upper grey and lower black mud exposed in Area D.

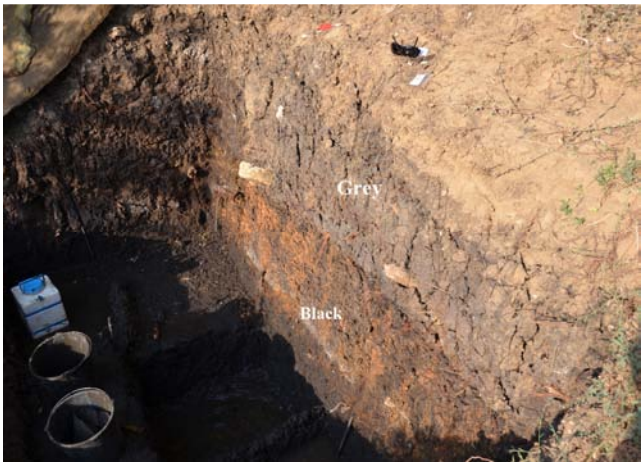

Figure 16: Contact between upper grey and lower black mud at eastern section of Area E. Lower dark mud is oxidized after exposure to air.

The upper part of the excavation, into the mud, both grey and black, revealed only few flint tools, one of which was a point “floating” in the mud. Additional basalt cobbles and a bone or two also were found. However, the density of the finds was very low. The mud, when dried, was subjected to oxidation and was weathered in small cubes, making it difficult to sieve in water. It did not contain finds of any kind.

As the excavation continued, the mud remained similar in nature. Upon reaching the water level of the river, water was coming into the excavation area through the wall and the excavation become very muddy and water had to be removed using buckets every morning (Fig. 17). Excavation in the afternoon became impossible. Interestingly, the mud was reported to smell (stink was the term used) from organic material. This smell was also observed in the lab when sorting the sediments after sieving.

Upon reaching the level of approximately 60m ASL a basalt pile was exposed. This pile, made of cobbles and pebbles, was topped by a layer very rich in mollusks. The mollusks layer is only some 10-20 cm thick and the dominant species seems to include primary melanopsis and unia. This layer micro-fauna bones as well as seeds and fruits in a unique condition of preservation. In addition, some well-preserved wood and bark pieces were exposed.

Figure 17: Water in Area E.

The final stratigraphy of this section of the Jordan River is described as follows (top down; Fig 18 & 19):

1. Recent sandy soil of the present day Jordan
2. Grey mud, probably similar to the mud in Area D.
3. Black mud, underling the grey mud with a sharp contact tilted towards the east. An OSL date from this mud gave an age of 74±3 k years BP.
4. Moving downward within the black clay, the number of mollusk shells increases until at a level of 58:65 (at some places) a layer of sandy coquina appears. This is a relatively thin layer of 10 cm or less, covering a basalt cobble and pebble layer formed in the shape of a small hill. The sandy layer is very rich in bones (mainly small), wood and flint tools. It is most likely shore material of a lake. All material including micro-botanical remains are in prime state of preservation.
5. A layer of basalt cobbles and pebbles is then observed, covered by the sandy layer. It is in the shape of a small hill or a bar. Unfortunately, it seems to either slant strongly to the east or to disappear at this point, so only a small area was exposed. The flint, wood and bones are found lying on the basalt as well as between the basalt cobbles.
6. When removing the basalt cobbles and pebbles a white clay layer or lens was observed, in which flint flakes were abound (Fig. XX). The nature of this white lens is yet not understood.

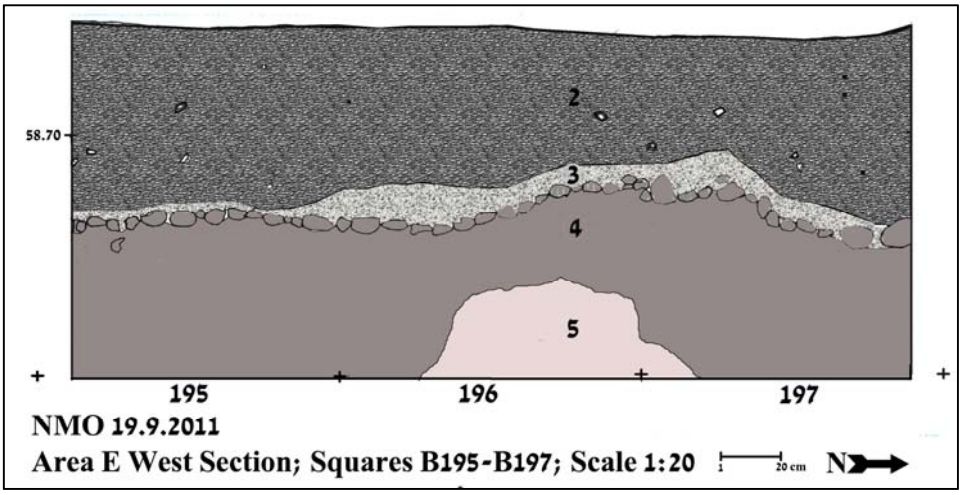

Figure 18: Area E Section West stratigraphy.

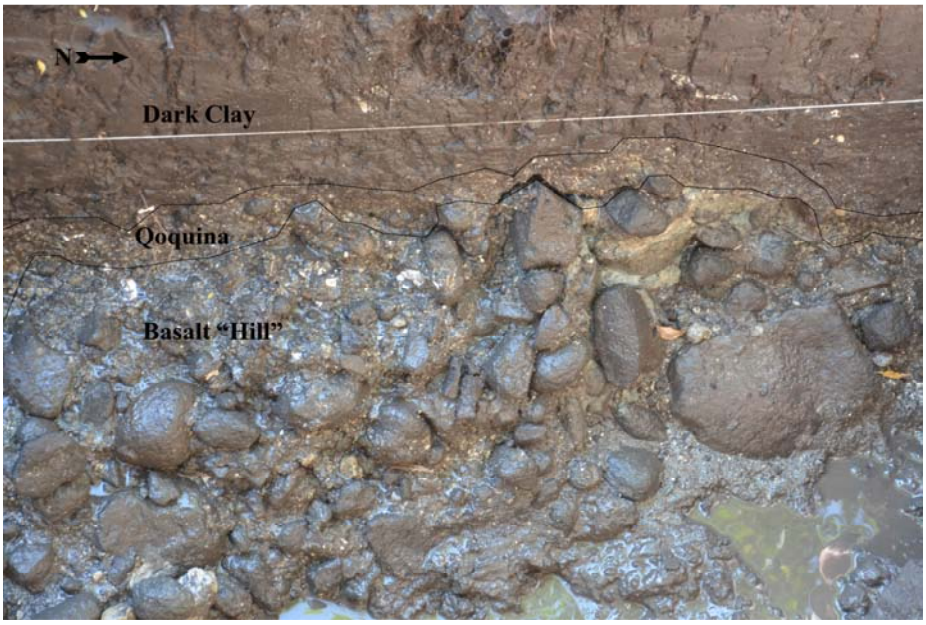

Figure 19: Area E West Section stratigraphy photo.

In summary, the excavation at Area E exposed a very interesting sequence, showing exceptional preservation of organic materials at some of the layers and a lithic assemblage that, when analyzed, will be shown to belong to the Mousterian tradition, but very different in nature from the Area D assemblage. Unfortunately, the small exposure available for study due to the small area preserved at the river bank and the underwater nature of the excavation will not allow further excavation of these layers.


Figure 20: Basalt "hill" at Area E. Note the flint tools.

Figure 21: Flint tool, bones and wood laying on basalt layer at Area E. Scale 10 cm.

Figure 22: Two views of large wood fragments on top of basalt at Area E.

Figure 23: Lens of off-white clay inside basalt hill.

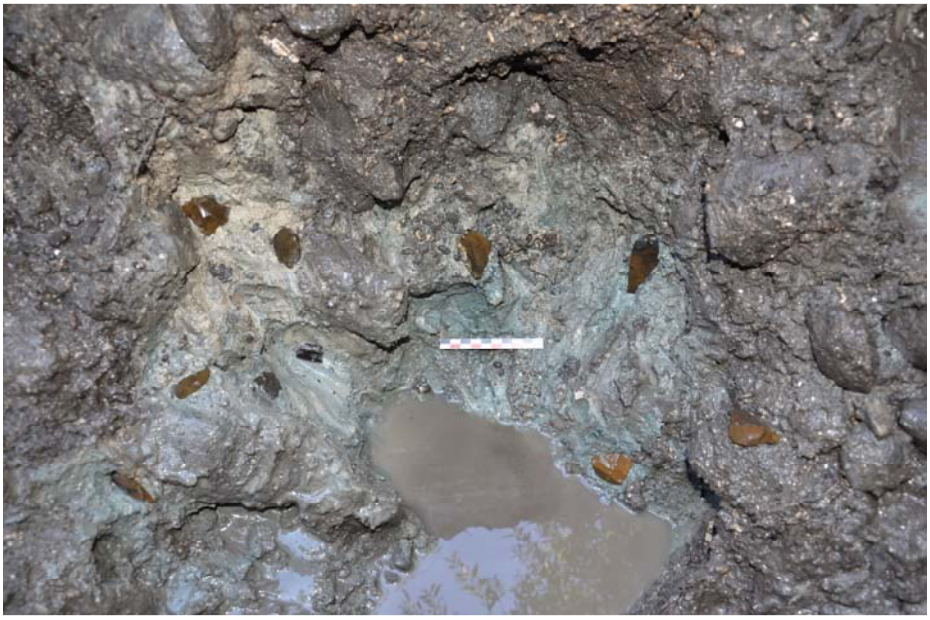

Figure 24: Flint tools scattered within white lens inside basalt "hill" at the bottom of Area E.

Area D

The primary excavation area of the site, Area D was excavated with the goal of continuing the previous season excavation by enlarging the excavation area in particular sections of interest. The focus of the 2012 season was on squares at the northern, southern and western parts of Area D (fig. 25). The following description will give an overview of the results according to the Area D parts.

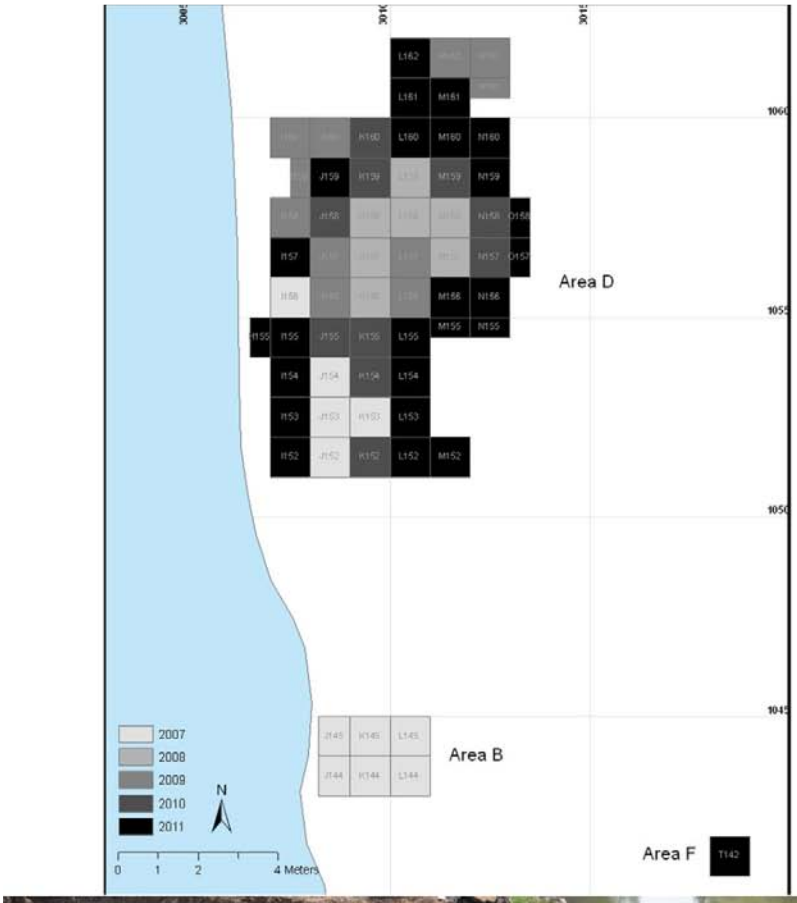

Figure 25: Area D after the 2011 Season

North Squares

The goal of excavation in these squares was to enlarge the excavated surface and to continue the work in the squares that were not fully excavated in the previous year, some of which were among the richest in finds in the site. Fig. 25 shows the location of the squares described here.

Excavation in Squares L162 and M161 started at a high level of more than 50 cm above the neighboring squares to the south. All of the sediment that had to be removed to reach the excavation level was dark mud. Excavation was conducted in 10 cm spits and, as a rule, only one of five buckets was sieved. At both squares, the density of finds was very low. Only a few flint tools and bones were found but, typical to the site, these were either points or knives. At Square L162 at a level of 59:20 a scatter of finds floating in the mud appeared. It included 2 basalt cobbles, a bone and a large flint knife (Fig 26). Interestingly, the large flint knife excavated here was refitted into the large sequence of flakes (see below) with flakes originating on the basalt in L160.

Figure 26: Finds at square L162 level 59:20

Figure 27: Area D north squares

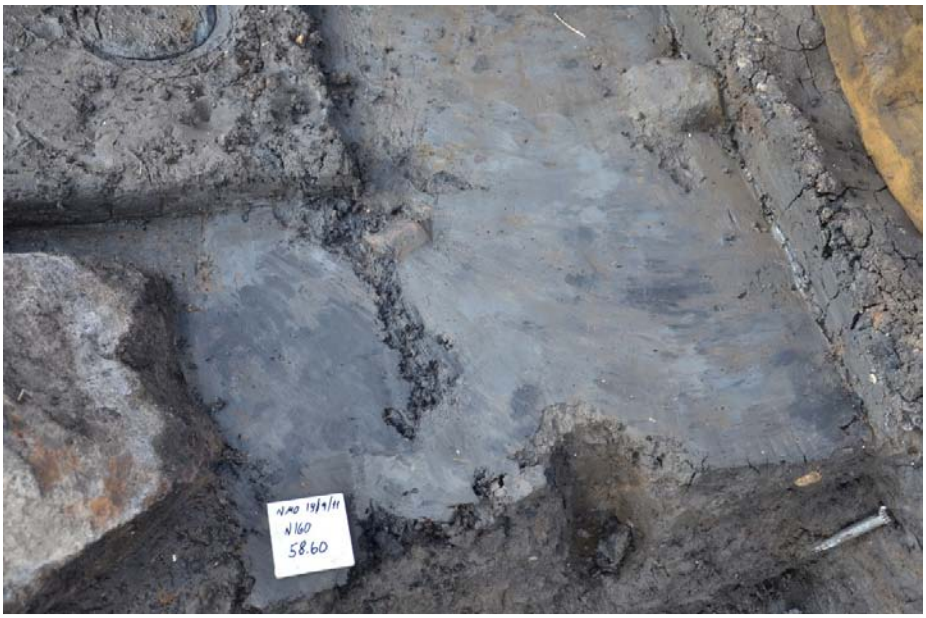

Figure 28: Sediments at square N160

Figure 29: Layer 4 sediments at square L161

Figure 30: Wood in square L161: a. tip of wood as first exposed; b. wood during excavation. Arrows indicate bone and flint finds nest to wood; c. wood exposed; d. removal of wood.

The three 160 squares – L160, M160 and N160 (Fig. 27) were excavated and each show different results. Square M160 was very rich in finds in most of the square, with the flint tools and bones reaching the basalt floor of layer 5 in a similar matter to the previous years. At the east half of this square, and in particularly in square N160, the density of finds decreased to almost zero. The sediment of these squares is comprised of mud in different colors forming some kind of lenses and spots (Fig. 28). The nature of these sediments is still unclear. At square L160, the richest in the 2010 season, no finds were exposed for most levels. Sediment was similar to the Layer 4 typical sediment – sandy, with many small particles of light grey color basalt but with no finds (Fig.29). This strange distribution of finds may suggest an anthropologic agent to the scatter distribution. Only at the lower part, after a gap of ca. 20cm, a large tip of wood branch was exposed (Fig. 30a). This wood was followed north, into a sub-square of the north neighboring square L161. It may be either a branch or a root of a tree. Flint tools and bones were exposed next to the wood (Fig. 30c). It seems that the wood is lying on the basalt floor, but this will be studied next season. The presence of wood and finds after over 20cm clean of finds suggests that there is a gap in the finds in this square but only a spatial study can answer this question. GIS analysis of the finds from this layer (Fig. 31) clearly shows this gap on horizontal scale and confirms this observation.

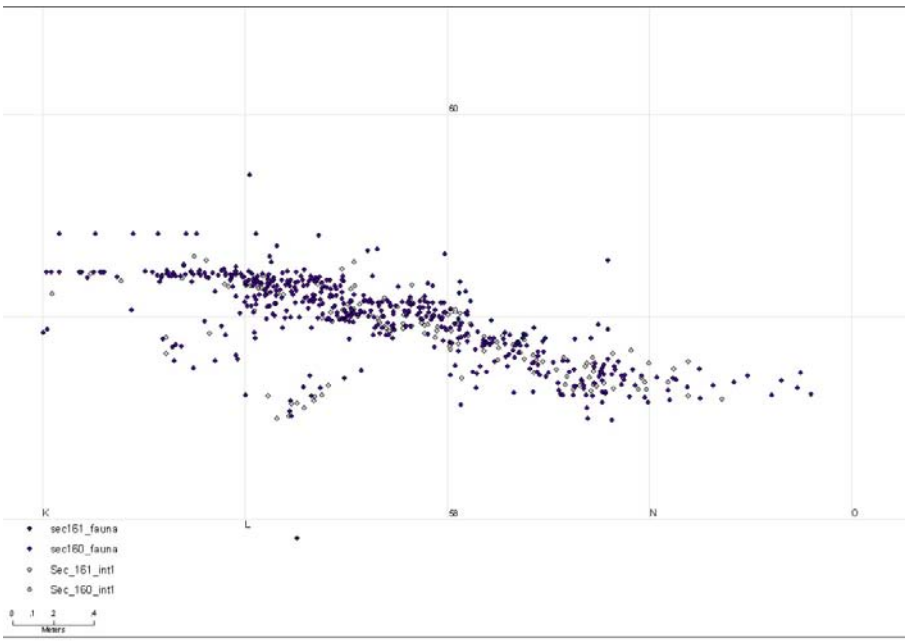

Figure 31: East west section of finds in squares 160-161 showing gap in finds at squares L.

West Squares

This line of squares, mostly belonging to the I line squares (Figs. 1, 3 & 32), was excavated also in previous years, including a test excavation to the lower level at Section 6-07 in the 2007 season. However, only during the 2011 season was the excavation deep enough and wide enough to allow some more conclusive observations. It should be noted that due to their location on the immediate bank of the Jordan River these squares were affected by changing water level. As a result of water rising during the day, excavation was possible only during the mornings. More important, these squares were cut by the channel of the Jordan River, possibly artificially dug by tractor during drainage, so only the western half of most of them survived. The observations obtained increase our understanding of several aspects of the site as follows:

Figure 32: Area D and west squares.

Excavation of these squares exposed the western face of the basalt floor of Layer 5. They show a relatively steep face slanting strongly to the west creating a kind of a low "wall" edge to the basalt pile (Fig. 32). This edge may reflect water activity in an old channel that cut into the basalt hill after it was formed. Similar formations are visible in recent day basaltic stream fans entering the Hula Valley from the east. This observation supports the fluvial origin of the basalt hill of layer 5.

It can be suggested that the steep nature of this "western wall" is a result of heavy machinery activity during drainage operations. This hypothesis should be rejected as rich archaeological layers are attached to this wall from the west and indicate an in situ nature of the finds (Figs. 33-35). The archaeological layers were accumulating next to the basalt hill when it was already standing in its present form and were not removed by tractor activity. Furthermore, some of the finds were exposed from within the basalt cobbles and in small niches of sediments penetrating into the basalt from the west. This indicates that the basalt may have seen small collapses during occupation that were later sealed by the sediments (Fig. 36).

As mentioned above, the west squares were rich in finds, both in stone tools and bones. They are also rich in botanical remains and in oxidized concritions ("gingim" – see 2010 report). The richest parts were the south squares of I-154 to I-157, immediately west of the top of the basalt hill. Finds density decreased towards the north, but excavation in these squares was not completed and this picture may change next season.

Figure 33: Bones and flint in Square I154

Figure 34: Bones and flint tools attached to the west to the basalt “wall” in square I154

Figure 35: Large bone (scapula?) in square I 157.

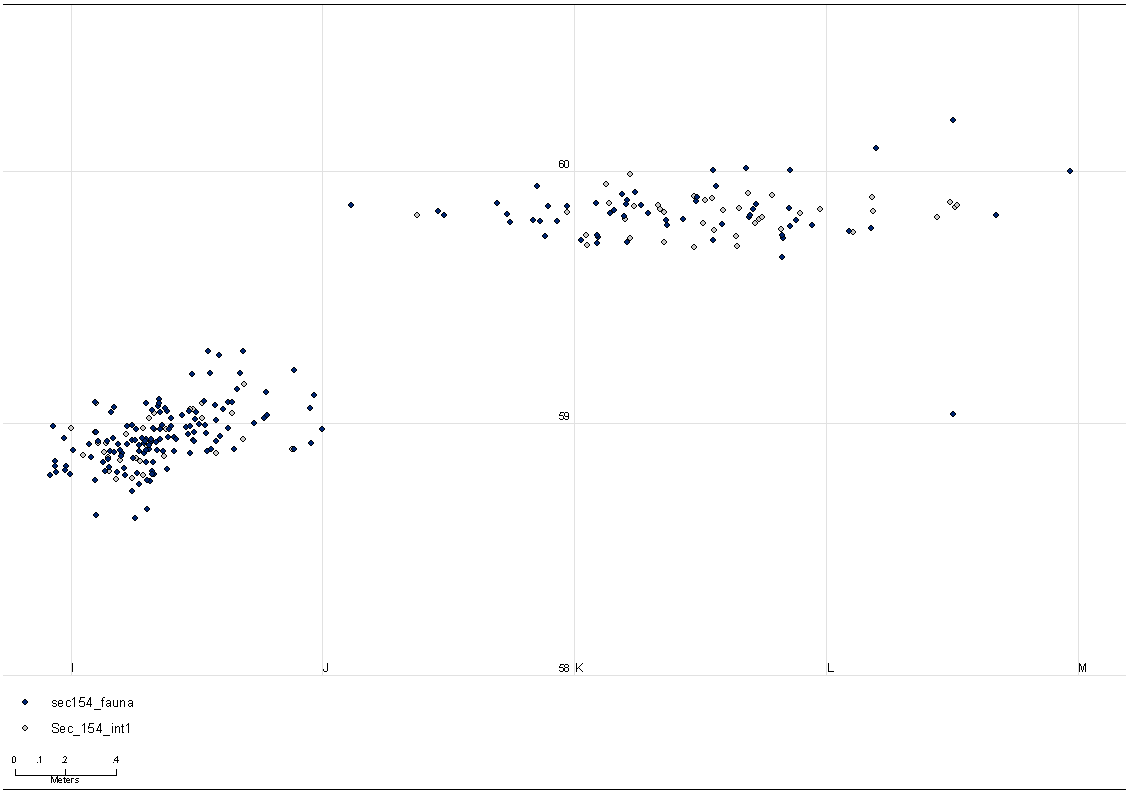

Figure 36: East west section of finds along the 154 line. Note the drop between basalt hill and "west squares".

The archaeological layer 4, rich in finds, was followed downward and was demonstrated to "finish" in a sharp contact between layers. This contact is dropping from the west to the east (Fig. 37). Below it, a layer of grey mud was exposed, sterile of any archaeological finds. This suggests the assumption that the basalt hill was found by the site inhabitants in its present day form.

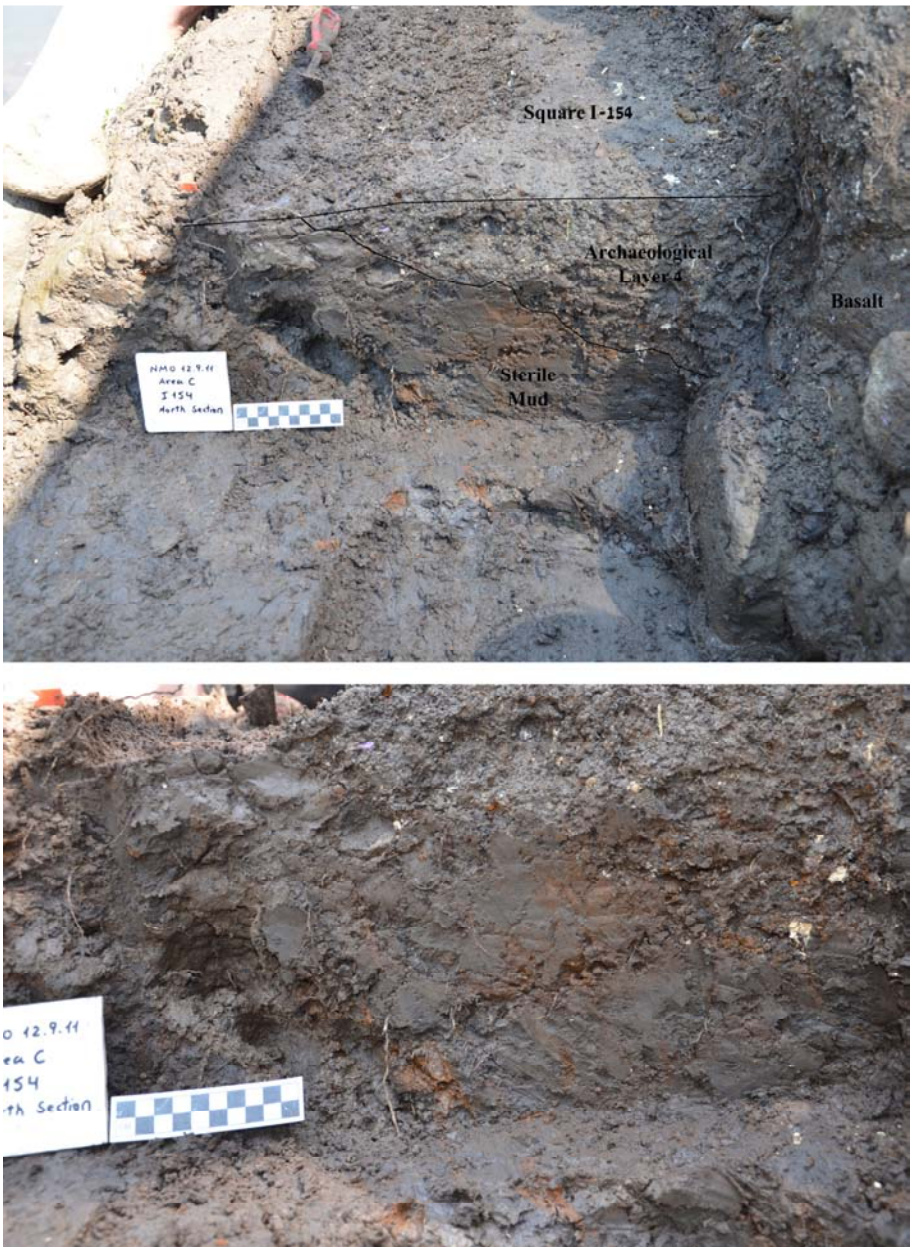

Figure 37: North (upper) and South (lower) Section of square I154 showing contact between archaeological layer 5 and the underlying, archaeologically sterile, mud layer in the west of the site.

South Squares – top of the hill

These squares (Fig. 25), are located in the contact between Area C (2007) and Area D. Archaeologically and stratigraphically they are located at the top of the basalt hill of Layer 5. To the north and south, the hill slants gradually downward. The presence of basalt cobbles in Area F and in Trench IV suggests that the gradient from the top toward the southeast (0.5 meters over 10 meters) is not as dramatic as that to the northeast (2 meters over 5 meters). Therefore, we are expecting interesting data from the excavation of this more "flat" surface in the next seasons.

The sediment covering the basalt here is dark mud, with basalt pebbles appearing in the sediment some 10-15 cm before the basalt surface. No evidence for human utilization was recorded on this basalt. Stone tools and bones are found in the mud above the basalt and immediately over it. Some of the bones are "stuck" in the mud in a tilted rather than horizontal position.

Stone tools and bones are quite dense in these squares (in NMO criteria) with the flint tools somewhat less fresh than the ones in the topographically lower squares to the north (Fig.38). Bone preservation level is certainly lower than in the northern and western squares, possibly due to less water in the sediment or, alternatively, due to longer exposure to atmospheric conditions before cover. If the basalt of Layer 5 was indeed a hill at the time of occupation, of which the lower parts were covered in mud and water, the bones and tools discarded at these parts of the site were either deposited in the mud or covered very quickly, while the higher parts of the hill, which were not covered with water, were exposed to air for a longer time and were covered only at a later stage.

Figure 38: Four stages of finds in square K153. Last stage - basalt Layer 5 is fully exposed.

To the south, a very clear contact between the lower dark mud and upper sandy trench material is visible. This most likely represents a trench of the paleo-Jordan (or paleo Mahanayeem), adjacent to the current Jordan channel, cutting the sediments from above.

At sub-square b (North West) of square L155 a sharp contact between black and grey muds was observed (Fig. 39). This is the same contact known from the north section of Area D. This observation, together with previous recording of this contact in the north and east sections of Area D has enabled us to locate the margins of this large land slide toward the east that seems to have affected the upper part of the site stratigraphic sequence.

Figure 39: black and grey mud contact in square L153.

Refitting

Lab work during 2011-2012 yielded many additional refitting's within the flint assemblage. These new refits contribute a great deal of data to our understanding the technology and behavior of the sites inhabitants. The full results still awaits publication. Yet, the data collected so far contribute to the establishment of the primary depositional status of the site. This can be observed from the distribution map presented in Fig. 40 below:

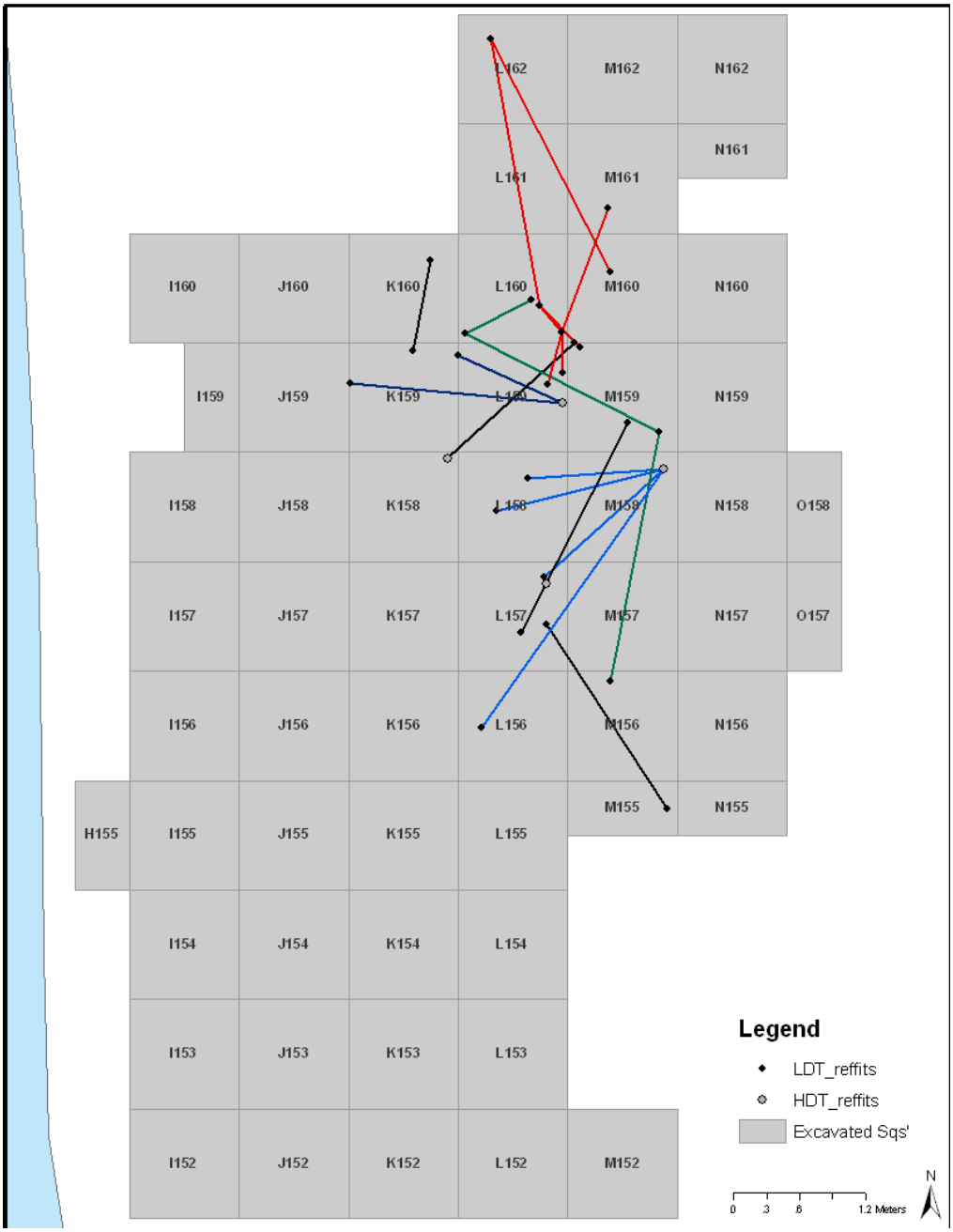

Figure 40: Refitted flint artifacts spatial distribution in Area D.

The Research Plan and Collaboration for Excavation Season 2012

As presented in the IAA license request submitted on May 2012:

The work plan is to continue the excavation according to the guidelines of previous seasons. The multidisciplinary project includes expanded excavation of the site to enlarge the fauna, flora and lithic sample sizes, as well as the study of the spatial distributions of the finds, the nature of occupation and the stratigraphy and geology of the site layers. The analysis of the finds will focus on the study of the botanical material aiming to reconstruct the vegetarian diet and paleo-environmental background for human activity in the region. Techno-typological analysis of the lithic assemblage and study of the faunal remains and their spatial distribution will contribute to our understanding of MP open-air and task-specific behaviors. Refitting of flint tools was achieved as part of the study of the NMO lithic assemblage. These results will contribute greatly to our understanding of the site's formation processes as well as the spatial distribution of the site and the technological behavior of its Mousterian inhabitants (see 2011 site report).

The primary goals of the continued excavation are to extend the excavation in an effort to enlarge the data sets available for the occupation layers exposed during the initial excavation seasons of 2007-2011 (see attached maps). The excavation work plan is based upon results from previously excavated surfaces, the extensive geo-archaeological survey completed in 2002 and the geological section and trenches dug in 2007-2011. The specific objectives of the 2012 season are:

To expand the excavated surface of Area D from the ~30m2 excavated to date, in order to explore the spatial distribution of the finds, refine the stratigraphy and enlarge the sample of stone tools, fauna and flora. Special attention will be paid to the understanding of the nature of the basalt floor of Layer 5 (see previous seasons reports submitted to the IAA).