JRD

Jordan River Dureijat (JRD)

2016 Excavation Report

Excavation Permit Number – G/68-2016

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האוניברסיטה העברית בירושלים
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INTRODUCTION

The site of JRD was discovered during the massive drainage operation of the Jordan River in December 1999 (Sharon et al. 2002). The site was first observed in piles of sediment on the banks of the river some 1300m north of the Benot Ya'aqov Bridge (Fig.1c) and finds were collected from the piles on the east bank. In the summer of 2002, a survey was conducted to evaluate the damage of the drainage operation. During this survey, a test excavation of one square meter (Section 6-02) was dug on the east bank of the Jordan River. A full account of the results of the 2002 survey and test excavation was published (Marder et al. 2015). Please refer to this publication for details and data regarding past research at the site. For a description of the 2014 test excavation season at JRD please refer to the 2014 report submitted to the IAA June 2015. For details and data regarding the 2015 excavation season please refer to the 2015 report submitted to the IAA May 2016.

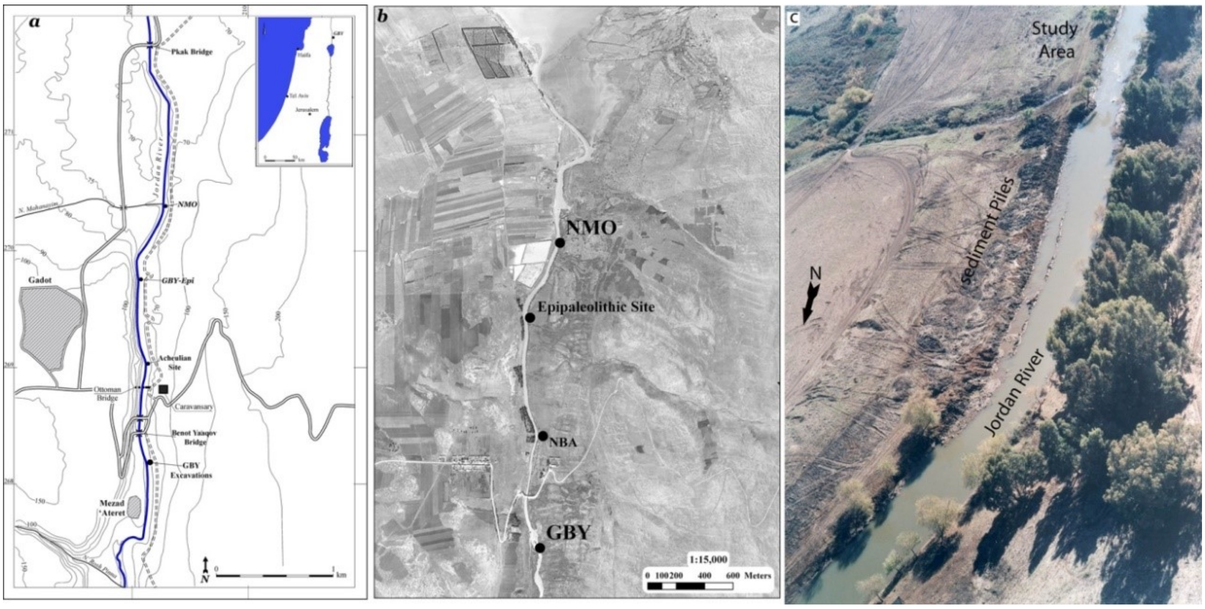

Figure 1: a. JRD location map; b. location of prehistoric sites on 1945 aerial photo; and c. view of the site during drainage work in 1999.

JRD 2016 EXCAVATION SEASON

The 2016 excavation season at JRD took place between September 2 and September 29, 2016; Excavation permit – G/68-2016, renewal of permit G-83/2015. The team included some 40 students from the Tel-Hai College archaeological excavation field school (each participating in 2 weeks of excavation) and volunteers from Iceland, Spain, Italy, UK, USA and, of course, Israel. Area supervision, recording, and measuring were conducted by Francesco Valletta, Laura Centi (Italy, The Hebrew University), and Jorge Calvo Gómez (Spain).

The primary objectives of the 2016 excavation season were:

1. To enlarge the surface area excavated during the 2015 season.
2. To expose Layer 5, the deepest layer reached during the 2015 season.
3. To excavate the top layers of the archaeological sequence, which were largely missed during the 2015 season by extending Area B toward the north.
4. To establish the chronology of the site's layers by collecting controlled samples for 14C dating.
5. To collect soil samples for sedimentological study of the layers and for pollen analysis.

Excavation methodology

The primary goal of the 2016 JRD excavation season was to expose a large surface area and to reconstruct the spatial distribution and patterns of finds. The site was marked by a 1-square meter grid. Each square was subdivided into 4 50^2cm sub-squares (fig. 2). Each excavator was in charge of 1-square meter. The excavation was recorded by each of the excavators on a daily page (See Appendix 1). The excavation was executed in 5 cm spits and all finds were left in place and recorded in situ prior to removal from the square. Recording of the artifacts was done by Leica Total Station device where all finds larger than 3 cm are recorded. Smaller finds were collected into "general bags" sorted by material (flint, bone, botanic etc.). All soil samples and other important features were also recorded by the Total Station. All sediments were collected in buckets and sieved in the Jordan River using 0.2mm mesh sieves. In some cases, for example in layers sterile of finds, only a sample of sediments was collected. In most cases, sampling was of a single bucket per spit per square. Any sampling was noted in the daily excavation page. All daily pages are part of this report. Sediments and pollen samples were collected by the geology (S. Mischke and L. Bunin) and pollen (D. Langgot; Fig. 3) experts using their own specific methodology. All samples were recorded by the total station for location data.

Figure 2: JRD Area B at the end of the 2016 excavation season

Figure 3: Pollen sampling of Area B East Section –"master section"

Geology of JRD

The logging and sampling of sediments on the exposed eastern and southern walls of excavation Area B was conducted by three geology students from the University of Iceland under the direction of Professor Steffen Mischke. After reviewing the stratigraphy established during the 2015 field season we chose to focus on a representative section of Area B's east wall. Continuous sampling of this "master section" at a vertical resolution of 1 centimeter yielded 131 samples and reached the base of Layer 4 (fig. 3). Because the 2016 excavation exposed lower stratigraphic levels in the southwest of Area B, the samples from the east wall master section were supplemented by a second set of 1-cm samples taken from the south wall. These samples from the south wall cover Layers 4 and 5. All samples were shipped to the University of Iceland at the conclusion of the excavation season.

Stratigraphy and Chronology

The sedimentological analysis of the sampled "master section" produced a stratigraphic log of Area B stratigraphy (Fig. 4). The logs show alternating layers of sandy, shell-rich sediments and fine-grained sediments containing few-to-no shells. We suggest that the shell horizons were deposited at the margin of the lake during low stands while the muddier, archaeologically barren layers represent deposition in a deeper environment. Layers 1 and 2 are excluded from this assessment as radiocarbon dating performed on charcoal recovered from Layer 2 provided a modern age. The sharp contact between the sand of Layer 2 and the underlying shells of Layer 3 is interpreted as erosional and may represent a significant gap in the sedimentary record (Fig. 5).

The sets of shell horizons and associated underlying mud units that make up Layers 3, 4 and 5 are interpreted as reflecting deposition in an environment where the distance from the lakeshore to the study area is changing cyclically. Shell horizons in these layers are not uniformly thick throughout the excavation area, and in some places bifurcation of individual shell horizons may indicate locally higher sedimentation rates (Fig. 5).

Six radiocarbon dates from charcoals recovered in 2016 were used to date Layers 3, 4, and 5 (Table 1). This radiocarbon-derived chronology fits well with the chronology developed from analysis of the site's archaeological artifacts (Fig. 4). In Layers 3 and 4, the dates preliminarily suggest that each cycle of sedimentation lasted for 1.5-3 ka, except in the case of Layer 3-B, which appears to have been deposited more or less instantaneously. It is unlikely that sedimentation rates during periods of beach facies formation match sedimentation rates during times of lake mud deposition. We hope to clarify this with the submission of six additional charcoals for radiocarbon dating in spring 2017 (locations marked by grey arrows in logs (Fig. 4).

Area B – 2016 excavation

Between the seasons, the excavated area is covered by sediments for protection and preservation. Hence, the beginning of each season the site is measured to ensure the accuracy of the reopening and the attachment to previous year grid (Fig. 6). At the next stage, the sediments are dug using a JCB excavator to expose the excavated surface (Fig. 7). The final cleaning of the last 10-20 cm of sediments is done by hand to prevent damage to the excavated surface (Fig. 8).

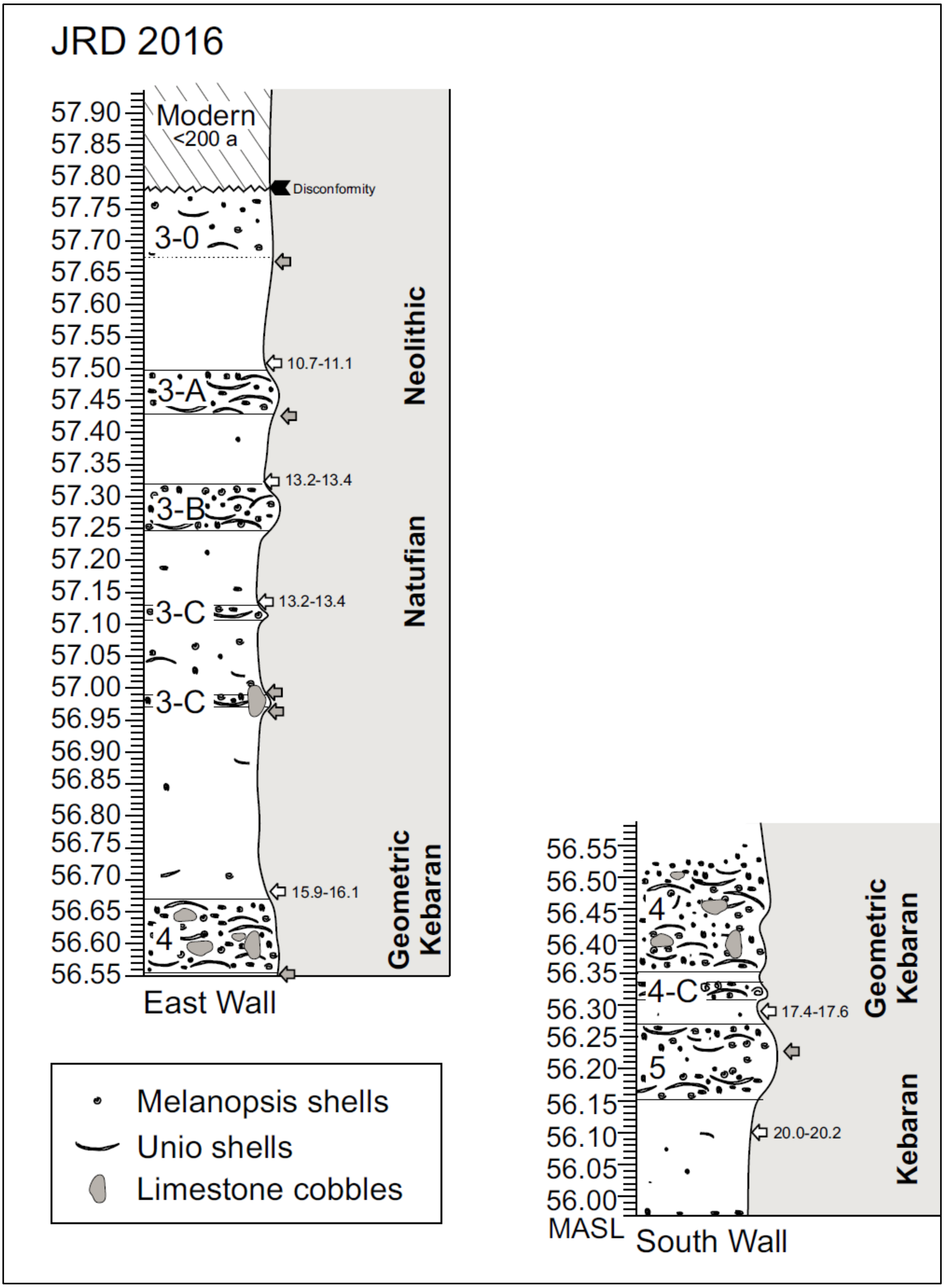

Figure 4: Stratigraphy of exposed walls of the JRD site. Ages (white arrows) are calibrated radiocarbon dates in thousands of years BP. Gray arrows indicate stratigraphic intervals that will be dated in the coming months.

Table 1 Radiocarbon dates as reported by Beta Analytics. Calibrations were performed by the dating lab using the INTCAL13 database (Reimer et al 2013)

Sample Location	Measured Radiocarbon Age	Conventional Radiocarbon Age	2σ Calibration	Lab Number
Layer 2	190 ± 30 ^{14}C BP	170 +/- 30 BP	Cal AD 1925 AD to Post 1950	Beta - 457485
Base of 3-0 mud	9570 ± 40 ^{14}C BP	9570 ± 40 ^{14}C BP	11,120 to 10,730 cal BP	Beta - 457486
Top of 3-B Shells	11270 ± 40 ^{14}C BP	11480 ± 40 ^{14}C BP	13,415 to 13,260 cal BP	Beta - 457487
Base of 3-B mud	11490 ± 40 ^{14}C BP	11480 ± 40 ^{14}C BP	13,415 to 13,260 cal BP	Beta - 457488
Base of 3-C mud	13320 ± 40 ^{14}C BP	13330 ± 40 ^{14}C BP	16,145 to 15,935 cal BP	Beta - 457489
Layer 4-C mud	14350 ± 40 ^{14}C BP	14390 ± 40 ^{14}C BP	17,625 to 17,455 cal BP	Beta - 457490
Layer 5 mud	16660 ± 50 ^{14}C BP	16660 ± 50 ^{14}C BP	20,205 to 19,995 cal BP	Beta - 547491

Figure 5: JRD stratigraphy – Section South 2016


Figure 6: Preseason measurement of the site


Figure 7: Area B exposed by tractor before cleaning

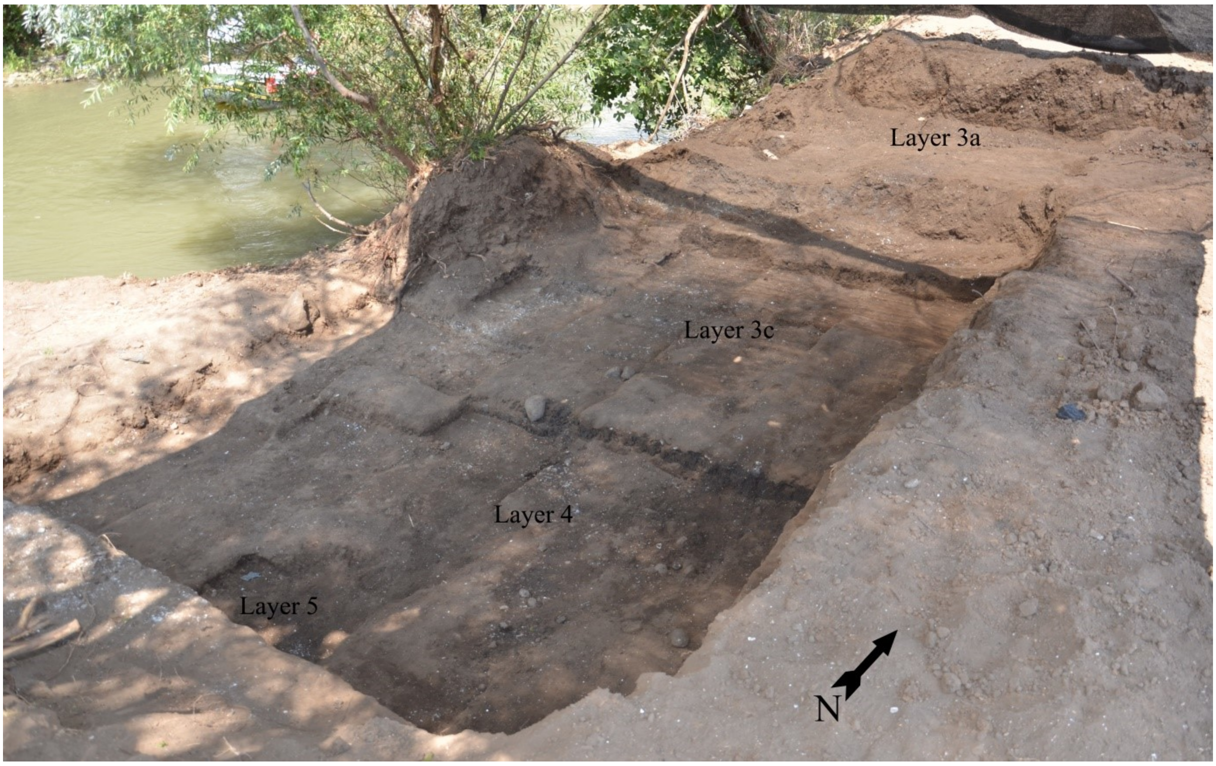

Figure 8: Area B clean prior to excavation, September 2016.

As mentioned above, the goals of the 2016 excavation season at JRD Area B were to:

1. Extend the exposure of the most recent layers of the site's sequence, mainly the Natufian Layers 3a and 3b that were only minimally excavated during the 2015 season. This was achieved by extending the excavated surface toward the north; opening two additional rows of squares numbered 102 and 103 (see Fig. 9).
2. To complete the exposure of Layer 3c in the Area B northern squares excavated in 2015 and to remove this layer in order to expose layer 4 in these squares.
3. To complete the exposure of Layer 4 in the Area B southern squares and to expose Layer 5 in the southern portion of Area B.

Area B Northern Squares

The results of the 2015 excavation season indicated the presence of archaeological layers at the top of the sequence that were not excavated due to their exposure by the tractor shovel during the opening of Area B at the beginning of the 2015 season. These layers, identified immediately under the sandy Layer 2, were visible at the northern section of Area B (Fig. 10) and were laying below the exposed surface of the 2014 test excavation of Area B1 (Fig. 11). Eight additional squares were opened in 2016 to the north of Area B, limited to the north by the 2014 Trench 2 (Figs. 9 & 12).

Figure 9: Area B at the end of the 2016 season. Squares opened at the north sector of the excavation area at bottom.

Figure 10: North section of Area B at the end of the 2015 season.

Figure 11: Area B1 and Trench 2 to its north at the end of 2014 season

Figure 12: North sector of Area B before excavation 2016

At squares Q-102 & Q-103, the uppermost layer of the JRD sequence, Layer 3-0 (or top-3) was exposed. Its appearance is marked by the exposure of numerus basalt cobbles and pebbles "floating" at a level of ~57.80. A lower, similar level was exposed at a level of ~57.65 (Fig. 13). It may be that the level thickness is 10-20 cm or that some separate horizons can be identified. The excavated area (only ca. 2 meter^2) and the nature of the sediment (hard mud) made observation difficult. Spatial analysis of the finds as recorded by the total station may add more information. The layer consisted primarily of basalt cobbles, relatively angulated in shape, with a few limestone pebbles (most of them heavily weathered) and flint flakes (a total of less than 10 flints for the entire level. No bones were exposed in this layer (Fig. 14). Some of the basalt were knapped by possibly humans but the entire layer may be of fluvial origin and not anthropogenic. The layer was exposed in the two squares, documented and removed.

Figure 13: Layer 3-0 (top3) at level of ca. 57.75 in Square Q-103.

Figure 14: Layer 3-0 exposed in Square Q-102 Level 57:65

After removing the mud below level 3-0, to a level of c. 57.30, a layer rich in mollusks began to emerge. This is the top of Layer 3a. At this level, the first finds included flints, numerous small basalt pebbles, limestones, a few bones (including a carnivore canine) and a wealth of Unio shells (Fig. 15).

Layer 3a

Layer 3a was exposed during the 2016 season in squares N-102, N-103, O-102, O-103, Q-102 & Q-103 all in the northern sector of Area B (Fig. 9). During the 2015 season, layer 3a was excavated primarily in the northern squares of Area B, in squares N-100, N101, O-100 & O-101 in what was named the Natufian Patch (see 2015 IAA report). Layer 3a did not yield significant finds in the southern sector of Area B (squares in rows 99 to 96) because it was the first layer to be exposed when removing the top soil (Layers 1 & 2) by the tractor. An additional reason may be that the local nature of the deposit was more significant in the north (the patch) and thinner toward the south.

Excavation of the rich "Natufian patch" during the 2015 season was the reason why we opened the squares to the north of Area B in the 2016 season, namely the two rows of squares 102 and 103. The northern edge of this sector is bordered by the geological trench 2 dug during the 2014 season (Fig. 11 – 2014).

Layer 3a was exposed under the gray sandy mud below layer 3-0. The top of the layer is exposed at a level of roughly 57:30. Its appearance is marked by looser sediment, numerous shells of Unio and many pebbles, primarily of basalt. The pebbles are ca. 5 cm in maximal diameter and mostly rounded. Limestone appears in smaller amounts, some of which are similar in morphology to the typical net sinkers of the lower levels. Flint artifacts were found infrequently but nonetheless represent significant numbers (Figs. 16-21). It is important to note that natural (un-knapped) flint is totally absent from this layer.

Figure 15: first exposure of Layer 3a "roof" in Area B north sector squares.

The wealth of Unio shells is notable. The sediment seems to be almost Unio shell coquina in some squares. The shells are white in color and mostly open, indicating that this is not their "living" habitat, rather they were brought in and piled together by an external agent (see discussion below: Layer 4). It is impossible, at the current state of knowledge, to say whether humans were involved in this accumulation or whether it was fully natural (lake-shore deposit). It should be noted that occasional closed valve shells can be found within the 3a sediments.

Figure 16: Layer 3ai at Level of 57:27

Figure 17: Layer 3ai in North sector of Area B

Figure 18: Layer 3ai in square P-103. Note flint artifacts. Scale 10 cm.

Preliminary observations suggest that layer 3a can be divided into sub-layers (Fig. 19). The uppermost part of this layer is comprised of a wealth of small stones embedded within many Unio Shells and is rich in finds. This horizon was named 3ai. The thickness of this sublayer is similar to the size of the stones, normally <5cm. When the stones of 3ai are removed, a layer comprised of almost only Unio shells is exposed. This horizon is poor in finds and in stones, a few cm in thickness and was named 3aii. Below 3aii, an additional layer of small stone was exposed in squares o-102 7 O-103, similar in nature to horizon 3ai. This layer, 3aiii revealed the rich horizon in Figure 24.

Figure 19: Stratigraphy of Layer 3a in Northern Sector during excavation.

Figure 20: large bone in Square O-103 (?) Layer 3ai

Figure 21: Location of arrowhead found in Layer 3ai Square N-103b (marked by the scale arrow)

Figure 22: El Hiyam type arrowhead from Layer 3ai

Figure 23: Layer 3ai Northern Sector finds: basalt line fishing net and carnivore canine

Figure 24: Square O-103d at level 57:22. Layer 3aiii. Gazelle horn core and other finds.

Recording of Layer 3a – the layer is deposited within fine and loose sediment and comprised primarily of small basalt stones. Documenting of the layer is problematic as exposure is time consuming and the little stones tend to move when exposed. The method of recording was set as follows: Drawing (Fig. 25) – only large basalt stones (~>10cm or significant) were drawn. The small basalt stones were drawn as a raster only. All flint, bones, and limestones were drawn. When recording, only basalt >5cm were recorded. Only the basalt artifacts were kept.

The other basalts were recorded by total number and discarded. Non-worked limestone was recorded individually but collected in a single bag per sub-square. All flint and bones were recorded and collected.

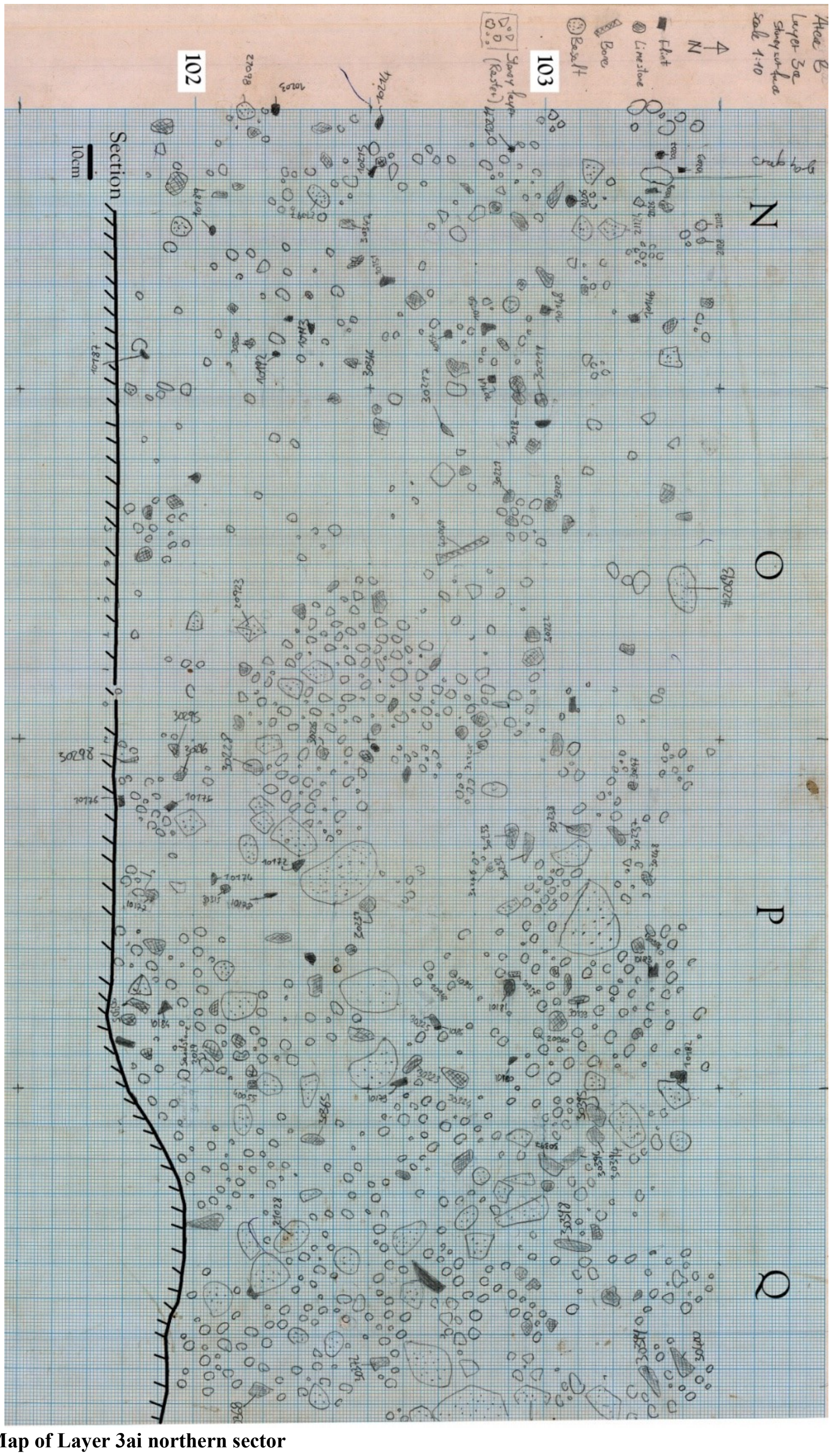

Figure 25: Map of Layer 3ai northern sector

Layer 3a finds

The study of the layer 3a finds is ongoing. However, preliminary observations regarding the most significant finds can be made. The most significant find of the 2016 season were the 3 additional bone fish hooks from Layer 3a (Fig. 26). Two of the hooks were found during the sorting of the sediments and the third, very small and badly preserved was found in situ in layer 3aii. The total number of fish hooks from JRD is now six. The other 3 hooks were found in Layer 3b. The 3a hooks are somewhat smaller but more study is needed before further observations can be made. Next to the fish hooks, additional line weights were found (Figs 23 & 27). A large basalt pebble with a grove around it was found in-situ in Layer 3aii (Fig. 23); the other two are smaller and made of limestone.

One of the more significant finds of Layer 3a is the flint blades with typical sickle shine on their cutting edge (Fig. 28). The shine is well-developed and it seems that they were used for intensive harvest (or alternatively for harvest of tough material such as cane). Typologically, they are quite large, the cutting edge is unmodified, and the backing is either nonexistent or irregular. Such sickle blades are typical of the Final Natufian in sites like Nahal Ein Gev II (L. Grosman, personal com.).

Figure 26: bone fish hooks from Layer 3a 2016

Figure 27: Line fishing weights of Layer 3a 2016. Right – limestone; Left – basalt.

Figure 28: Layer 3a 2016 sickle blades. Typologically similar to the Late Natufian sickle blades of Nahal Ein Gev II (L. Grosman, personal comm).

Layer 3c

At the end of the 2015 season, we believed that we had completely removed Layer 3c (Natufian) from the southern half of Area B, and that only a small portion remained to be removed from some of the northern section squares. The plan was to finish the exposure of mud 3c (below Layer 3c) and to reach Layer 4 in most of the areas. However, it turned out that Layer 3c was much thicker toward the northeast, reaching a thickness of some 30 cm (Figs. 29 & 30). As a result, it took the first 3 weeks of the seasons to remove the lower part of Layer 3c, and only during the last week was Layer 4 exposed at the northeast section of Area B. By the end of the 2016 season, the entire Layer 3c was removed from Area B and the stone rich Layer 4 was exposed in much of the surface.

Figure 29: Layer 3c in section east and south of Area B. Note the increase in thickness toward the northeast

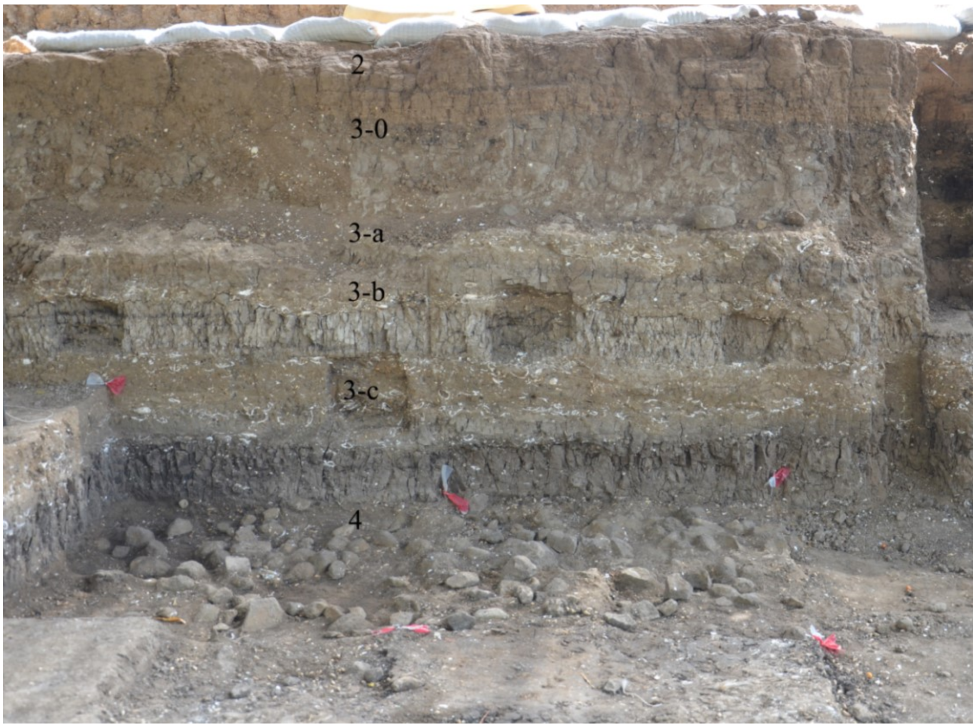

Figure 30: Stratigraphy of northern part of section east at the end of 2016 season. Note the thickness of Layer 3c.

Figure 31: Lower part of Layer 3c in Area B lines 99--100-101. Note the large basalt stones distribution. Many of them are exposed in pairs.

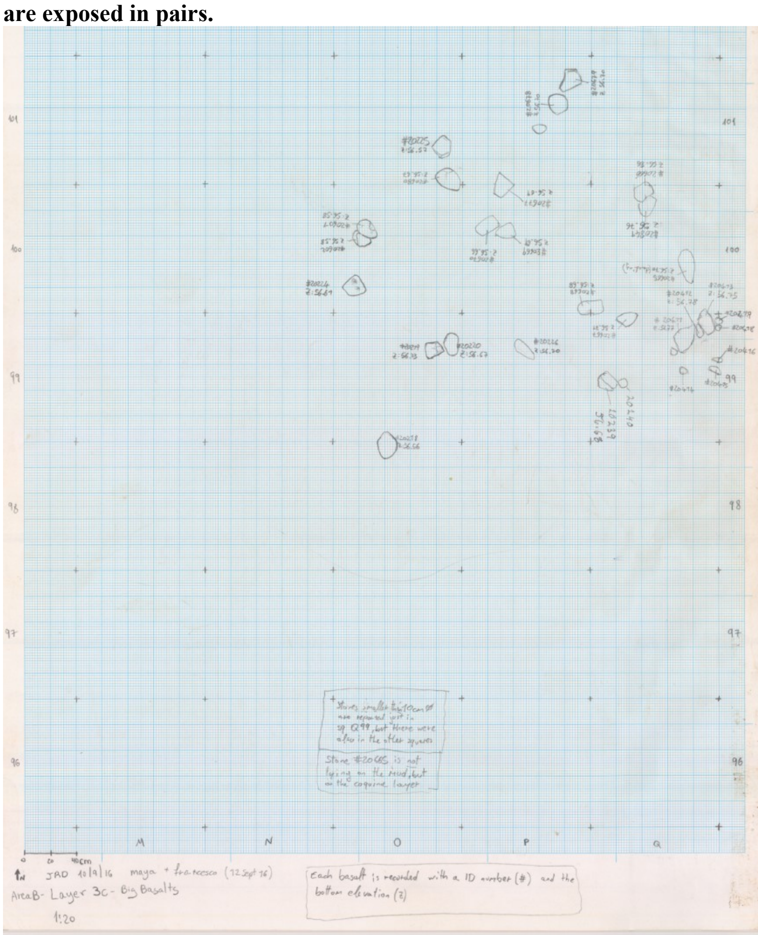

Figure 32: Map of Layer 3c surface noting the location of basalt stones

Figure 33: Close-up of basalt stones in Layer 3c square O-100. Note additional smaller stones and concentration of charcoal in the sediments.

Layer 3c in this section (North of Area B – Squares 98-100) is rich in Unio, with few flint tools, little wood, and very few bones. However, the layer is very rich in charcoal (fig. 33). A dominant feature of this layer is the presence of medium-sized stones, ca. 20 cm in maximum length and, in many cases, found in pairs. The pairs are spaced 50cm apart. These stones were clearly brought in by human agency and scattered for some purpose (Figs. 31-33). Some are probably anvils (Fig. 34), others may have been used for other purposes, possibly even as stable points in the muddy environment.

Figure 34: Layer 3c basalt in square O-100. Note pitted surface suggesting its use as anvil. Lower figure, same stone after removal. Note charcoal attached to stone.

An additional note should be made regarding the presence of the very large Unio shells in Layer 3c. Their presence was documented in the same layer at the western part of Area B (see 2015 IAA report). During the 2016 season, such giant Unio shells were also documented in Square P-101 at a level of 56.90 (Fig. 35)

Figure 35: Giant Unio shells at Level 56:90 square P-101 upper part of Layer 3c.

N-101 hearth (?)

Excavation of Layer 3c at square N-101 exposed what seems to be a feature of reddish sediments and high concentration of charcoal (Figs. 36-43). This potential hearth is some 25 cm in diameter and seems to have been dug as a shallow pit into the sediment. The feature was cut during the earlier excavation of square N-100 to the south leaving a clear section at the south margin of Square N-101. The sediment, typical to Layer 3c is primarily of Unio shells (Figs. 40 & 43). In the section, it seems that the Unio shells have been dug into, then, a layer of gray sediment containing many charcoals, some of which are quite large (>1cm) is present. Then, at the center of this feature is a layer of red sandy sediment. The feature was carefully excavated, many soil samples have been collected and a large block of sediments, holding the center of the feature was removed for micro-morphology study (Fig. 44).

Figure 36: N-101 feature as exposed. b. close-up.

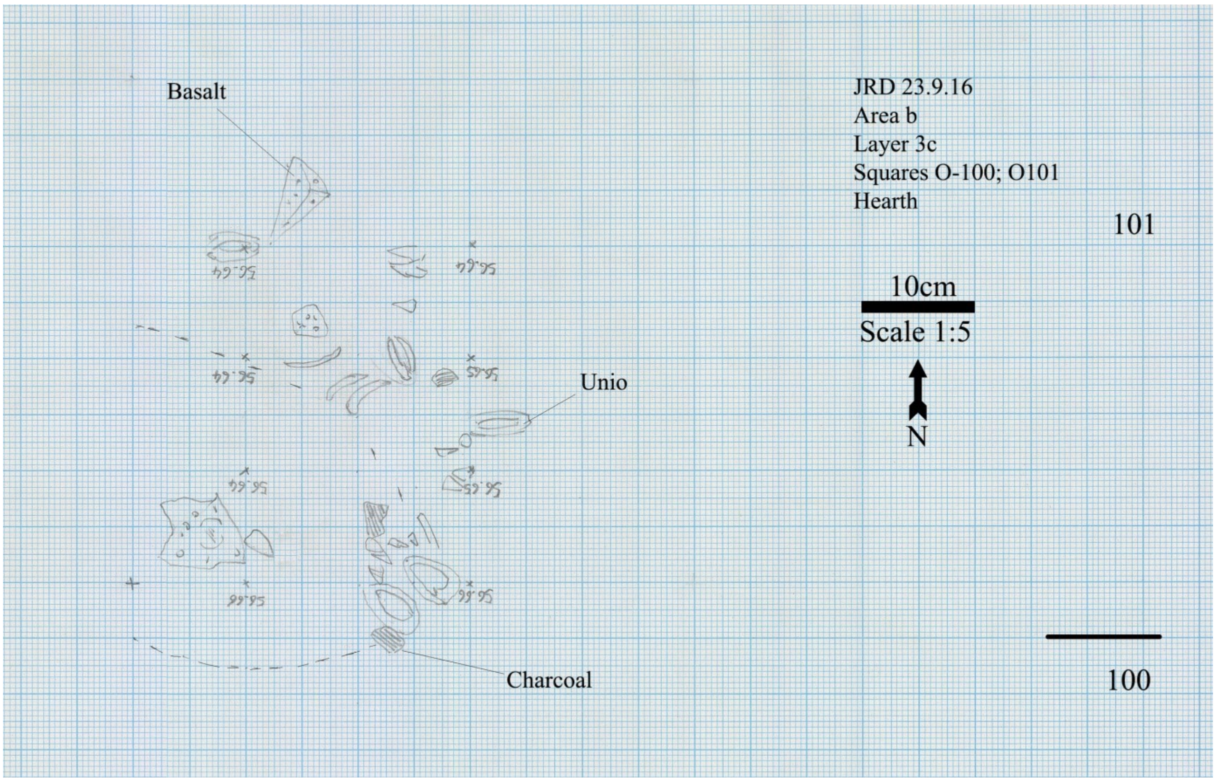

Figure 37: map of N-101 feature in Layer 3c

Figure 38: N-101 feature close-up. Note the charcoal and the round shape.

Figure 39: views of N-101 feature during excavation.

Figure 40: Feature N-101 during excavation; a. from top; b. section looking north.

Figure 41: Feature N-101 during excavation. General view toward the north.

Figure 42: feature N-101 during excavation. Layer 3c Unio exposed to the west.

Figure 43: Feature N-101 during excavation – the section between N-100 and N-101 looking north.

Figure 44: Feature N-101; sampling a block for micro-morphology at the end of excavation.

Layer 4

Layer 4, which was exposed in most parts of Area B, is currently known to comprise a sequence of a few horizons representing a somewhat complex accumulation of sediments. It is also clear now that there is a spatial variation and the nature of the Layer 4 horizons, their thickness, and even their actual appearance varies between the different sectors of Area B. As in all layers of JRD, the eastern squares of the site are less "problematic" than the western squares. In Layer 4, it seems that in the center of Area B, in squares M and O 97-99, the sequence is more complex. It seems that during accumulation, this part of Area B had a depression into which finer sediments were deposited in comparison to the eastern part of the layer. This was also observed in Square O-96 and O-97 during the 2015 season where a "stream" was identified, disturbing the Layer 4 sediments (see 2015 report). All this said, it seems that a sequence can be suggested for Layer 4 in most parts of Area B, and, the actual archaeological Layer 4 can be identified in most squares regardless of stratigraphic disturbances. The stratigraphy of Layer 4 can be described as follow (Figs. 45-47):

Below the mud of Layer 3c is a layer rich in Unio shells but poor in archaeological finds. The lower part of this horizon is comprised of a wealth of tiny melanopsis (?) shells. The thickness of this "baby shell" layer is varied and can rich 10 cm in some squares. In most parts of Area D this small shell layer is only 1-3 cm thick. This level (Unio + tiny shells) was named 4a. Below the small shell layer is a horizon of very large Melanopsis shells, normally 1-3 cm in thickness. The shells in this layer are strongly cemented to each other creating a tough crest that is hard to excavate and was coined the "melanopsis concrete". When the large melanopsis layer was removed, a layer of large stones embedded in mud was exposed. This is the archaeological Layer 4, observed in most parts of Area B and described below. This horizon was termed 4b. Below 4b is dark mud, with many Unio shells concentrated in lines, in in-situ, living position (Fig. 53). This mud is 5-10 cm thick and below it is an additional horizon of shells and stones with rare flint artifacts and bones which was termed 4c. Below 4c is an additional mud layer following which Layer 5 was exposed. This stratigraphy is even more complex in some of the squares (primarily toward the west of Area B, and the thickness of each horizon varies between the different parts of the excavated surface. Layer 4 was accumulating in an open lake-shore environment, with changing conditions on a small scale, wave activity, depressions in the surface, and possibly small streams crossing the surface. The result is a complex sequence and accumulation history. Luckily, the primary archaeological horizon, Level 4b, is well-defined and easy to identify.

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Figure 45: Section between N-98 and N-99 at the end of the 2016 season. Note the complexity of the Layer 4 sequence and the stratigraphic disturbance from the west.

Figure 46: Section between N-98 and N-99 at the end of the 2016 season. Top – west part; bottom – east part.

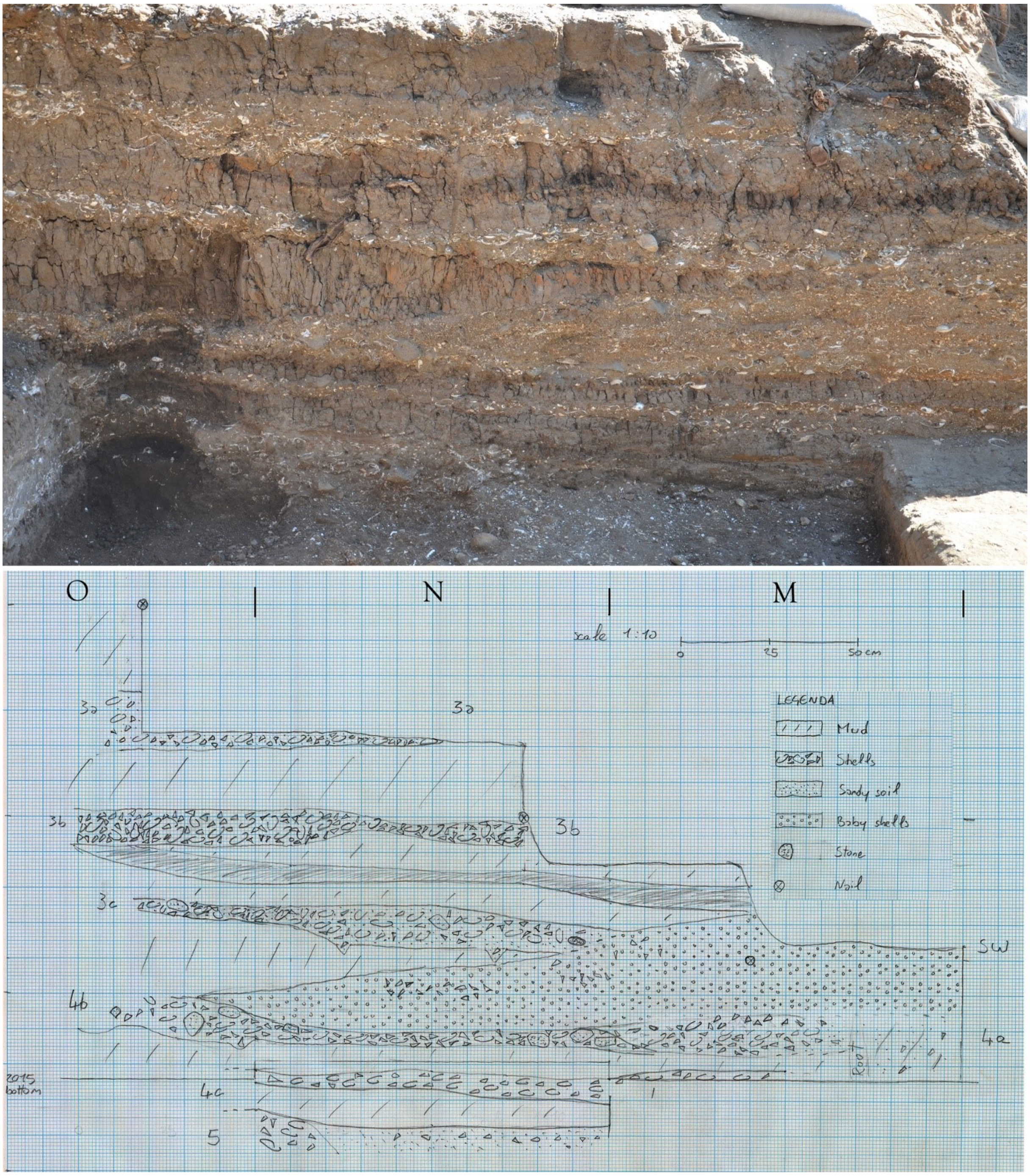

Figure 47: Area B Section South (west part) at the end of 2016 season. Note disturbance from the west and complexity of Layer 4 sequence.

Layer 4b was the primary archaeological horizon exposed in Area B during the 2016 season. It is ^{14}C dated to 16000 YBP calibrated. It was exposed primarily in the eastern part of the Area, in the P and Q squares (Figs. 48). The nature of the layer is similar to its exposure in the south-west squares during the 2015 season (see 2015 IAA report). The sediment is dark, fine mud with many Unio shells, some of which are still closed. The meaning of these observations is that the sediment of Layer 4 accumulated in a low energy environment lacking the energy to bring the large stones comprising the layer.

Layer 4 can be describing as a layer of cobbles homogenously scattered creating a stony layer (Figs. 48-52). All observations presented here are field observations and the precise data will be reported from the study of the lithic assemblage (ongoing). Most of the stones are basalt (80%?) with a prominent minority of limestone cobbles and pebbles. A low density of flint artifacts is present. Significantly, natural flint (pebbles, rolled cobbles atc.) is totally absent from this layer. The size of the stones is from 5 to 20cm with the majority between 10 and 15 cm. Most of the basalt seems to be unworked. Nevertheless, some of the basalt cobbles are clearly knapped and basalt flakes are present. All of the limestone finds of Layer 4 seems to have been collected at a source outside of the site due to their elongated morphology (Fig. 51). This observation is in agreement with the nature of the limestone assemblage observed during 2015 (see report). The limestone collected was brought into the site to be used as net sinkers. Field observations suggest that the energy of the sediments forming Layer 4 was low, depositing fine sand and silt. It is suggested, therefore, that all of the stones forming the Layer 4 surface were imported by human agency into the site. Most of the stones (basalt & limestones) could have been used as net sinkers (or weights for other purposes) and the layer represents a stage of human presence (fishing?) on the shore of the Paleo-Hula lake.
When removed, the sediment below the stones of Layer 4 is rich with charcoal. In two cases, the stones removed were completely black at the lower part, as if they were completely burned.
Below the Layer 4 stony surface is, as in most JRD layers, a layer of dark mud. Inside this mud, concentrations of Unio shells were exposed in a few squares. The Unio shells are clearly in primary position and were living (and dying) in the mud without any significant post depositional movement. Such Unio were exposed, for example, in Square Q-97 (Fig. 53).

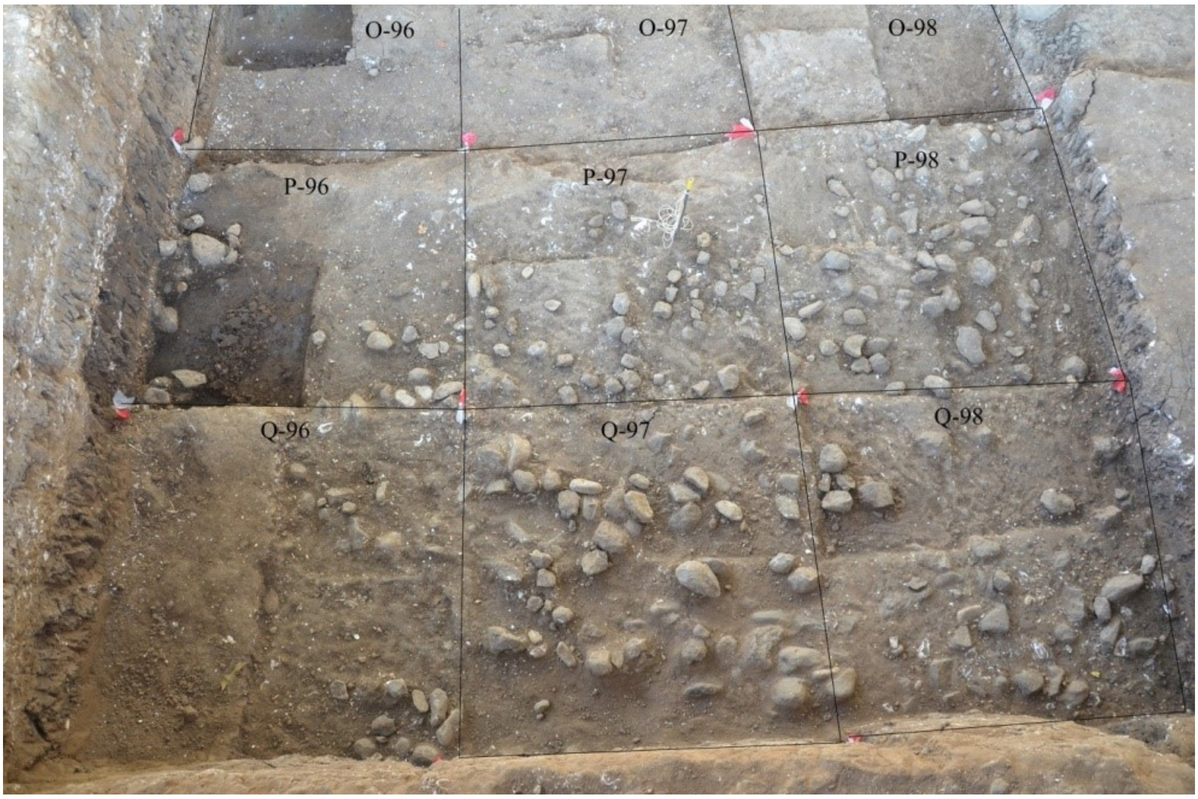

Figure 48: Layer 4 surface at south-east sector of Area B. Location of squares.


Figure 49: Layer 4 surface at south-east sector of Area B.

Figure 50: Layer 4 surface at south-east sector of Area B additional view.

Figure 51: Layer 4 surface at south-east sector of Area B Square Q-97. Note limestone net-sinkers marked with black dots.

Figure 52: Map of Layer 4 stony layer (Layer 4b) surface at east squares of Area B Season 2016.

Figure 53: Sediment below Layer 4 b in square Q-97. Unio shells in dark mud

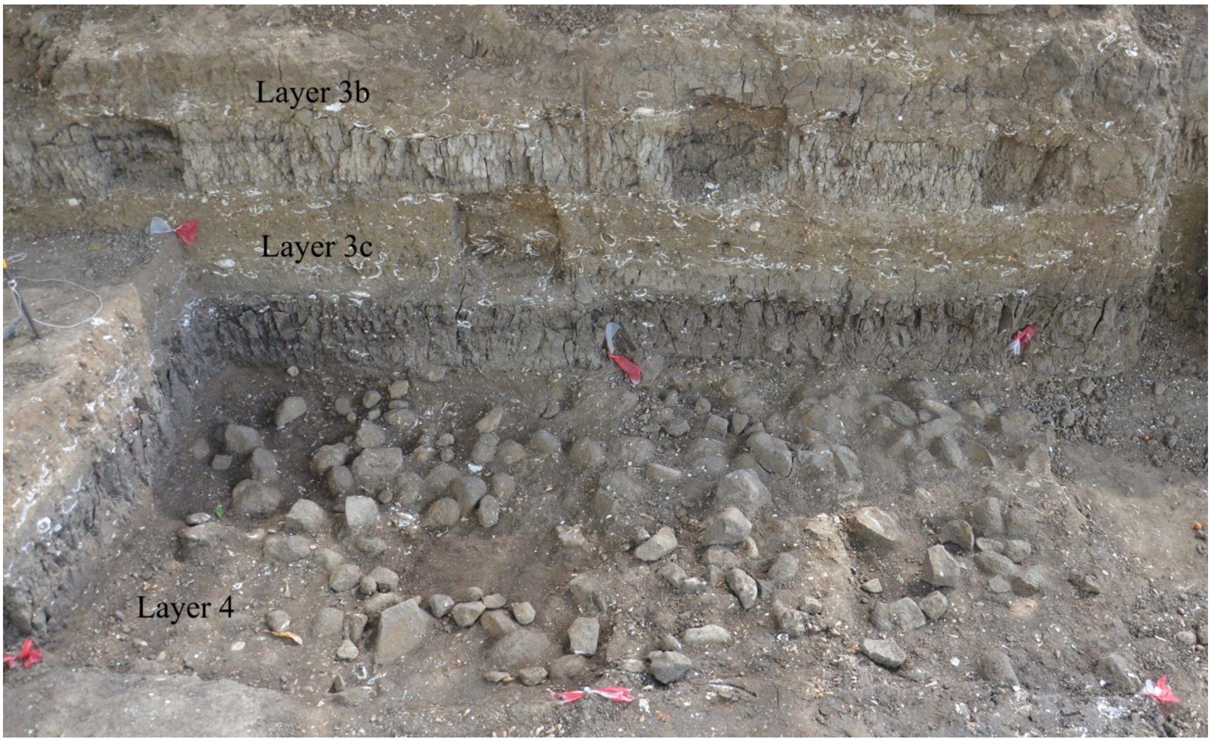

Figure 54: Surface of Layer 4b and Section East stratigraphy in northeast squares of Area B 2016.

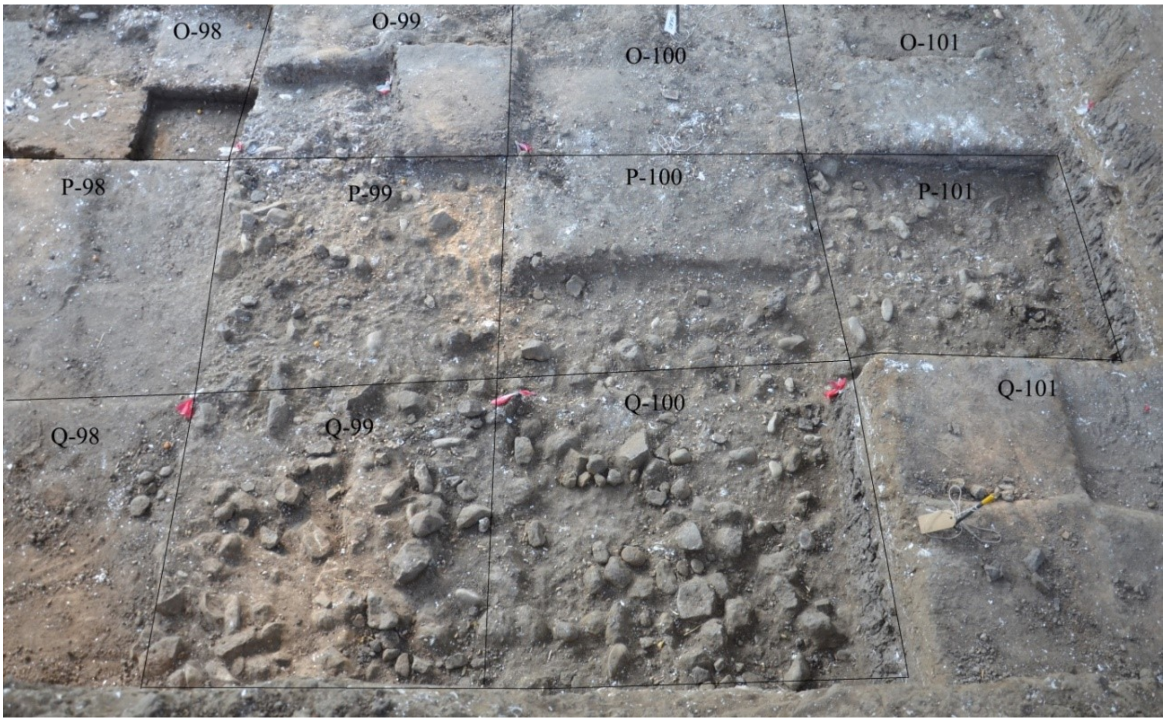

Figure 55: Layer 4b exposed in Area B northeast squares. Squares location map.


Figure 56: : Layer 4b exposed in Area B northeast squares

Layer 4 – reuse of grinding stones pestle

During the exposure of Layer 4 at square P-101 a broken pestle was unearthed (Fig. 57). This is the second such tool that was recovered from this layer. The other pestle was excavated in square M-97 during the 2015 season (Figs. 58-59). The 2016 pestle is broken on both distal and proximal edges. It is made from fine-grained basalt and the quality of workmanship seems excellent.

Figure 57: Broken pestle at Layer 4b square P-101 Level 56:53.

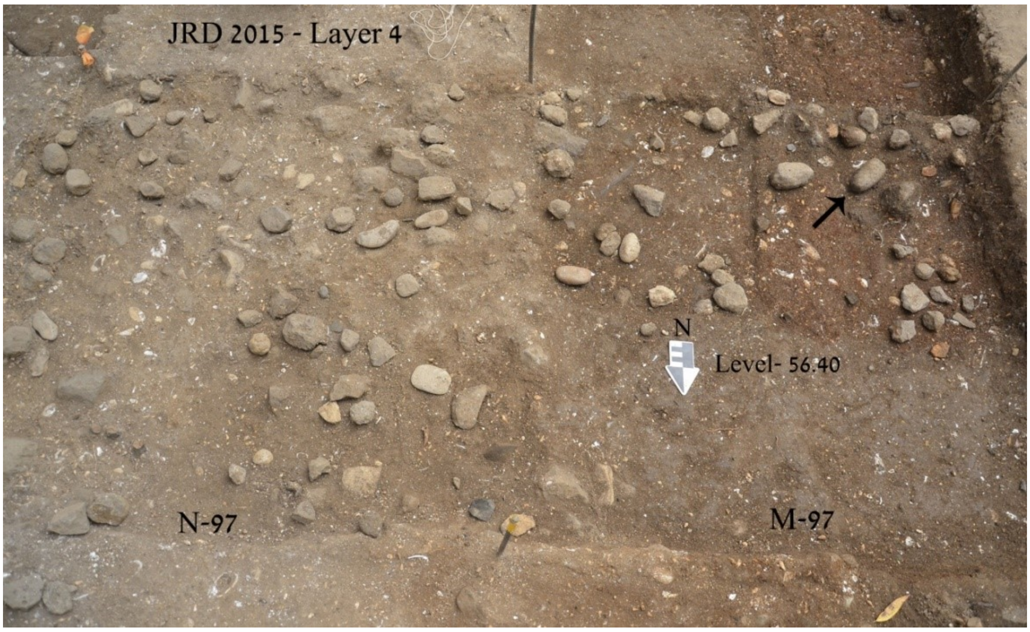

Figure 58: Layer 4b in 2015 season. Arrow indicating location of broken pestle.

Figure 59: Broken pestle in Layer 4b square M-97 2015.

Below Layer 4 – The Basalt Slab

An interesting feature was unearthed in Square O-98 when removing the Layer 4 mud (below Layer 4) aiming to expose the top of Layer 5 for excavation. A uniform method is used at JRD for removing the (archaeologically sterile) mud between the archaeological layers. The mud is removed using hand-picks and soil samples are kept systematically. When removing the mud in square O-97, a basalt slab was unearthed "floating" in the mud halfway between Square O-97 and O-98 (Figs. 60-69). The slab is

31 cm in length and 23 in width and 48 mm in max thickness but the thickness around the margins is ca. 2 cm all around. The slab is c. 4kg in weight. It is lying horizontally in the mud (Fig. 68). Interestingly, when looking at the section between Square O-97 and O-98, it seems that Unio shells are found only above the slab and not to its sides (Figs. 62& 68). The sediments above the slab in Square O-98 were carefully excavated and sampled (figs. 66-67). The sediments are part of the mud below Layer 4 but no clear pattern (of finds, shells, tools, or evidence for pit) was observed, not above the slab and not in its vicinity. The same holds true for the removal of the slab that exposed no evidence for pitting or spatial organization of the sediments.

Figure 60: Slab between O-98 and O-99, general location.

Figure 61: Slab between O-98 and O-99

Figure 62 Slab between O-98 and O-99 in section. Note the presence of Unio shells only above slab.

Figure 63: Slab between O-98 and O-99 during excavation

Figure 64: Slab between O-98 and O-99 section close-up.

Figure 65: Slab between O-98 and O-99 during excavation. Note the presence of charcoal in sediment

Figure 66: Slab between O-98 and O-99 during excavation.

Figure 67: Slab between O-98 and O-99 excavated

Figure 68: Slab between O-98 and O-99 exposed

Figure 69: removal of Slab between O-98 and O-99

Below Layer 4

The sediment below Layer 4 was primarily excavated in squares O-96, N-96 and N-97. As in all layers of JRD, the sequence is more complicated toward the west squares. The sediment below Layer 4 (below Level 4c) in squares N-96 and N-97 is primarily dark mud with lances of reddish sand and other sediments at different levels (Figure 70). It seems that the sequence was deposited in shallow water with changing local depositional conditions resulting in different sediments. At a level of 56:10 a layer extremely rich in botanic material was exposed (Fig. 71). While some of the botanic remains in this level can result from new tree roots penetrating into the sediments (Fig. 72), it seems that most of the botanic remains are old and this level may represent a layer of small twigs and branches drifting on the shore of the lake.

The mud below Layer 4 was the habitat for some of the best preserved Unio shells exposed at JRD to date (Fig. 73). The shells still preserve their original brown color, unlike the shells in other layers that are completely white. Some shells are still standing in their original living position indicating minimal movement of the sediment since their deposition. In many shells the organic tissue connecting the two valves has survived (Fig. 73c), evidence of the unique preservation conditions.

Figure 70: stratigraphy of Square O-96 below Layer 4.

Figure 71: Layer rich in botanical remains at Square N-97b at Level 56:10


Figure 72: Modern roots penetrating the layers of Area B Section south. Note the light color of the modern root, distinguishing them from archaeological dark roots

Figure 73: Unio shells preservation at Square N-97 below Layer 4. Arrow indicating preserved organic material.

Layer 5

Layer 5 was exposed during the 2016 season in squares O-96, N-96, and N-97 at a level of ca. 56:05. The layer was 14C dated to ca. 20000 years BP calibrated (Table 1). This is a somewhat sandy layer with loose sediments and comprises flint tools, bones, and small basalt cobbles (Figs. 74-76). Interestingly, many of the basalt cobbles are homogenous in size and rounded, suggesting their possible use as line sinkers. A larger surface needs to be opened before further observations can be made.

Figure 74: Layer 5 at square N-96 Level 56:05

Figure 75: Layer 5 surface at Square O-96c Level 56:05


Figure 76: Layer 5 surface at Square N-97c Level 56:05

Area B at the end of the 2016 season

Area B is divided into two primary sectors: The north squares, comprising line 102 and 103 squares and the main area holding squares 101 and lower toward the south (Figs. 77 -80). At the south sector, in squares (**check**) the upper part of the Natufian Layer 3c1 was exposed, documented, and mapped. The aim of the 2017 season will be to continuing exploring these upper Natufian layers. At the southern sector of Area B, Layer 3c is now completely removed in all squares (except maybe in N-101 where it is possible that a few more cm should be removed). In most of this sector, the stony Layer 4 was largely removed apart from half of O-99 and O-100, O-101 (Figs. 77-78). The beginning of the 2017 season will be dedicated to the removal of the Layer 4 mud and approaching Layer 5 in most of these squares. It should be noted that Layer 4 holds a complex sequence with more than a single horizon and, therefore, caution should be taken when removing the mud (see slab section above). Layer 5 was exposed in 3 squares only N-96, N-97 and O-96. During the 2017 season we hope to enlarge its exposure and to excavate the lower layers beneath it.

Figure 77: Stratigraphy of Area B at the end of the 2016 excavation season from north

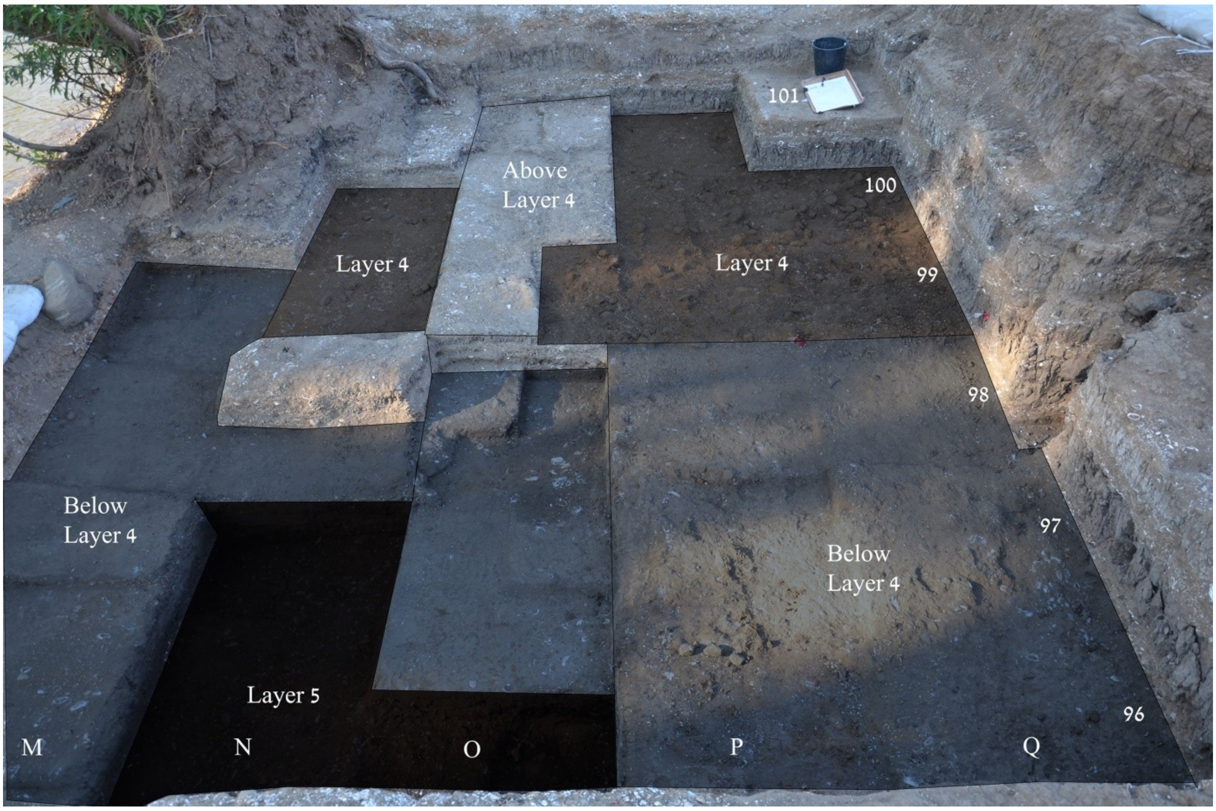

Figure 78: Stratigraphy of Area B at the end of the 2016 excavation season from south

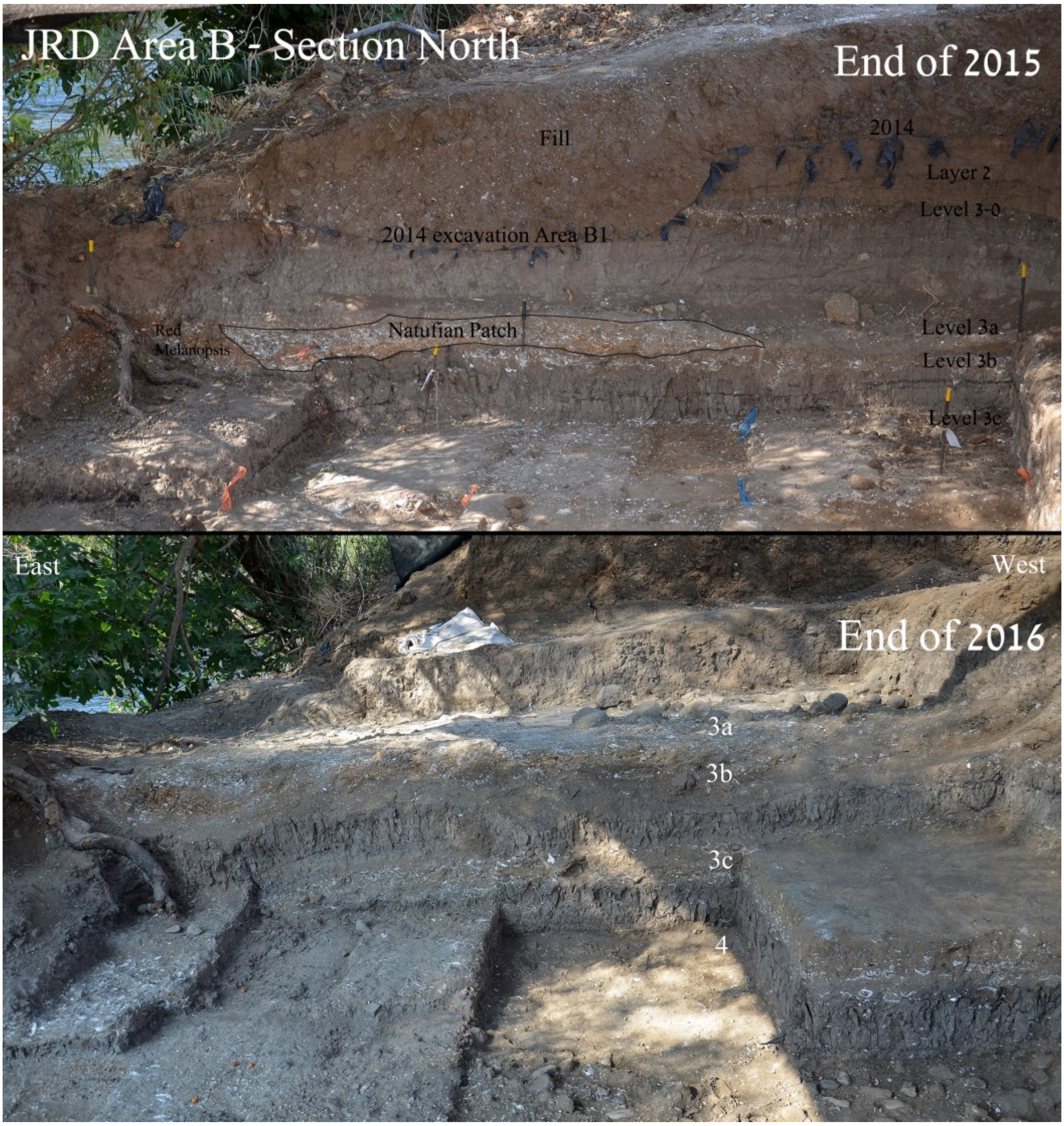

Figure 79: Area B Section North at the end of 2015 season and end of 2016 Season.


Figure 80: Area B at the end of the 2016 excavation season. General view from northeast

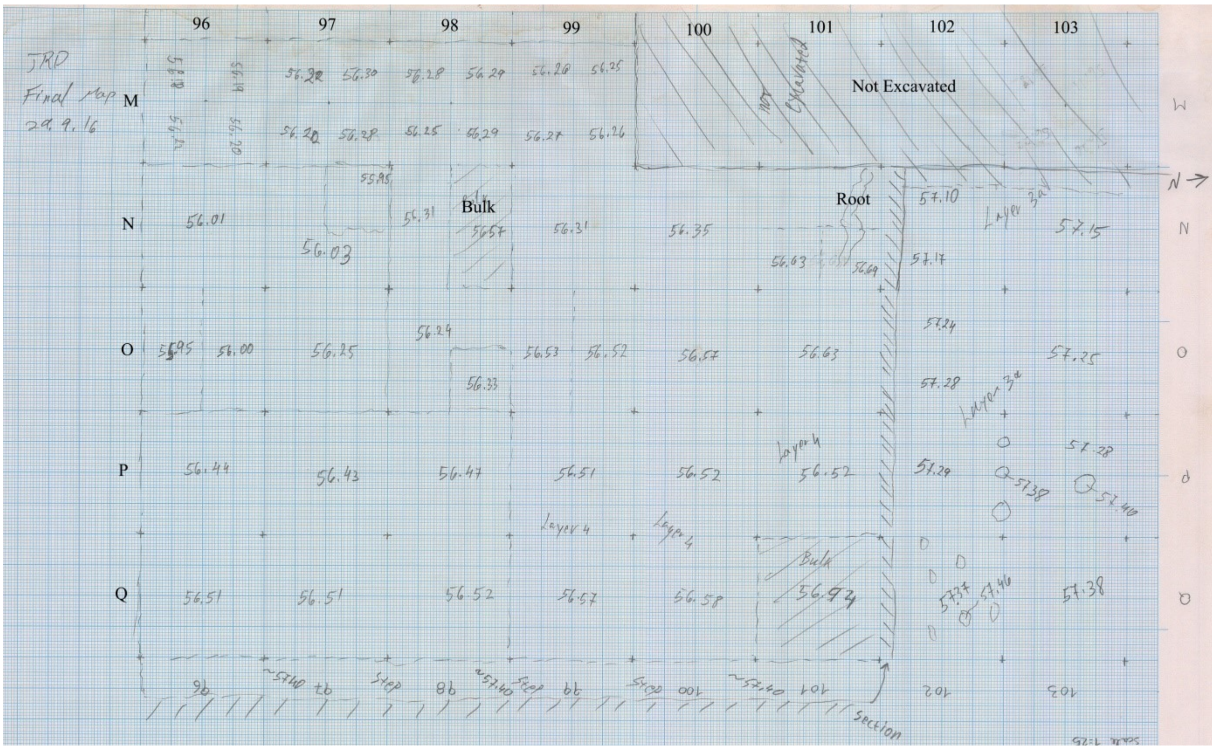

Figure 81: Final elevation map. Area B at the end of the 2016 excavation season

Site preservation and closing

At the end of the season a map showing the elevations reached in each and every square was recorded (Fig. 81). In accordance with the conservation program of the site, the exposed layers were covered by thick plastic sheet (Fig 82) to mark the excavated surface. The entire excavation area was then covered by sediments (Fig. 83). This is done to protect the layers from the exposure to atmospheric conditions during the year, to prevent weathering of the sediments due to water winter floating and also for safety reasons.

The site was left totally covered by soil (Fig. 83). We created small trenches around the excavated surface to prevent vehicles from parking on top of the excavation (even though the damage should be minimal). In recent visits to the site during the 2017 winter (which was mild), it seems that the site covering is holding well.

Figure 82: Area B covered at the end of 2016 season

Figure 83: Covering of Area B at the end of 2016 season

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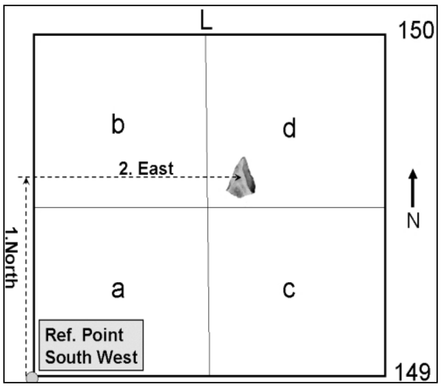
Appendix 1

Excavation Daily Page 2016

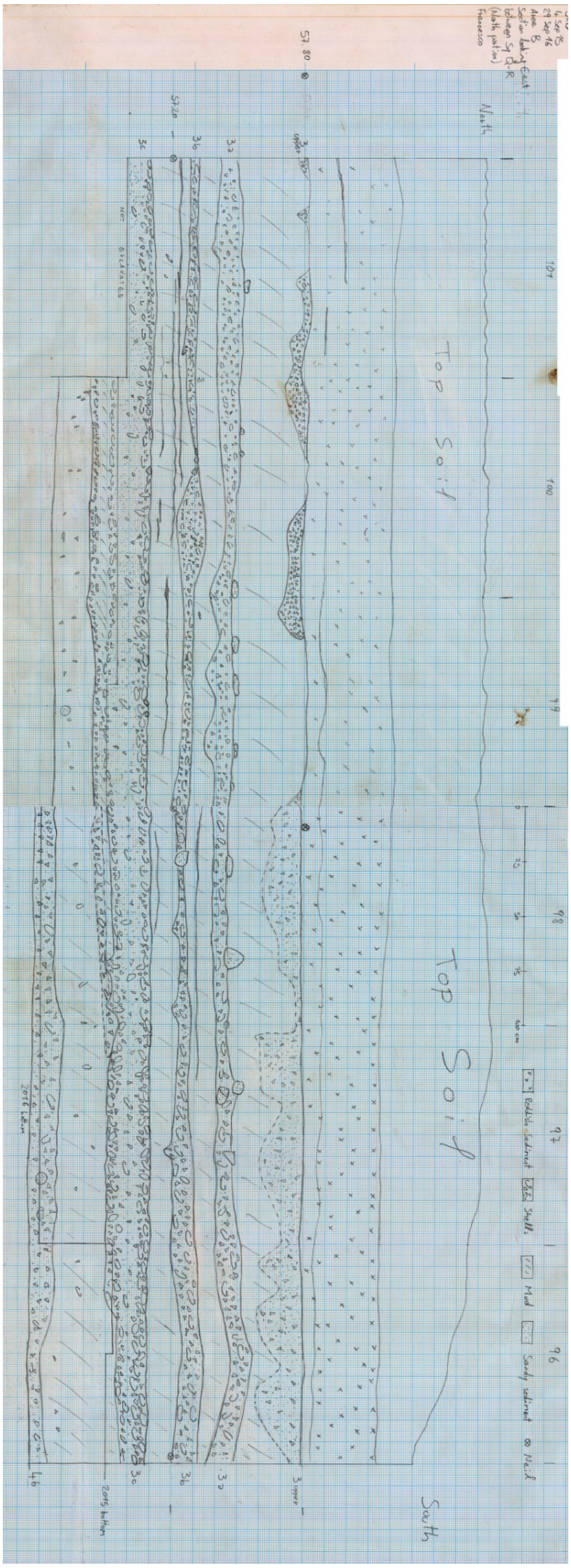
Date: ______/ 9 /2016
Excavator: ______________________
Area: __________________________
Square______________________
Layer:_________________

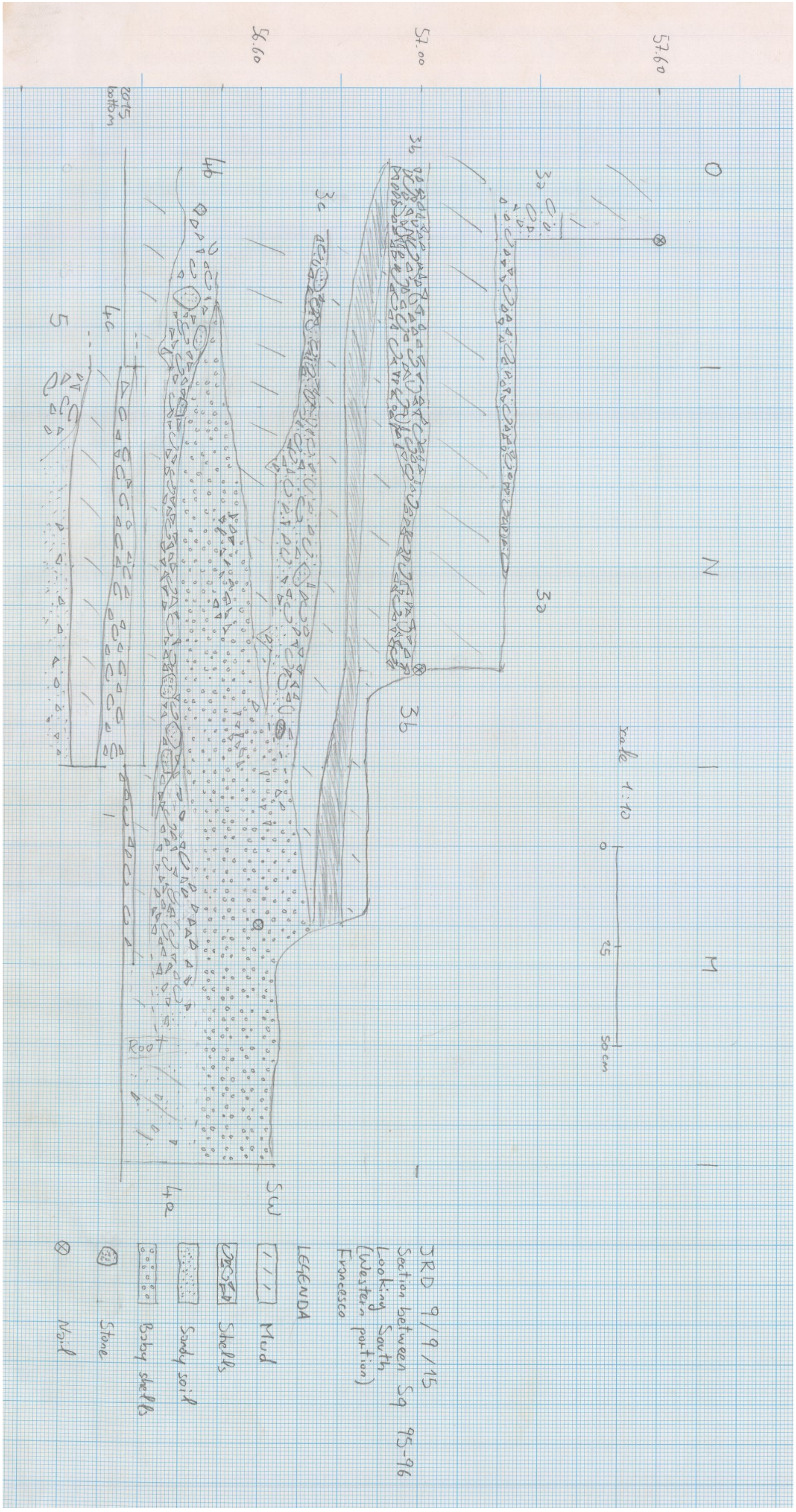


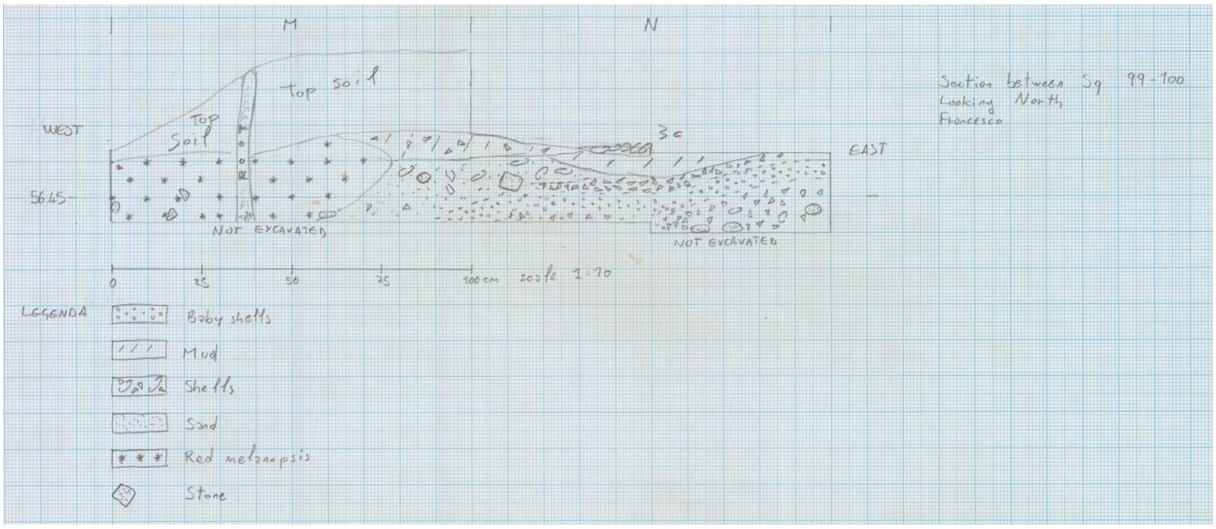
Example – Square L150-d Find Coordinates

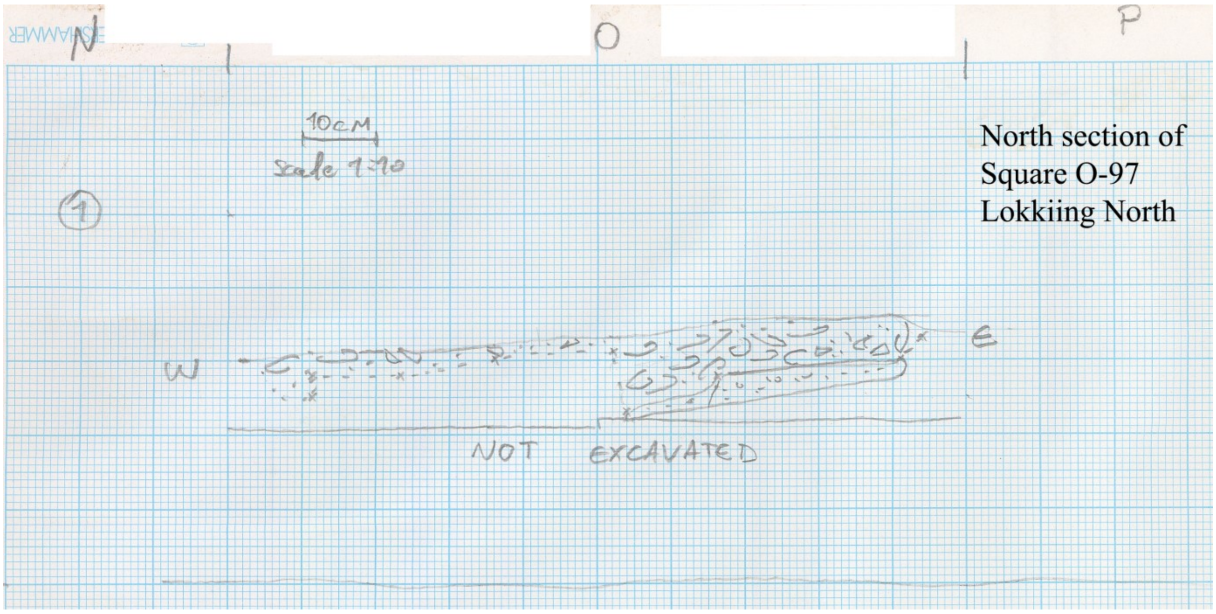
		SubSq. a	SubSq. b	SubSq. c	SubSq. d	Buckets
Spit #1	Z- start					
	Z - end					
Description & Remarks:						
		SubSq. a	SubSq. b	SubSq. c	SubSq. d	Buckets
Spit #2	Z- start					
	Z - end					
Description & Remarks:						
General bag – date – Square – Sub-Square – Layer – Level Top – Level bottom – Excavator Name – type of find Flint – Basalt - Limestone – Charcoal – Bone – Wood - Other						

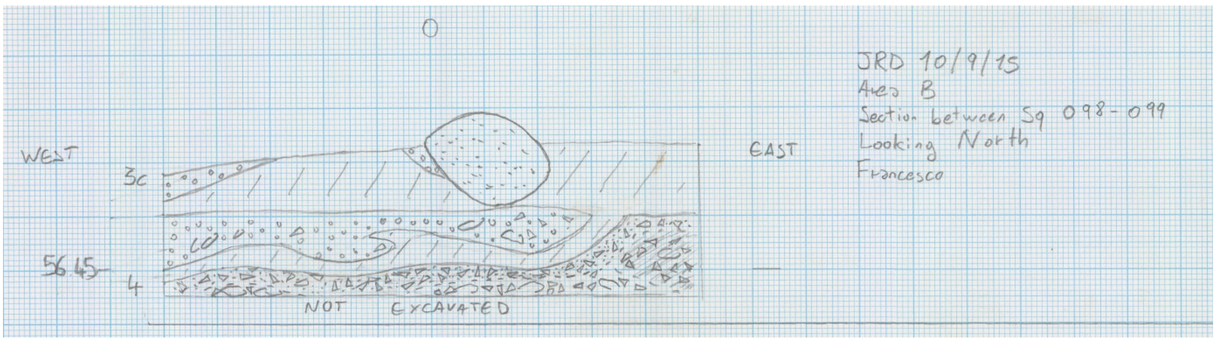
Appendix 2
2016 Sections




57.60
57.00
56.60
2015 bottom
O
N
M
3a
3b
3c
4a
4b
4c
5
Root
SW
scale 1:10
0
25
50 cm
JRD 9/9/15
Section between Sq 95-96
Looking South
(Western portion)
Francesco
LEGENDA
Mud
Shells
Sandy soil
Baby shells
Stone
Nail


M
N
Top soil
Top Soil
WEST
3c
EAST
5645
NOT EXCAVATED
NOT EXCAVATED
0 25 50 75 100 cm scale 1:10
LEGENDA
Baby shells
Mud
Shells
Sand
Red melanopsis
Stone
Section between Sq 99-100
Looking North
Francesco


N
O
P
10cM
scale 1:10
1
North section of
Square O-97
Lokkiing North
W
E
NOT EXCAVATED


O
JRD 10/9/15
Area B
Section between Sq 098-099
Looking North
Francesco
WEST
EAST
3c
5645
4
NOT EXCAVATED