5 DSR – Crimean Sites

5.1 Introduction

Four sites were sampled in the Crimea (Figure 5.1): Sary-Kaya, Kabazi V, Kabazi II, and Karabai. Sary-Kaya and Kabazi II were open sites lying on South facing valley sides, at least 150 m from (and ~30 m vertically below) limestone scarps. Kabazi V was a rock shelter lying immediately below the scarp, higher up the valley side east of Kabazi II. The Kabazi sites appeared to contain sediments primarily derived from the local nummulitic limestone, although at Kabazi II these would have been subject to more extended colluvial reworking prior to deposition. Sary-Kaya also contained sediments derived from the local limestone that were probably colluvially deposited, but higher dose rates and its proximity to the rather different site of Karabai indicate the potential inclusion of allochthonous material. Karabai was an open site, but on the north facing slope of a small ravine, ~ 1 km north east of Sary-Kaya. Its geographical situation was more akin to Biriuchya Balka and Kostenki on the Russian Plain, and the sediments also appeared to be colluviated loessic in character. In total, 89 luminescence and related samples were taken from the four sites, from the thirteenth to the twenty-fifth of August 2004 (Table 5.1).

The natures and histories of the sites were assessed prior to sampling. Reviews of the sites and sediments can be found in Section 5.5 of this report, and tabulated notes from these found in Appendix 5.1. A general description of the samples, and tabulated information relating to each luminescence sample is presented in Appendix 5.2. *Insitu* measurements of environmental gamma dose rate were made at the locations of all dating samples. A general description of the measurements, and tabulated information relating to each measurement is presented in Appendix 5.3.

Of the 89 luminescence related samples, 22 were full luminescence dating samples in steel tubes or tins, with associated *insitu* dose rate measurements made using a field gamma spectrometer (Table 5.1). 3 such samples were taken from Sary-Kaya (Figure 5.2, Figure 5.3), which consisted of a series of apparently colluvial deposits with limestone clasts presumably derived from the scarp above the site, but only one level with a concentration of archaeological finds – this was bracketed by the luminescence samples. There may be some autochthonous material in the sediments at

Sary-Kaya, and colluvial reworking prior to deposition may make this site relatively datable by OSL.

Four luminescence sediment samples in tubes were taken at Kabazi V, plus one each of flint and limestone clasts thought to have been burnt (Figure 5.4, Figure 5.5). This site contained evidence for progression between Middle Palaeolithic archaeological industries, from Micoquian to Western Crimean Mousterian. It has been interpreted as a "base camp" related to Kabazi II (Table 5.3), with evidence for butchering of *Equus hydruntinus*. To date, only fragmentary pollen evidence has been obtained, due to poor preservation in most layers. Some inconsistent uranium series and ESR dates have been measured at Kabazi V, and chronological conflicts require resolution. However, their limestone rich autochthonous nature means that OSL dating of the sediments at Kabazi V is likely to be highly problematic.

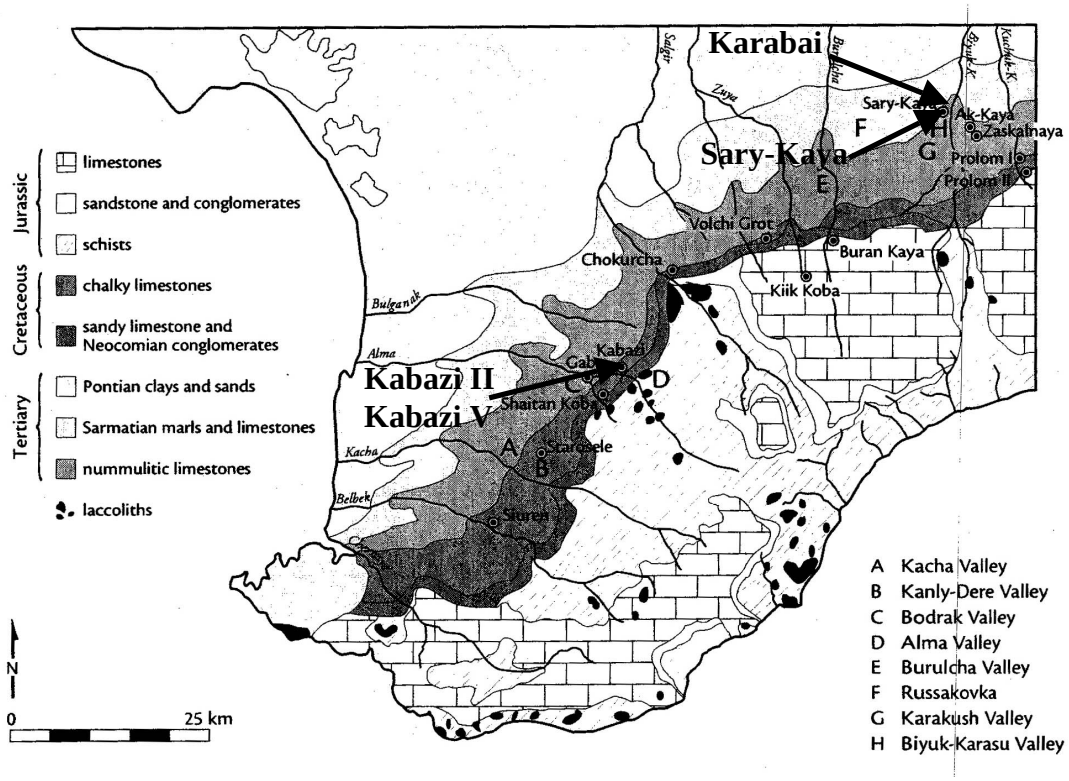


Figure 5.1. Location of the Crimean sites, with locations of other Middle Palaeolithic sites and geology/raw material sources in south-western Crimea. (Adapted from Uthmeier, 2004).

Site	Section	Context	Sample		Field gamma spectrometry	
			Number	Type	Measurement	Dose rate (mGy/a)
Sary-Kaya	N, Sq35C	Modern Surface	EFD4L243	Bag ~ 200 g	-	-
Sary-Kaya	N, Sq35C	Layer 4	EFD4L244	Tube ~1 kg	EFD4G077	0.43 ± 0.02
Sary-Kaya	N, Sq35C	Layer 5	EFD4L245	Tube ~1 kg	EFD4G078	0.40 ± 0.02
Sary-Kaya	N, Sq35C	Layer 6 (Arch' V)	EFD4L246	Tube ~1 kg	EFD4G079	0.44 ± 0.02
Sary-Kaya	N, Sq35C	Profiling	EFD4L247-58	Small Tubes ~1 g	-	-
Kabazi II	-	Modern Surface	EFD4L259	Bag ~ 200 g	EFD4G081	0.26 ± 0.02
Kabazi V	SW, Sq. 6Б	Layer 12, Arch' III/1A	EFD4L260	Tube ~1 kg	EFD4G088	0.20 ± 0.01
Kabazi V	SW, Sq. 6Б	Layer 12, Arch' III/4	EFD4L261	Tube ~1 kg	EFD4G089	0.19 ± 0.01
Kabazi V	SW, Sq. 6Б	Layer 12A, Arch' III/5-3	EFD4L262	Tube ~1 kg	EFD4G090	0.18 ± 0.01
Kabazi V	SW, Sq. 6Б	Layer 14A, Arch' IV	EFD4L263	Tube ~1 kg	EFD4G091	0.20 ± 0.01
Kabazi V	SW, Sq. 6Б	Layer 12, Arch' III/1A	EFD4L264	Burnt Flint ~ 20 g	EFD4G088*	0.20 ± 0.03
Kabazi V	SW, Sq. 6Б	Layer 12, Arch' III/1A	EFD4L265	Burnt Limestone ~ 20 g	EFD4G088*	0.20 ± 0.03
Kabazi II	East, Sq. M	Layer 7, Arch' II/7AB	EFD4L266	Tube ~1 kg	EFD4G095	0.15 ± 0.01
Kabazi II	East, Sq. M	Layer 9, Arch' IIA/2	EFD4L267	Tube ~1 kg	EFD4G096	0.187 ± 0.007
Kabazi II	East, Sq. M	Layer 10	EFD4L268	Tube ~1 kg	EFD4G097	0.162 ± 0.008
Kabazi II	East, Sq. M	Layer 11U (above III/2)	EFD4L269	Tube ~1 kg	EFD4G098	0.20 ± 0.01
Kabazi II	East, Sq. M	Layer 11L (below III/2)	EFD4L270	Tube ~1 kg	EFD4G099	0.19 ± 0.01
Kabazi II	East, Sq. M	Layer 13	EFD4L271	Tube ~1 kg	EFD4G100	0.22 ± 0.01
Kabazi II	East, Sq. M	Layer 13A	EFD4L272	Tube ~1 kg	EFD4G101	0.24 ± 0.01
Kabazi II	East, Sq. M	Layer 14A	EFD4L273	Tube ~1 kg	EFD4G102	0.28 ± 0.01
Kabazi II	East, Sq. M	Layer 14B	EFD4L274	Tube ~1 kg	EFD4G103	0.29 ± 0.01
Kabazi II	East, Sq. M	Layer 14B1	EFD4L275	Tin ~1 kg	EFD4G104	0.27 ± 0.01
Kabazi V	SW, Sq. 6Б	Profiling	EFD4L276-291	Small Bags ~1 g	-	-
Kabazi II	East, Sq. M	Profiling	EFD4L292-308	Small Bags + Tubes ~1 g	-	-
Kabazi II	-	Cliff & Boulder	EFD4L309-310	Clast	-	-
Karabai	S, Sq. K	Arch' 2	EFD4L311	Tube ~1 kg	EFD4G106	0.35 ± 0.01
Karabai	S, Sq. K	Arch' 3-2	EFD4L312	Tube ~1 kg	EFD4G107	0.35 ± 0.02
Karabai	S, Sq. K	Profiling	EFD4L313-325, 327-330	Small Tubes ~1 g	-	-
Karabai		Modern Surface	EFD4L326	Bag ~ 200 g	EFD4G075	0.61 ± 0.03
Karabai	S, Sq. K	Arch' 4-2	EFD4L331	Tube ~1 kg	EFD4G108	0.38 ± 0.02

Table 5.1. Luminescence and related samples taken, and measurements made at sites in the Crimea

Site	Section	Context	Sample		
			Number	Depth	Type
Kabazi V	Sq. Ж	Layer 14A	EFDT327	13 cm thick (= IV/1)	T/M/S
Kabazi V	SW, Sq. 6Б	Layer 12	EFDT328	489-495 cm (= III/1)	T/M/S
Kabazi V	SW, Sq. 6Б	Layer 12	EFDT329	495-507 cm (sterile)	T/M/S
Kabazi V	SW, Sq. 6Б	Layer 12	EFDT330	507-520 cm (sterile)	T/M/S
Kabazi V	SW, Sq. 6Б	Layer 12	EFDT331	520-528 cm (= III/1A)	T/M/S
Kabazi V	SW, Sq. 6Б	Layer 12	EFDT332	528-541 cm (sterile)	T/M/S
Kabazi V	SW, Sq. 6Б	Layer 12	EFDT333	541-550 cm (= III/2)	T/M/S
Kabazi V	SW, Sq. 6Б	Layer 12	EFDT334	550-560 cm (= III/3)	T/M/S
Kabazi V	SW, Sq. 6Б	Layer 12	EFDT335	560-572 cm (= III/3)	T/M/S
Kabazi V	SW, Sq. 6Б	Layer 12	EFDT336	572-582 cm (= III/4)	T/M/S
Kabazi V	SW, Sq. 6Б	Layer 12	EFDT337	582-592 cm (=III/4)	T/M/S
Kabazi V	SW, Sq. 6Б	Layer 12	EFDT338	592-600 cm (=III/4)	T/M/S
Kabazi V	SW, Sq. 6Б	Layer 12A	EFDT339	Transitional, 600-608 cm (=III/5-1)	T/M/S
Kabazi V	SW, Sq. 6Б	Layer 12A	EFDT340	608-618 cm (=III/5)	T/M/S
Kabazi V	SW, Sq. 6Б	Layer 12A	EFDT341	618-628 cm (= III/5)	T/M/S
Kabazi V	SW, Sq. 6Б	Layer 12A	EFDT342	628-638 cm (= III/5)	T/M/S
Kabazi V	SW, Sq. 6Б	Layer 12A	EFDT343	638-646 cm (=III/5)	T/M/S
Kabazi V	SW, Sq. 6Б	Layer 12	EFDC419	509 cm (= III/1A)	14C
Kabazi V	SW, Sq. 6Б	Layer 12	EFDC420	520-525 cm (= III/1A)	14C
Kabazi V	SW, Sq. 6Б	Layer 12	EFDC421	492 cm (= III/1)	14C
Kabazi V	Sq. 7Б	?	EFDC435	590 cm (= III/4-5)	14C
Kabazi V	Sq. 7B (=v)	?	EFDC436	? cm, (=III/5-3B1)	14C
Kabazi V	Sq. 11Ж	?	EFDC437	704 cm (=IV/3)	14C
Kabazi II	East, Sq. 3L	Layer 14B1	EFD4S344	1120-1130 cm	T/M/S
Kabazi II	East, Sq. 3L	Layer 14B1	EFD4S345	1110-1120 cm	T/M/S
Kabazi II	East, Sq. 3L	Layer 14B1	EFD4S346	1100-1110 cm	T/M/S
Kabazi II	East, Sq. 3L	Layer 14B	EFD4S347	1090-1100 cm	T/M/S
Kabazi II	East, Sq. 3L	Layer 14B	EFD4S348	1080-1090 cm	T/M/S
Kabazi II	East, Sq. 3L	Layer 14B	EFD4S349	1070-1080 cm	T/M/S
Kabazi II	East, Sq. 3L	Layer 14B	EFD4S350	1060-1070 cm	T/M/S
Kabazi II	East, Sq. 3L	Layer 14B	EFD4S351	1050-1060 cm	T/M/S
Kabazi II	East, Sq. 3L	Layer 14B	EFD4S352	1040-1050 cm	T/M/S

Kabazi II	East, Sq. 3L	Layer 14B	EFD4S353	1030-1040 cm	T/M/S
Kabazi II	East, Sq. 3L	Layer 14B	EFD4S354	1020-1030 cm	T/M/S
Kabazi II	East, Sq. 3L	Layer 14B	EFD4S355	1010-1020 cm	T/M/S
Kabazi II	East, Sq. 3L	Layer 14B	EFD4S356	1000-1010 cm	T/M/S
Kabazi II	East, Sq. 3L	Layer 14A	EFD4S357	992-1000 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 14A	EFD4S359	990-1000 cm overlap	T/M/S
Kabazi II	East, Sq. 3M	Layer 13A	EFD4S360	980-990 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 13A	EFD4S361	970-980 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 13A	EFD4S362	960-970 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 13A	EFD4S363	950-960 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 13A	EFD4S364	940-950 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 13A	EFD4S365	930-940 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 13A	EFD4S366	920-930 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 13	EFD4S367	910-920 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 13	EFD4S368	900-910 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 13	EFD4S369	890-900 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 13	EFD4S370	880-890 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 13	EFD4S371	870-880 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 13	EFD4S372	860-870 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 13	EFD4S373	850-860 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 13	EFD4S374	840-850 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 13	EFD4S375	830-840 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 13	EFD4S376	820-830 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 13	EFD4S377	810-820 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 11 lower	EFD4S378	800-810 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 11 lower	EFD4S379	790-800 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 11 lower	EFD4S380	780-790 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 11 lower	EFD4S381	770-780 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 11 lower	EFD4S382	760-770 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 11 lower	EFD4S383	750-760 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 11 lower	EFD4S384	740-750 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 11 lower	EFD4S385	730-740 cm	T/M/S
Kabazi II	East, Sq. 3M	Transition	EFD4S386	720-730 cm (=III/2)	T/M/S
Kabazi II	East, Sq. 3M	Layer 11 upper	EFD4S387	710-720 cm, Krutitsa soil	T/M/S

Kabazi II	East, Sq. 3M	Layer 11 upper	EFD4S388	700-710 cm, Krutitsa soil	T/M/S
Kabazi II	East, Sq. 3M	Layer 11 upper	EFD4S389	690-700 cm, Krutitsa soil	T/M/S
Kabazi II	East, Sq. 3M	Layer 11 upper	EFD4S390	680-690 cm, Krutitsa soil	T/M/S
Kabazi II	East, Sq. 3M	Layer 11 upper	EFD4S391	670-680 cm, Krutitsa soil	T/M/S
Kabazi II	East, Sq. 3M	Layer 11 upper	EFD4S392	660-670 cm, Krutitsa soil	T/M/S
Kabazi II	East, Sq. 3M	Layer 11 upper	EFD4S393	650-660 cm, Krutitsa soil	T/M/S
Kabazi II	East, Sq. 3M	Layer 10	EFD4S394	640-650 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 10	EFD4S395	630-640 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 10	EFD4S396	620-630 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 10	EFD4S397	610-620 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 10	EFD4S398	600-610 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 10	EFD4S399	590-600 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 10	EFD4S400	580-590 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 9	EFD4S401	570-580 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 9	EFD4S402	560-570 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 9	EFD4S403	550-560 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 9	EFD4S404	540-550 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 9	EFD4S405	530-540 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 9	EFD4S406	520-530 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 9	EFD4S407	510-520 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 9	EFD4S408	500-510 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 7	EFD4S409	490-500 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 7	EFD4S410	480-490 cm (=II/8)	T/M/S
Kabazi II	East, Sq. 3M	Layer 7	EFD4S411	470-480 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 7	EFD4S412	460-470 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 7	EFD4S413	450-460 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 7	EFD4S414	440-450 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 7	EFD4S415	430-440 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 7	EFD4S416	420-430 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 7	EFD4S417	410-420 cm	T/M/S
Kabazi II	East, Sq. 3M	Layer 7	EFD4S418	400-410 cm	T/M/S
Karabai	South, Sq. K11	Arch’ IA	EFD4S422	500-510 cm	T/M/S
Karabai	South, Sq. K11	Sterile (IA-I)	EFD4S423	510-520 cm	T/M/S
Karabai	South, Sq. K11	Arch’ I	EFD4S424	520-530 cm	T/M/S

Karabai	South, Sq. K11	Sterile (I-IIA)	EFD4S425	530-540 cm	T/M/S
Karabai	South, Sq. K11	Arch' IIA upper	EFD4S426	540-550 cm	T/M/S
Karabai	South, Sq. K11	Arch' IIA lower	EFD4S427	550-560 cm	T/M/S
Karabai	South, Sq. K11	Sterile IIA-II)	EFD4S428	560-570 cm	T/M/S
Karabai	South, Sq. K11	Arch' II	EFD4S429	570-580 cm	T/M/S
Karabai	South, Sq. K11	Sterile (II-III/1)	EFD4S430	580-590 cm	T/M/S
Karabai	South, Sq. K11	Arch' III/1	EFD4S431	590-600 cm	T/M/S
Karabai	South, Sq. K11	Sterile (III/1-III/2)	EFD4S432	600-610 cm	T/M/S
Karabai	South, Sq. K11	Arch' III/2	EFD4S433	610-620 cm	T/M/S
Karabai	South, Sq. K11	Sterile (III/1-IV/1)	EFD4S434	620-630 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 4	EFD4S306	260-270 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 4	EFD4S307	270-280 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 4	EFD4S308	280-290 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 4	EFD4S309	290-300 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 5 (= I-IV)	EFD4S310	300-305 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 5 (= I-IV)	EFD4S311	305-310 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 5 (= I-IV)	EFD4S312	310-315 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 5 (= I-IV)	EFD4S313	315-320 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 5 (= I-IV)	EFD4S314	320-325 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 5 (= I-IV)	EFD4S315	325-330 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 5 (= I-IV)	EFD4S316	330-335 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 5 (= I-IV)	EFD4S317	335-340 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 5 (= I-IV)	EFD4S318a	340-345 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 5 (= I-IV)	EFD4S318b	345-350 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 6	EFD4S319	350-360 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 6	EFD4S320	360-370 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 6	EFD4S321	370-380 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 6	EFD4S322	380-390 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 6	EFD4S323	390-400 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 6	EFD4S324	400-410 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 6	EFD4S325	410-420 cm	T/M/S
Sary-Kaya	North, Sq. 35C	Layer 5 (= Arch' I)	EFD4C326	309 cm	14C

Table 5.2. Tephra, Magnetic Susceptibility, Sedimentary, and Radiocarbon samples from sites in the Crimea

Ten full luminescence dating samples were taken from Kabazi II (Figure 5.6, Figure 5.7). This site has the deepest stratigraphy of any sampled in the Crimea in the present project, and is thought to have accumulated over the longest time period of any sampled in this project as a whole (excluding Myshtulagty Lagat), i.e. from the Last Interglacial onwards. There is a detailed pollen record (Gerasimenko 1999), and a number of uranium series, ESR, and AMS ^{14}C dates. These have been used to relate the site to others in the region (Table 5.3) and beyond (Chabai, 2004). The dates are broadly in agreement in the upper levels, and indicate a late phase of the Middle Palaeolithic in the Crimea (~ 30-40 ka), there are conflicts in the middle of the stratigraphy, and no dates from the oldest levels. As at Kabazi V the deposits at Kabazi II are limestone rich and appear largely autochthonous, but colluvial bleaching is a possibility, and higher dose rates in the last interglacial deposits indicate the potential for allochthonous material having been incorporated. Artefacts from the upper and lower levels appear to have been buried insitu by colluvial sediments, while in the middle levels there is evidence for colluvial reworking of the assemblages. A variety of depositional and post depositional processes at Kabazi II are expected to impact on OSL dating results, such that varying levels of success may be expected from different layers at this site. However, Kabazi II provides a clear opportunity to both test the dating techniques being applied in the present project, and to contribute new information by resolving chronological conflicts and extending the absolute dating record in the region.

Three full luminescence dating samples were taken from Karabai, which is a smaller and was only first excavated in 2004. The archaeology in the sampled section is all Middle Palaeolithic (Micoquian and Western Crimean Mousterian), and appears largely *insitu*. Upper Palaeolithic archaeology was found in stratigraphically higher levels at the site, which is in a different type of location to the other localities sampled in the Crimea, and its function is therefore expected to have been different. It appears most similar to, in both its archaeological context and its sedimentology, the site of Biriuchya Balka for the sedimentology is loessic colluvial, which makes it perhaps the most OSL datable of the Crimean sites.

In addition to the full luminescence dating samples, 62 small samples were taken in zip lock bags or small tubes (Table 5.1). These were designed to provide profiles of more limited luminescence information up and down the sampled sections (Figure 5.3, Figure 5.4, Figure 5.5, Figure 5.6). These may be used to indicate

changes in luminescence behaviour and hence source material down section, and for the better quality samples change in stored dose with depth can be used to help assess the datability of the sequence. The best quality profiling samples (generally small tubes in soft sediment) might be used to measure approximate dates in their own right.

Modern surface samples were taken at Sary-Kaya, Kabazi II and Karabai in black bags (Table 5.1). Care was taken to avoid spoil from excavations and, since much of the sediment at these sites is thought to have accumulated colluvially, these samples are thought to have been subject to a similar depositional process as the archaeological sediments. This means that their analysis may be useful in determining the levels of bleaching and mixing in the archaeological samples. At Kabazi V a representative sample could not be obtained due to disturbance of the surface by archaeological and forestry activity on and around the site in recent decades.

Two separate clast samples were also taken from the most probable sources of limestone at Kabazi II: one from the boulder forming the sediment trap, which was itself from the harder limestone in the upper part of the cliff on the scarp above the site and would have provided the “fresh” limestones found in the deposits, the other was from the more friable limestone lower part of the cliff, which would have provided the more weathered material. Since the geology of the cliff was the same at the Kabazi V site, these samples also have relevance to the samples from that site.

In addition to the luminescence samples previously documented, a further series of samples were taken from the four aforementioned sites for combined volcanic tephra, magnetic susceptibility and sedimentary analysis (see T/M/S samples in Table 5.2). These were removed from the same cleaned sections that the luminescence samples came from although the vertical column used for T/M/S sampling was displaced a short distance from the line of luminescence sampling. The sampling was undertaken in continuous 5 or 10 cm spits in order to minimise the chances of missing a non-visible micro-tephra.

A total of 21 T/M/S samples were removed from Sary-Kaya (see Table 5.2). The 160 cm vertical sampling column encompassed geological layers 4, 5 and 6 situated between depths of 260-420 cm in excavation square 35C. The sequence therefore took in the four archaeological horizons (I-IV) associated with the fossil soil in geological layer 5, and the fifth lowermost archaeological horizon (V) that occurs around the 400 cm mark in geological layer 6. In addition, one radiocarbon sample

consisting of a tooth of *Equus hydruntinus* was taken for AMS dating. This came from archaeological horizon I in geological layer 5 at a depth of 309 cm.

The next site to be sampled was Kabazi V where a total of 17 sediment samples were removed for volcanic tephra, magnetic susceptibility and particle size analysis (see Table 5.2). One isolated T/M/S sample (EFD4T327) came from a 13 cm vertical profile associated with cultural layer IV/1, geological layer 14A, which was situated between two large limestone blocks in square Ж. The remaining 16 T/M/S samples (EFD4T328-EFD4T343) came from a cleaned vertical column in square 6Б. The prevalence of cultural horizons rich in potentially datable organic materials provided the opportunity of more extensive radiocarbon sampling and so six AMS ^{14}C samples were removed from cultural layers III/1A (x2) & III/1 in square 6Б, III/4-5 in square 7Б, III/5-3B1 in square 7B and IV/3 in square 11Ж. The presence of burnt stones also provided the potential of cross-correlation of ages using TL, in addition to AMS and OSL.

The third site sampled was Kabazi II where 75 T/M/S samples were taken from the East section in squares 3L and 3M (see Table 5.2); the reason for the 'dog-leg' in the sampling was because of safety requirements with the ladders. The lower section covering layers 14B1, 14B and 14A (992-1130 cm) came from square 3L, the upper sampled section covering layers 7, 9, 10, 11 (upper and lower), 13, 13A and 14A – including an overlap – (400-1000 cm) was made in square 3M. Since extensive AMS dating had already taken place on Kabazi II, no radiocarbon samples were taken in 2004.

The fourth site to be sampled in August 2004 was Karabai. A total of 13 T/M/S samples were taken from a cleaned vertical face covering a depth from 500-630 cm in square K11, about 20 cm to the right of the luminescence column. The samples encompass a series of archaeological horizons with intervening sterile layers. No organic material was encountered during the sampling and so no AMS samples could be taken, an unfortunate situation since no ^{14}C chronology exists for this site.

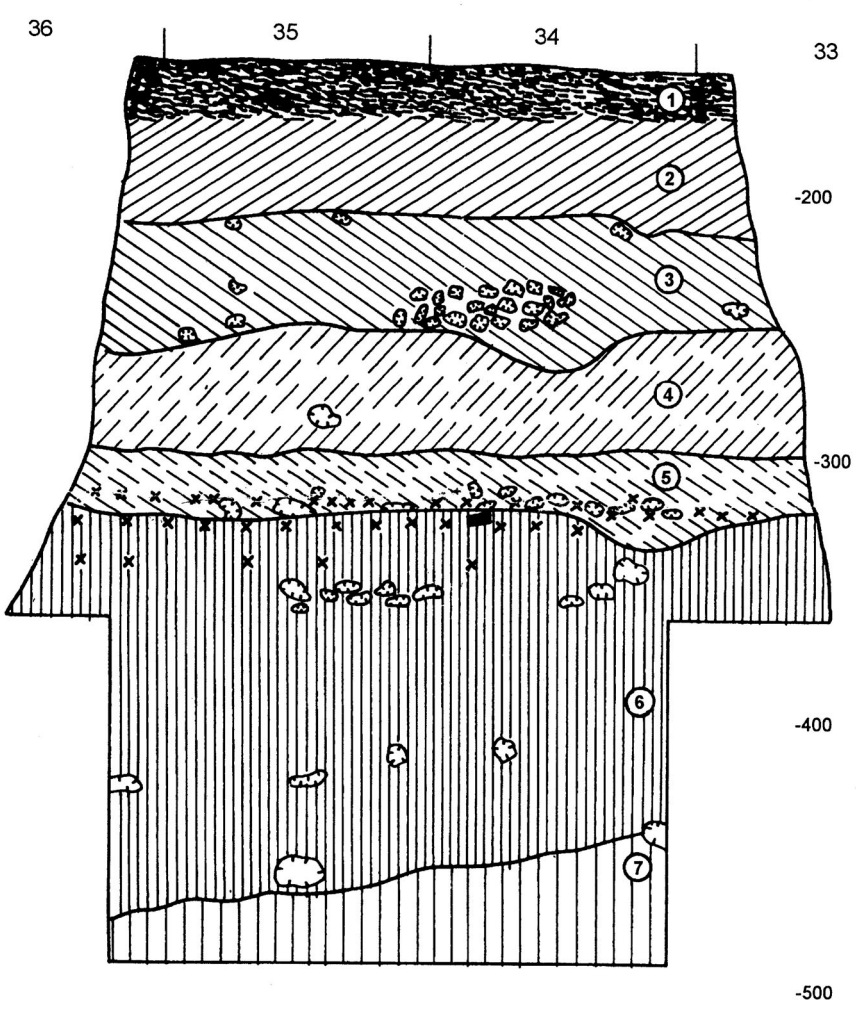


Figure 5.2. Published Sary-Kaya section, after Chabai (2004)

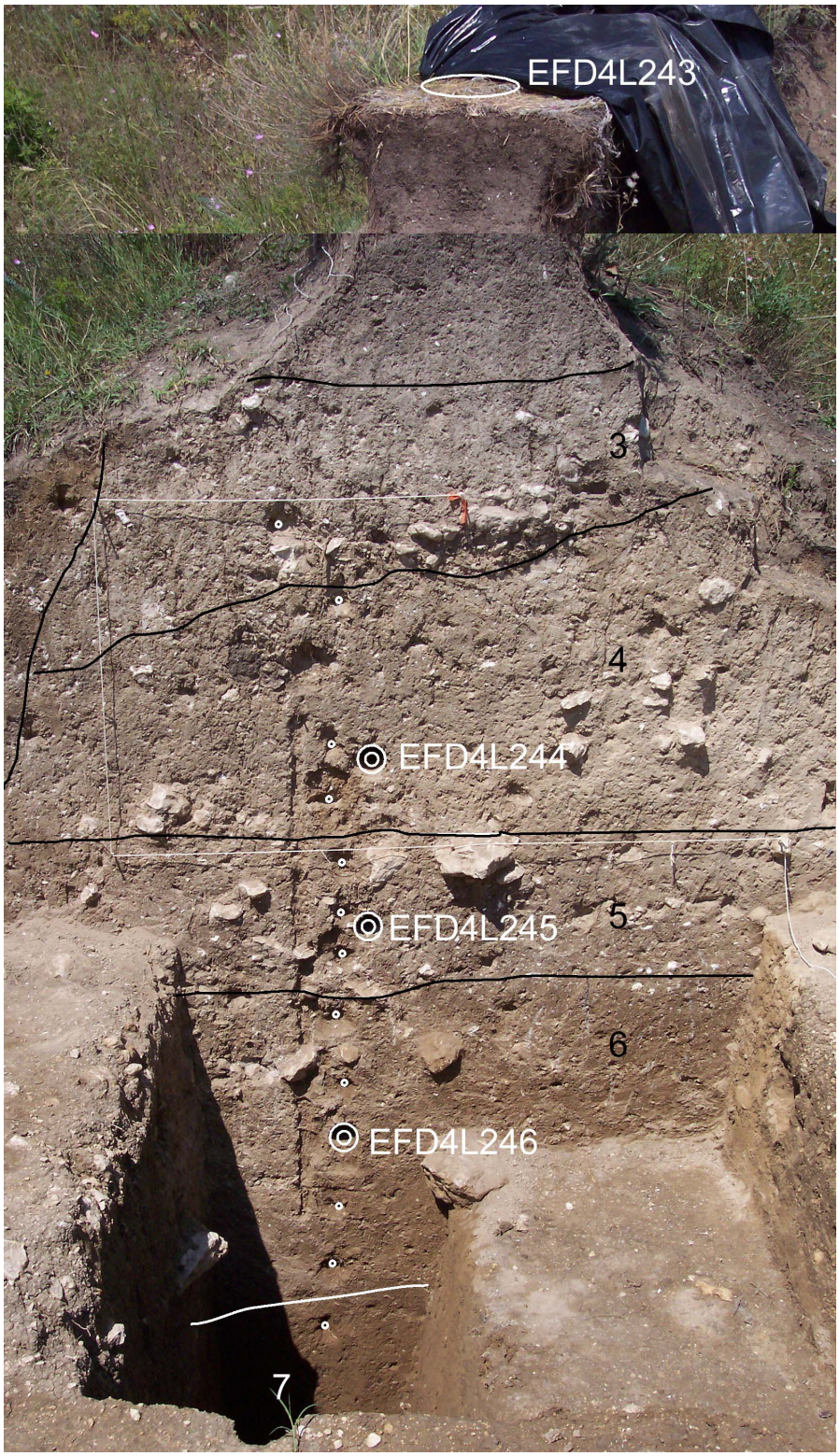


Figure 5.3. Sary-Kaya section. Luminescence sampling positions are shown as concentric circles, representing the diameters of the luminescence sampling tube and of the field gamma spectrometer probe. Small circles mark the locations from which small tube samples were taken for luminescence profiling.

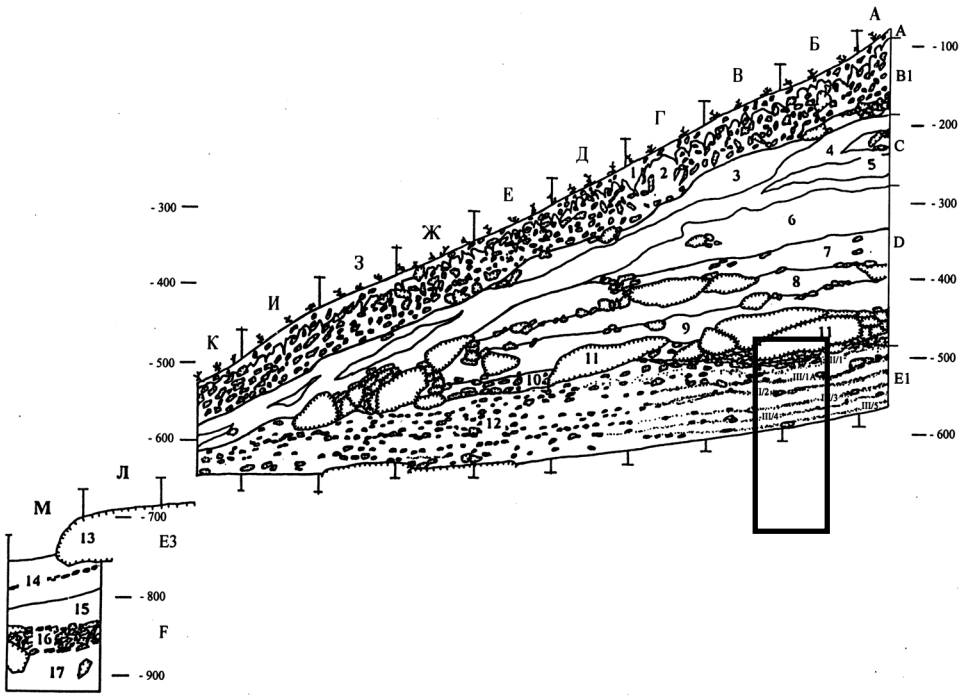


Fig. 11-2—Kabazi V, Stratigraphic profile along line "9": *1-17*–lithological layers; *A, B, D, E1-E2, E3, F*–geological strata; *III/1, III/1A, III/2, III/3, III/4, III/5*–archeological levels.

Figure 5.4. Published Kabazi V section. Relative position of sampling in the present study indicated. Adapted from Yevtushenko (1998).

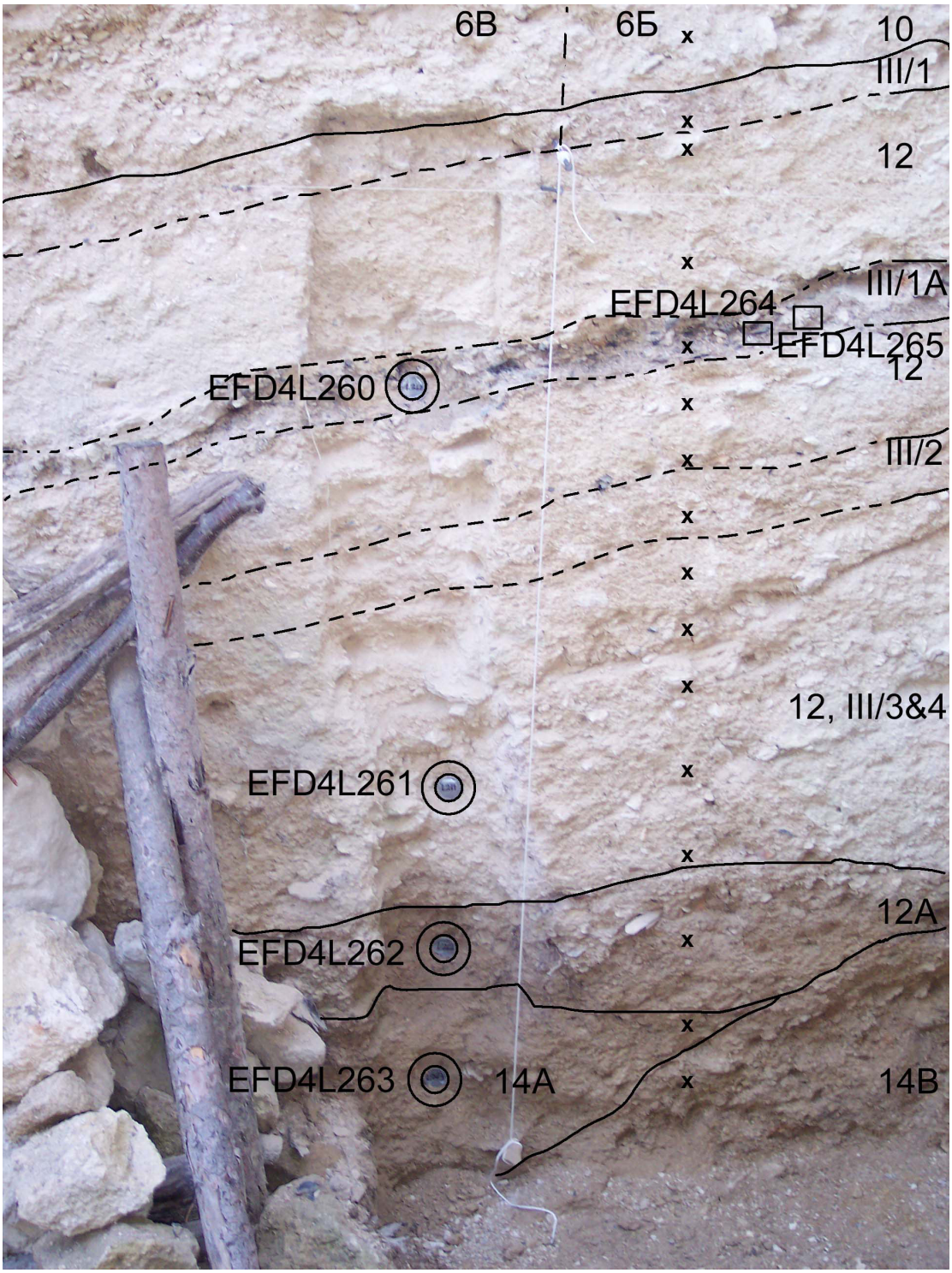


Figure 5.5. Kabazi V. Luminescence sediment sampling positions are shown as concentric circles, representing the diameters of the luminescence sampling tube and of the field gamma spectrometer probe. The locations from which burnt stones were taken for luminescence dating are shown as rectangles. “x”s mark the locations from which small bag samples were excavated for luminescence profiling.

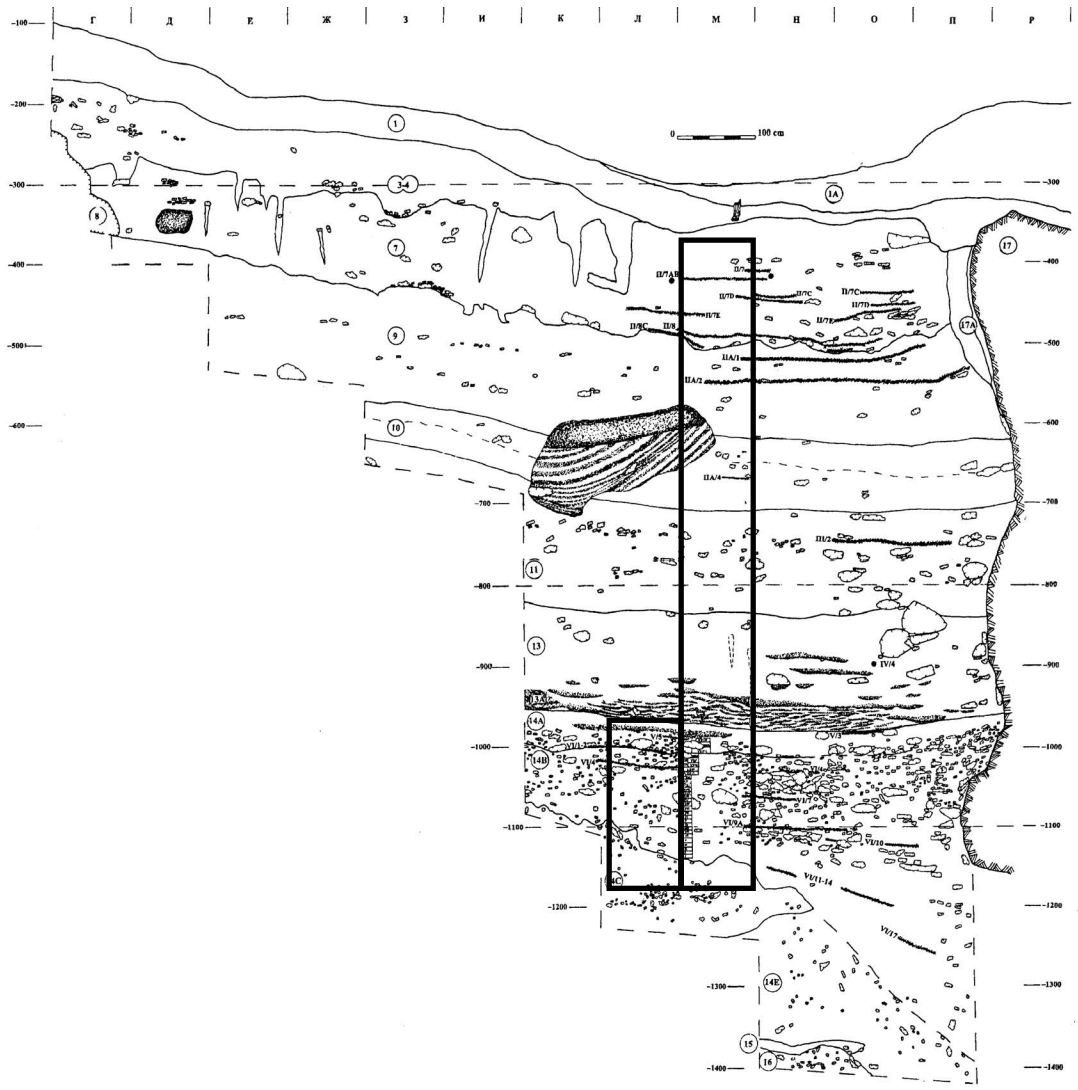


Figure 5.6. Kabazi II, East section. Position of sampling in the present study indicated. Adapted from Chabai (2004).

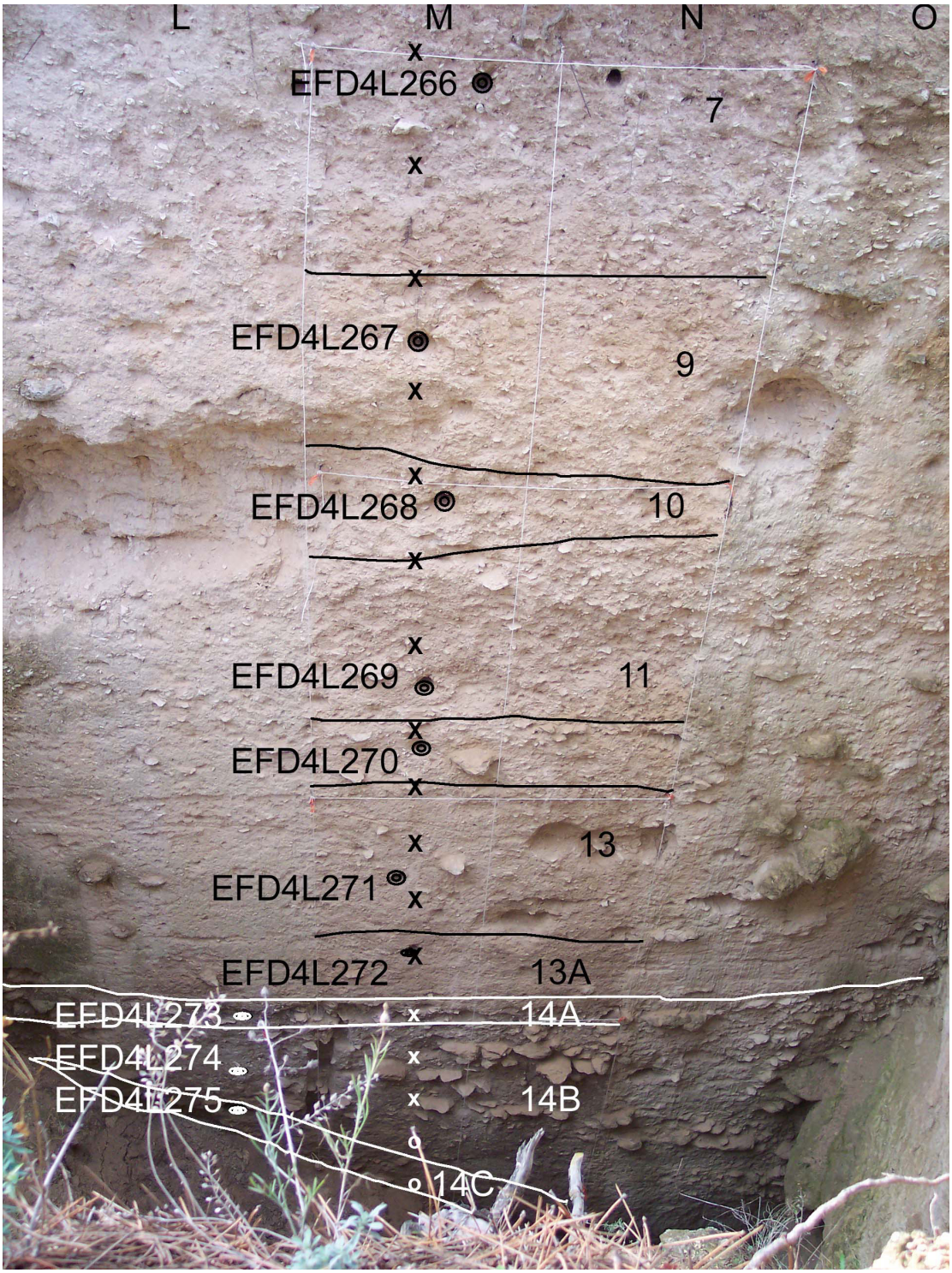


Figure 5.7. Kabazi II. Luminescence sampling positions are shown as concentric circles, representing the diameters of the luminescence sampling tube and of the field gamma spectrometer probe. “x”s and “o”s mark the locations from which small bag and tube samples were excavated for luminescence profiling.

ka BP	Glacial Stage	Vegetation/Climate	Kabazi II				Starosele				Kabazi V		
			Levels	*U-Series*	*ESR*	*AMS*	*Levels*	*U-Series*	*ESR*	*AMS*	*Levels*	*U-Series*	*ESR*
32	Arcy (Denekamp)	forest-steppe; climatic amelioration	horizon -195										
35	Stadial	xerophytic steppe; arid and cold; harsh continental climate	II/1A II/1 II/2 II/3 II/4 II/5	39.8±5	32±6	31.55±.6 35.1±.85 32.2±.9 33.4±1							
38	Les Cottés	pine forest, shrubs and steppe; inclement continental climate	II/6--II/7 II/7AB II/7C--II/7E		32±2								
42	Hengelo	forest-steppe vegetation, broad-leaved forest (birch) +pine + meadow steppe; moderate climate	II/7F8 II/8C IIA/1		39±3		1 2	 about 60 (?)	>41.2±3.6	41.2±1.8 42.5±3.6			
58	Stadial	pine forest, shrubs and steppe; inclement continental climate	IIA/2 IIA/2-3										
62	Moershoofd	forest-steppe vegetation, broad-leaved forest + meadow steppe, moderate climate	IIA/3-IIA/3B IIA/4					?			II/3 through II/4A; (II/7 ?)		
78 (?)	Stadial	xerophytic steppe, continental climate	IIA/4B III/1A-III/1				3	about 67.5 (?)	42±4.7		III/1; III/1A III/2; III/3	73.3±6	55±4
105	Odderade (?) Brörup Amersfoort	forest-steppe vegetation, broad-leaved (birch) forest + meadow steppe, humid moderate climate	III/2	54±3	61±1 (LU)		4	>80	48±11 (LU) 77±6 (RU)				
118	Stadial	shrub-arboreous formations, cold and humid	III/3		53±4 or 70±5 69±5 (LU)								
128	hygrothermic optimum Eem xerothermic optimum	broad-leaved forests, warm and humid pine and broad-leaved forests, an increase in humidity pine and broad-leaved forests, cooler and slightly drier warm hornbeam-oak forests	IV horizon -930 horizons: -980; -1037--1050; -1080;1100; -1135--1145										

Table 5.3. Correlations between Kabazi II, Starosel'e and Kabazi V. After Chabai *et al.*, chapter 11 table 11-1, ERAUL 87 (1999).

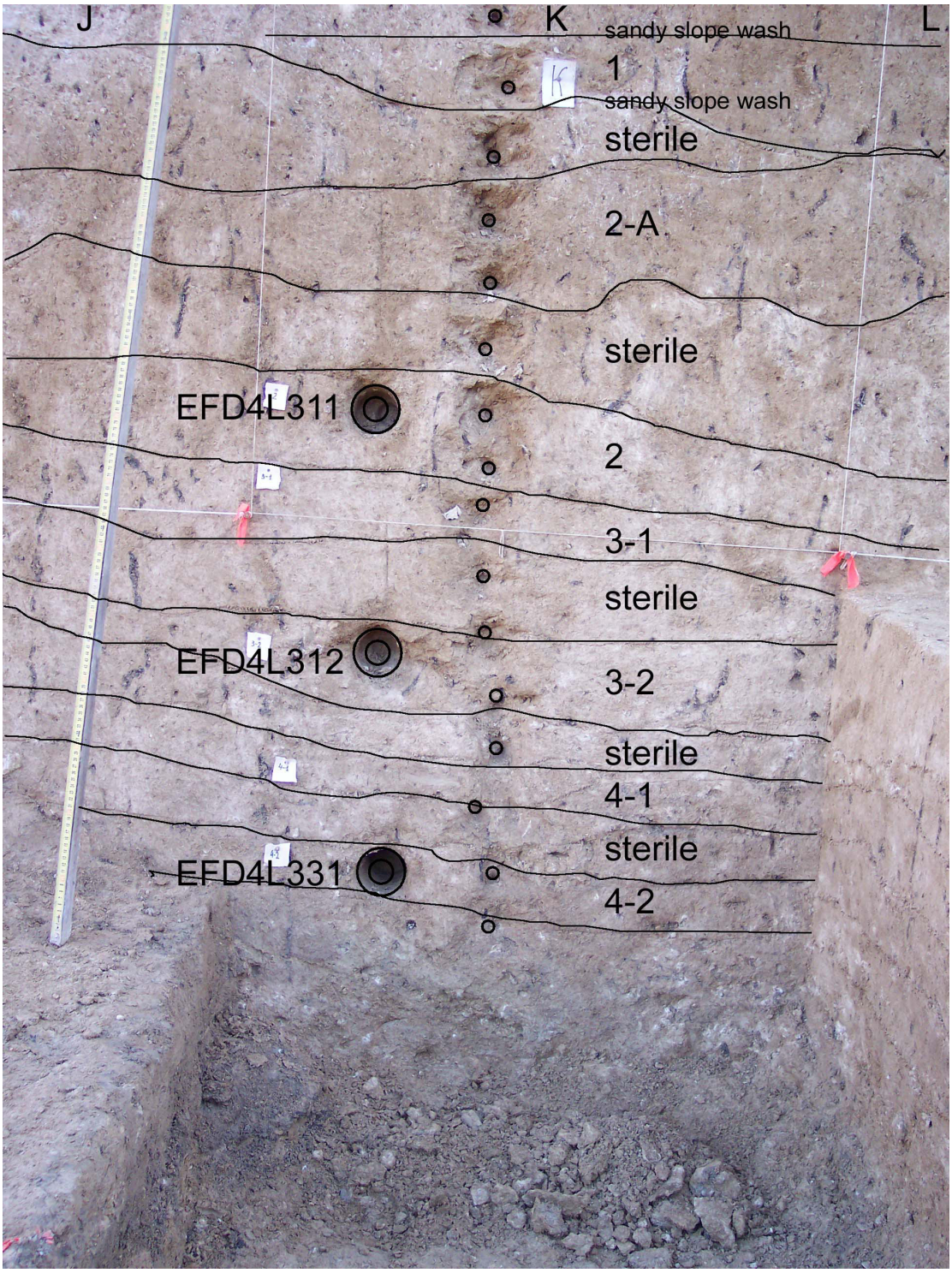


Figure 5.8. Karabai section. Luminescence sampling positions are shown as concentric circles, representing the diameters of the luminescence sampling tube and of the field gamma spectrometer probe. Small circles mark the locations from which small tube samples were taken for luminescence profiling.

5.2 Luminescence samples

Luminescence dating samples were generally taken in stainless steel tubes (*l* = 15 cm, ∅ = 3 cm) (Appendix 5.2). The ends of these tubes were taped to retain the sample material and water following very brief light exposure. In softer/less stony sediments, steel kubiena style tins (12.5 x 3 x 4 cm) were sometimes used. These were particularly advantageous for sampling thin or discontinuous layers, since there was greater assurance that the sample did not cut into other layers. After extraction the tins' lids were used to scrape off the outer layers (of light exposed material) as they were placed. These were taped on to seal the samples.

The tubes/tins were then labelled and sealed in labelled zip-lock bags, with additional loose sediment for gamma spectrometry measurements in the laboratory. This sediment was collected from a 6 cm ∅ hole made around the sampling position using a larger steel "over tube". The resultant hole facilitated placement of a 2" NaI probe for field gamma dose rate measurements (Section 5.3, Appendix 5.3). The zip-lock bags were packed in groups of two or three in labelled and sealed black bags. Other samples are described individually in the text, but were all ultimately packed in labelled and sealed black bags before being packed in a larger black bag containing all samples from the site and/or region.

5.3 Gamma Spectrometry

Insitu determinations of gamma dose rate were made by field gamma spectrometry at the point of sampling for all "full" luminescence dating samples (Appendix 5.3). The measurements were conducted using a Rainbow multichannel analyser with a 2" x 2" NaI probe. Gamma emissions were measured in the approximate range 10 – 3072 keV in 1024 channels, such that all emissions from ^{40}K, and the U and Th decay series could be observed. These account for the vast majority of gamma radiation present in a "natural" environment. *Insitu* "infinite medium" gamma dose rates were calculated from counts integrated above energies of 450 keV, above 1350 keV, and from the empirically corrected total energy integral. The proportion of total counts above 450 keV, and above 1350 keV, will be similar for ^{40}K, and the U and Th decay series when they are in secular equilibrium. Thus, in a

mixed field conversion from counts to dose rate can be made directly by integrating above these energies, with little effect from variations in the relative concentrations of ^{40}K, and the U and Th decay series. In the present study conversion was made using factors measured for another but similar instrument, which have been adopted as standard in the SUERC laboratory for 2" x 2" detector dimensions.

The field gamma spectrometry measurements were made for 10 minutes (600 s) each, which yielded counts >450 keV of between 2854 (EFD4G083, Kabazi II, surface of limestone block next to pit) and 12847 (EFD4G079, Sary-Kaya, Layer 6). *Insitu* gamma dose rates were calculated by hand following field measurements, using integrated counts above Channel 150, and assuming that the instrument gain setting was correct: *i.e*. It had not varied since the instrument was last set such that the ^{40}K peak (1461 keV) was at Channel 487, and channel width was thus ~3 keV. Recorded spectra were later processed using proprietary software ("Rainbow 3"), which included energy recalibration to the location of the gamma emission from ^{40}K observed in each spectrum.

For measurement, the NaI probe was generally placed in a 6 cm diameter hole cut around each sampling point using a larger "overtube". It was not generally possible to drive the tube into the sections the "ideal" distance of 30 cm, which would ensure that no more than ~1% of the detected gamma field would come from outside the sampled section. However, hole depth and the approximate geometry of the sediments around the measurement points was assessed and recorded. It was ensured that hole depth was sufficient for the large majority (>~90%) of the detected gamma field to come from sediments in the immediate vicinity of the luminescence sampling point. The relatively enclosed nature of the sections being sampled ensured that the remainder of the field would be close to an average for the section, such that averaging effects of no more than ~3% might be expected. Since this is less than other expected sources of uncertainty, no attempt was made to corrected for it. Other sources of uncertainty in the dose rates include the accuracy of the dose rate conversion factors, instrument reproducibility (over and above counting statistics), variations in water content during burial, and U-Series disequilibrium effects. The instrument related factors are currently being assessed, and the sample related factors will be assessed during later work on the samples in the laboratory. The dose rates quoted in this report should thus be regarded as preliminary, but are likely to be correct within uncertainties of ~5%.

5.4 Tephra, Magnetic Susceptibility, Sedimentary and Radiocarbon Samples

5.4.1 Tephra, Magnetic and Sedimentary Samples

The samples taken for tephra, magnetic susceptibility and sedimentary analysis consisted of loose sediment scraped with a knife from a cleaned prepared vertical section and placed into labelled zip-locked polythene bags. Sampling was contiguous and normally covered 5 cm or 10 cm of sedimentary accumulation although this had to be adjusted on occasion to take account of layer boundaries in order to avoid mixing material from separate units. During sampling the larger clasts were generally excluded in favour of fine-grained sediment, since the latter was deemed more suitable for the intended analyses.

5.4.2 Radiocarbon Samples

Sampling for radiocarbon was constrained by the paucity of appropriate material that is suitable for measurement by AMS, although in the case of Kabazi V this was less of a problem. Normally only where cultural material was prevalent in a layer was it feasible to locate good radiocarbon samples. In the case of the Crimean sites, a range of worthwhile ^{14}C datable material was identified that came from clear *insitu* stratigraphic horizons – charcoal, burnt bone and unburnt bone. Where possible these were taken. It was not necessary to separate the charcoal from the associated sediment in the laboratory and so the samples were all submitted to the Oxford Radiocarbon Accelerator Unit in the packaging in which they had been conveyed from the field.

5.5 Pre sampling site reviews (by Allsworth-Jones)

5.5.1 Sary-Kaya

The following description is given in Chabai (2004, 98-100). The section (his Fig. III-9) is reproduced from Kolosov *et al*. (1993), and was the one that we had to hand in the field (Figure 5.9).

Open air site on a cape-like promontory on the left side of Glubokaya Balka, which is cut into a limestone cuesta. Yu. G. Kolosov divided the almost 5 metres thick packet of loamy deposits into 8 lithological horizons (Kolosov *et al*., 1993, pages 100-105). He also succeeded in identifying 2 clearly marked soils, in the upper part of lithological horizon 4 and in horizon 5. Kolosov excavated the site in 4 field seasons in 1977-78 and 1985-86. In the first two seasons Sary-Kaya was dug as a one-layered site, but subsequently there was an attempt to subdivide the cultural layer into a number of archaeological horizons. Many flints and a few faunal remains were found in a relatively concentrated 20 cm thickness in the lower part of lithological horizon 5 (the fossil soil) and the upper part of horizon 6. This 20 cm thick packet was subdivided into 3 archaeological horizons (I-III). These horizons were not separated from each other by clear sterile lenses. The archaeological material also extended deeper, forming archaeological horizons IV-VII, although the concentration of flints was much less. No sterile lenses between these horizons were observed. Thus the cultural remains in the lower part of 5 and the upper part of 6 (undivided by sterile lenses) reach a total thickness of about 1.5 metres, the main concentration being in horizons I-III. The majority of the finds made in 1977-78 correlate with horizons I-III as distinguished in 1985-86.

In order to determine the processes which led to the formation of the archaeological horizons, detailed geo-archaeological investigations would be needed. At present, one can observe the homogeneous character of archaeological horizons I-III from the 1985-86 and 1977-78 excavations. Nonetheless it is likely that these collections are the result of many short term visits to the site.

In spite of the existence of two clearly defined fossil soils, the chronological position of the finds can presently only be guessed at. It is possible that the lower soil

(lithological horizon 5) may correspond to the climatic conditions characteristic of the Hengelo interstadial.

First version 15 August 2004; revised 22 August 2005.

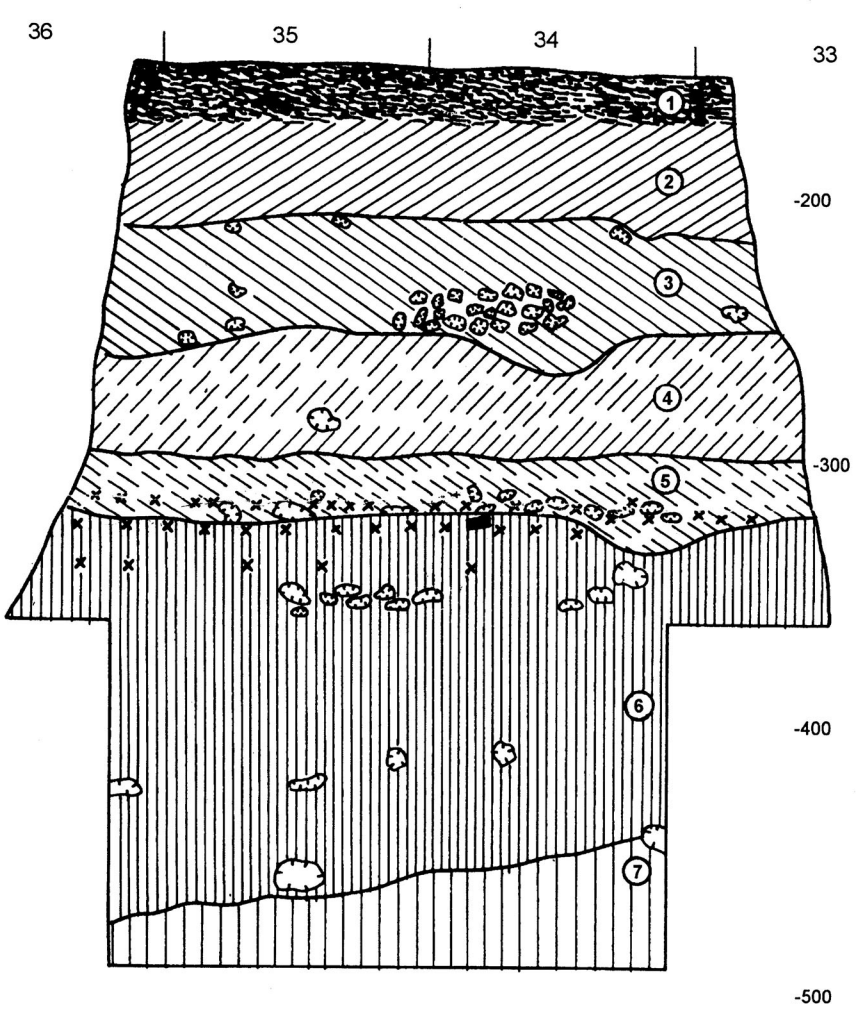


Figure 5.9. Sary-Kaya section, after Chabai and Kolosov

5.5.2 Kabazi V

The site is described by Yevtushenko (1998) in chapter 11 of ERAUL 84. ESR and Uranium series dates are reported by Rink *et al*. and McKinney in chapters 13 and 14 of the same volume. Burke (1999) in chapter 2 of ERAUL 87 provides a faunal analysis.

Kabazi V is on the steep south facing slope of Kalinovaya Balka, a valley on the right bank of the Alma river. Although the site is only about 400 m from Kabazi II, which is on the west facing slope of the same mountain, its situation is described as "quite different". It was first excavated by Kolosov and Chabai in 1986 when four archaeological units (I-IV) were recognised. Excavations continued in 1990, 1993, and 1995, when these units were subdivided. C.R. Ferring examined the stratigraphy from a geological point of view in the last two of these years. The stratigraphic profile along line "9" is shown in Yevtushenko's Fig. **11-2** (Figure 5.10). Ferring's geological description of the strata is at Table 5.4 and a "correlation" of the geological and archaeological sequence is at Table 5.5. The archaeological sequence shows the original units I-IV and their subdivision into levels. There are 18 lithological layers which are grouped into strata A-F, the latter being characterised in a detailed manner. Layers, strata, and archaeological levels III/1-5 are shown in Figure 5.10. In addition, Yevtushenko has suggested that the archaeological units and levels could be combined into a number of "complexes", and these are listed in the right hand column of Table 5.5.

It appears that, unlike Kabazi II, this really was a "collapsed rock shelter". Strata F and E derived from bedrock clays. There were two major episodes of roof fall in strata E3 and lower D. Up to that time the site functioned as a rock shelter, and archaeological units IV and III formed within it. From the time of D onwards "colluvial, and possibly eolian, sedimentation" predominated in an open site setting. Archaeological unit II accumulated after the rock shelter roof collapse. Units I, I-A, and II-A, are now recognised to have been displaced. According to Burke, there was not much change in the faunal composition through time, and most occupations were short lived. Only 8.9% of the 7292 recovered remains could be identified by taxon, but these were dominated by *Saiga tatarica* and equids. Exploitation of the open steppe environment on the plateau above the site is indicated, although the river valley was not altogether ignored.

ESR and Uranium series dates have been reported by Rink *et al*. and McKinney. Rink (Table 5.6, 13-6) lists the results for the dating of 4 teeth from archaeological levels III/1 and III/1a. The mean date for three teeth from III/1 is 24 ± 2 (EU) and 31 ± 1 (LU) ka, whereas the best estimate for the tooth from III/1a is that it is <41 ka old. Rink states that he has "strong confidence" in the dates for III/1. By contrast, McKinney (Table 5.6, 14-3) lists the dates for 4 teeth (59 and 210 being replicates) for III/1. His estimated age for the level is 73,300 ± 6000 years ago, a result which he considers "reliable". In the circumstances, a further attempt to date the site is justified.

The profile recorded in 2004 is said to have been situated at the boundary of 6В and 6Б, which implies that the excavated area may have been extended beyond line 9, though Chabai (2004) still illustrates the section along that line. The layers correspond to those previously identified, though subdivisions 12A and 14A and B seem to be new. These points should be checked with Yevtushenko.

First version 22 August 2005.

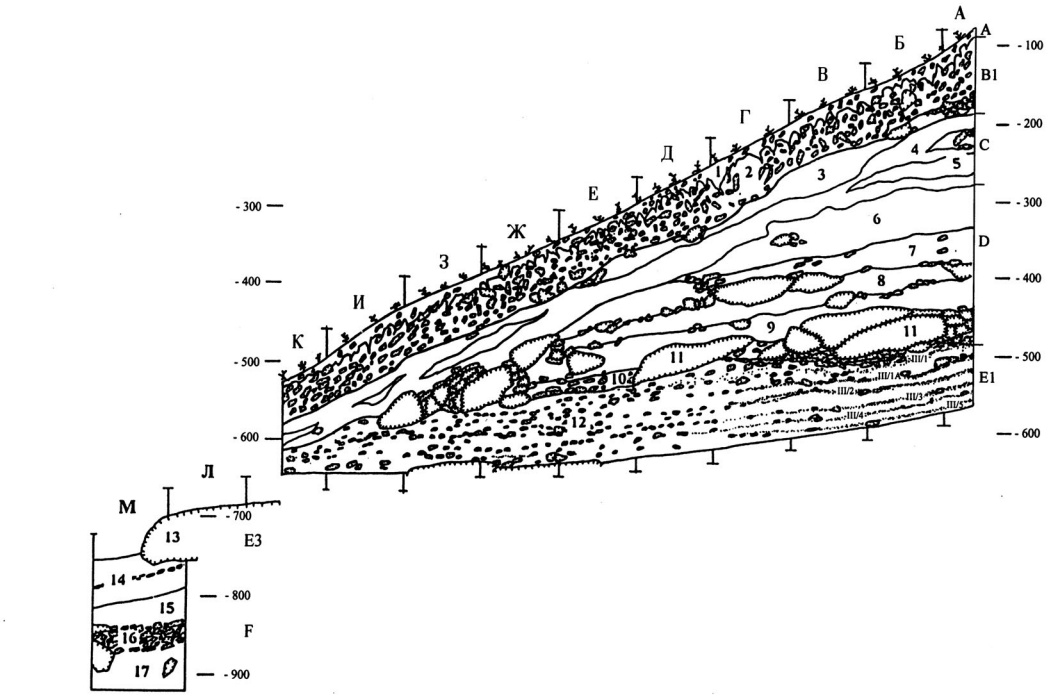


Fig. 11-2—Kabazi V, Stratigraphic profile along line "9": *1-17*–lithological layers; *A, B, D, E1-E2, E3, F*–geological strata; *III/1, III/1A, III/2, III/3, III/4, III/5*–archeological levels.

Figure 5.10. Kabazi V stratigraphic profile, line 9

TABLE 11-1
Kabazi V, Stratigraphic Description (all colors Munsell moist)

Stratum	Description
A	(Soil A horizon): 10YR4.5/1 poorly sorted gravelly silt loam; many angular and many rounded limestone cobbles and pebbles; thick carbonate crusts on clast bases; gradual wavy boundary.
B1	(Soil Ak horizon): 10YR7/2 gravelly silt; clasts, mainly granules, with some rounded pebble to cobble clasts; continuous carbonate coats and some possible concretions; gradual irregular boundary.
B2	(Soil Ak2 horizon): 10YR7/2 gravelly silt; clasts, mainly granules, with many rounded cobbles and few boulders; continuous carbonate coats on clasts; clear irregular boundary parallel to modern surface.
C	(Soil K horizon): 10YR8/1 silt; massive; contains few granule-size fossil clasts in upper part; thins downslope; upslope it merges with weathered bedrock; faint bedding planes parallel to slope; horizon of common artifacts with chaotic orientations in middle of stratum; lower 10 cm indurated; gradual smooth boundary.
D	10YR7/3 clast supported granule gravel; some thin beds are silt matrix supported; clasts mainly small fossils from bedrock; beds subhorizontal; gradual wavy boundary.
E1	10YR7.5/4 silt with angular cobble to pebble eboulis clasts; some zones clast supported; few thin discontinuous beds of sand-sized rock fragments; few large blocks of limestone rockfall (these are more common and larger in east wall of block); sediments fill vertical fissures in bedrock at backwall part of section; unit thins and pinches out to south; abundant artifacts and fauna between 188-200 cm; hearth in lower part, against bedrock back wall; base of unit appears erosional.
E2	10YR5/3 granular silt, with thin lenses of clast-supported granular to pebble eboulis; base of unit is rockfall slab (at 5.85 m below site datum at described section).
E3	(Sediments below rockfall slab in southeast part of block) 2.5YR6/4 granular silt; massive, very hard when dry; clasts are mainly nummulitic fossil fragments; contains bones and charcoal associated with Cultural Layer 4 in upper part. Increase in eboulis content and clast size with depth, with same silt matrix. 1.7m of exposed sediments below rock slab (0.8 m thick).

Table 5.4. Kabazi V stratigraphic description

TABLE 11-2
Kabazi V, Correlation of Geological and Archeological Sequence

GEOLOGICAL SEQUENCE†		*ARCHEOLOGICAL SEQUENCE*		
Stratum	*Lithological Layer*	*Unit*	*Level*	*Complex*
A	1	I	I/1	A1
B1	2		I/2	
B2	3	I-A	I-A	
C	4	II-A	II-A	
	5			
D	6 (upper)	II	II/1	A2
	6 (lower)		II/2	
	7		sterile	
	8		sterile	
	9 (upper)		II/3 (II/3a, II/3b)	B
	9 (lower)		II/4	
	10 (upper)		II/4a (II/5, II/5a, II/6)	C
	10 (lower)		II/7	
	11		sterile/roof collapse	
E1	12 (upper)	III	III/1, III/1a, III/2	D
E2	12 (middle)		III/3, III/4	E
	12 (lower)		III/5	F
E3	13		sterile/slab	
F	14 (upper)	IV	IV/1	G
	14 (lower)		IV/2	
	15		sterile	
	16		sterile	
	17		sterile	
	18		sterile (bedrock)	

† See figures 11-1 and 11-2.

Table 5.5. Kabazi V correlation of sequences

TABLE 13-6
Kabazi V, ROSY ESR Ages on Enamel and Analytical Data

Enamel Sample	*Level*	*Square*	*Elev.* †	*Cementum U (ppm)*	*Enamel U (ppm)*	*Dentine U (ppm)*	*ESR EU Age (ka)*	*ESR LU Age (ka)*
94301 IIA	III/1	J9	-539	49.6	0.3	29.5	23 ± 1	32 ± 2
94303 IIA	III/1	39	-571	18.5	0.1	21.4	24 ± 2	31 ± 2
94303 IIIA	III/1	39	-571	33.7	< 0.1	10.2	26 ± 2	30 ± 3
	Mean Level III/1			**33.9 ± 15.6**	**0.2 ± 0.1**	**20.4 ± 9.7**	**24 ± 2**	**31 ± 1**
94304 IIIA	III/1a	B9	-538	N/A	1.19	38.0	41 ± 2	55 ± 4

N/A: not applicable (no cementum layer present on the Saiga tooth), † cm below datum.

TABLE 13-7
Kabazi V, Mass Spectrometric U-Series Ages for Cementum (Cem), Dentine (Den), and Enamel (Enam)

Sample	*Level*	$^{234}U/^{238}U$	$^{230}Th/^{234}U$	$^{230}Th/^{232}Th$	*U [ppm]*	*Age [ka]*	*% of ESR EU age*
94301AII							
Cem 94301AII	III/1	1.029 ± 0.731	0.184 ± .001	736 ± 2	48.8 ± 0.3	22.1 ± 0.1	96
Den 94304III	III/1	1.015 ± .005	0.095 ± .001	424 ± 2	26.6 ± 0.1	10.8 ± 0.1	47
Enam 94304III	III/1A	1.069 ± .004	0.325 ± .026	220 ± 18	1.71 ± 0.1	42.6 ± 4.2	104
Den	III/1A	1.063 ± .005	0.421 ± .002	708 ± 2	31.4 ± 0.1	59.1 ± 0.4	144

TABLE 14-3
Kabazi V

Unit Level	*Sample Number*	*Uranium ppm*	*Thorium ppm*	U^{234}/U^{238}	Th^{230}/Th^{232}	Th^{230}/U^{234}	*Age K years BP*
III 1	64-304-E-3	0.93 ± 0.02	<0.01	1.15 ± 0.04	226	0.42 ± 0.03	58.7 ± 6/5
III 1	59-300-E-1	2.3 ± 0.03	<0.01	1.14 ± .02	75	1.01 ± 0.02	>350,000
III 1	210-300-E-3	1.4 ± 0.1	<0.01	1.04 ± 0.1	38	0.13 ± 0.02	15.4 ± 2/2
III 1	214-312-E-3	0.45 ± 0.03	<0.01	1.2 ± 0.1	14	0.29 ± 0.04	37.2 ± 5/5
III 1	202-311-E-3	0.51 ± 0.04	0.05 ± 0.02	1.04 ± 0.1	6.1	0.18 ± 0.02	21.6 ± 3/3

Table 5.6. Kabazi V ESR and U-series dates

5.5.3 Kabazi II

5.5.3.1 Part 1

The site is described in the three ERAUL volumes on the Palaeolithic of the Crimea edited by Chabai *et al*. vol. 1 (1998) vol. 2 (1999) and vol. 3 (2004). These will be referred to as ERAUL 84, 87, and 104. ERAUL 84 chapter 8 provides an introduction to the site by Chabai, chapters 9 and 10 deal with the artefacts, chapter 13 by Jack Rink *et al*. deals with the ESR dating, and chapter 14 by Curtis McKinney deals with the uranium series dating. Chapter 15 is a preliminary synthesis by Chabai and Marks. ERAUL 87 contains a valuable chapter 6 by Natalia Gerasimenko on the palynology and geological correlation of the site. Chapters 3 and 11 by M. Patou-Mathis and by Chabai *et al*. are relevant. The last chapter 25 in ERAUL 104 by Chabai *et al*. should also be consulted.

The site is on the northern valley wall of the Alma river, on the southern slope of Kabazi mountain, at a height of 300 metres above sea level. Kabazi is part of the second ridge of Crimean mountains. Limestone, chalk, and marl form the bedrock. Excavations commenced in 1986. The Lower Excavation Area (60 square metres) now provides the principal section to a depth of about 8 metres, a continuation to a depth of 13 metres being provided by the 2 square metre sondage (S1) immediately to the north-west of it (ERAUL 84, Figure 8.4) (Figure 5.11). The site was at first believed to be a collapsed rock shelter, but this has proved not to be the case. Unusually, it formed in the open on the hill slope, as a result of sediment becoming trapped behind a large limestone slab or barrier (ERAUL 84, Figure 8.2) (Figure 5.12). At least two more limestone blocks fell or rolled onto the site later (nos. 8 and 12 in the above Figure, as distinct from no. 17). Colluvium filled in behind the limestone barrier, thus constituting the ‘unique topographic setting’ of the site. J. Rink *et al*. commented with regard to Kabazi II (as well as Starosel’e and Kabazi V) that ‘no wind blown sediment was found, which precluded the application of optical luminescence dating at these sites’ (ERAUL 84, page 323). By contrast, Gerasimenko labels at least two strata at Kabazi II as ‘loesses’, which would be not unexpected at an open-air site (ERAUL 87, Table 6.1) (Figure 5.13). A full description of the 13 strata in the Lower Excavation Area was provided by C.R.

Ferring (ERAUL 84, Table 8.1) (Table 5.7). This should be seen in conjunction with the drawn section. Ferring commented on the main features as follows.

Strata 1 and 2 are young colluvial. There is an erosional break between 2 and 3. Strata 3-6 show prolonged weathering indicated by pedogenic features. There is a further major erosional disconformity between 6 and 7. Strata 7-11 are said to be indicative of 'rapid' colluvial deposition, behind the limestone barrier. The uranium series dates are quoted in evidence to support the idea of rapid accumulation (but see below for further discussion of this point). 12 is one of the fallen limestone blocks. 13 is quite different from the strata above, with the highest clay content, indicative of warmer and moister conditions at the site.

Chabai described the archaeological succession in terms of five main archaeological units, subdivided into levels and horizons (ERAUL 84, pages 181-183). The position of these units and subdivisions is most usefully indicated by Gerasimenko in relation to the lithological strata (ERAUL 87, Table 6.1) (Figure 5.13). It should be noted however that in support of her diagram she quotes only some of the U and ESR dates, whereas the radiocarbon dates (OxA series) are given in full. Chabai's description of the archaeological material is as follows.

Unit (I). Horizons 1-4, derived, i.e., not *insitu*. To these may be added Horizon 5 '-195' which had a very little archaeological material. This was first called 'Staroselian' but it is not quite clear whether this appellation has now been dropped.

Unit (II). 14 subdivisions. Stratum 6 contained unit II/1A. Stratum 7 contained unit II/1-7E and 8-8C. All were attributed to the Western Crimean Mousterian (WCM), part of the Levallois Mousterian sensu lato. Chabai commented that there were no fireplaces, charcoal, or burned bone. (Stratum 8 can apparently be amalgamated with 7).

Unit (IIA). 8 subdivisions. Strata 9 and 10. Unit IIA/1-4B. Crimean Micoquian (Ak-Kaya).

Unit (III). 4 subdivisions. Upper part of stratum 11. Unit III/1A-3. Crimean Micoquian (Ak-Kaya).

Unit (IV). Upper part of stratum 13. At first compared with Kiik-Koba lower layer, now called Last Interglacial Micoquian (pace Stepanchuk, not Taubachian).

There are six more archaeological horizons in stratum 14 in the sondage (not as yet published in detail) whereas strata 15 and 16 are sterile. All together this constitutes the 'longest palaeolithic stratigraphic sequence' in the Crimea.

The ESR dates obtained by Rink *et al*. were listed in terms of archaeological unit (ERAUL 84, Table 13.4) (Table 5.8, 13.4). Three mean values were given for II/1A, II/7B, and III/2. Single values are available for II/8 and III/3. Some U-series ages for dentine were also given (Table 13.5) (Table 5.8, 13.5) but they have not featured in any subsequent discussion. Subsequent discussion has also focussed entirely on the Linear Uptake (LU) ESR dates (and not the younger EU).

The uranium series dates obtained by McKinney were also listed in terms of archaeological unit (ERAUL 84, Table 14.1) (Table 5.8, 14.1). As he said in respect of his results in general, there were 'surprises and unexpected problems'. For unit I/3 there was an 'average' date of 31 ± 3 ka and a 'plotted' date of 38 ± 2 ka. This has not featured in subsequent discussion, presumably because of the displaced nature of the deposits. Unit II/1-7F8 produced eight dates and unit III/2 six more. In McKinney's opinion, the period of accumulation of Unit II was 'not a rapid event'. He suggests that it may have occupied about 15,000 years, and that treating it as a 'single unit' its average age will have been 39.8 ± 5 ka. In her diagram however (ERAUL 87, Table 6.1) (Figure 5.13) Gerasimenko uses McKinney's individual U-series dates for II/1A, II/1, and two for II/7F8, to give a range from 32.1 ± 6.5 to 65.5 ± 2.5 ka for this unit. Clearly this is double the amount posited by McKinney, and if true would definitely not constitute a 'rapid' event. McKinney's 'average' date for III/2 comes to 60 ± 3 ka whereas his 'calculated' date is 54 ± 3 ka. Both feature in subsequent discussions of the site. Again Gerasimenko quotes the minimum and maximum ages given by McKinney for this unit, 41.1 ± 2 and 117 ± 13 ka (ERAUL 87, Table 6.1) (Figure 5.13).

Gerasimenko herself has produced a complete pollen diagram for the entire section including the deep sounding (ERAUL 87, Figure 6.1). She took 48 samples of which 42 were usable. She distinguished 14 pollen zones numbered from the base up. They have been correlated with general European phases of the last interglacial and glacial periods. Three main intervals were identified, but the general trend was for a proportional decrease of AP in relation to NAP through time. (See comments above for her use of absolute dates in the construction of her Table 6.1 (Figure 5.13)).

Chabai *et al*. attempted to sum up the dating and environmental evidence in the concluding chapter of the second ERAUL volume. In doing so, they broadly accepted Gerasimenko's framework, and were quite critical of some of the dates when they did not fit this scheme (ERAUL 87, Table 11.1) (Table 5.9). Specific criticisms were as follows. With regard to Gerasimenko's pollen zone V, the Early Glacial Stadial, they commented that the ESR date of 69 ± 5 ka for unit III/3 seemed 'too young' since they would expect it to date >100,000 BP. For unit III/2 their comment was that 'neither the ESR nor U-series dates correspond to the generally accepted dates for the Early Glacial Interstadials' represented by Gerasimenko's zone VI. They do not dispute the ESR date of 39 ± 3 ka for unit II/8, which corresponds to Gerasimenko's zone X and is supposed to equate with the Hengelo Interstadial (although they pass over in silence the two older U-series dates shown by Gerasimenko on her diagram of 48 ± 17 and 65.5 ± 2.5 ka for unit II/7F8). For Gerasimenko's zone XI, their comment is that 'the ESR and U-series ages for Levels II/7B and II/7 are not completely reliable'. They do not dispute the ESR or the AMS dates relating to Gerasimenko's zone XII, which is correlated with the Main Glacial Stadial. In their view the Middle Palaeolithic occupation of the site does indeed extend up to about 32,000 years ago

In the light of the above, it seems that, in spite of the amount of work already done at Kabazi II, there are still some problems with the dating of the site. Some of the dates do not fit the environmentally generated scheme of Gerasimenko; within each dating method, there are very broad ranges for certain of the units and levels, and there are some apparent stratigraphic reversals; and there are some problems in comparing the results from one method with those from another. These problems have been particularly highlighted for the early part of the sequence. For the end of the sequence, there is the further question of how reliable radiocarbon dates are in this time range, and what effect their calibration would have.

5.5.3.2 Part 2

Part 1 describes the information that was available to us thanks to the ERAUL volumes. When we went to the Crimea in August 2004 we found a situation that had advanced somewhat beyond that. More up to date information is to be found in Chabai's book on "*The Middle Palaeolithic of Crimea*" (2004). This deals with the Crimea as a whole, but there are sections dealing with Kabazi II in particular (Chabai, 2004, 7-13, 81-89).

The stratigraphy had earlier been described by reference to the section along the line of squares 8/9 (the north-western face) of the Lower Excavation Area (ERAUL 84, Figure 8.4) (Figure 5.11). An updated version of this section is given in the new book (Chabai, 2004, Fig. III.1), which is particularly relevant for the lower portions of the sequence, which hitherto had been accessible only in the sondage (S1). However, the stratigraphic record is now more fully and clearly manifest on the opposite (south-eastern) face of the Lower Excavation Area along the line of squareS3/4, and this is where our efforts were concentrated. The full sequence here is shown in Chabai's book (Figure **I-2**) and in more detail for the lower portion (Figure **III.2**). Both figures are reproduced here (Figure 5.14, Figure 5.15).

The geological characteristics of layers 1-13 were described in detail by C.R. Ferring (ERAUL 84, Table 8.1) (Table 5.7), and these remain as before. Briefly, the layers below are characterised by Chabai as follows.

(13A). Rhythmically alternating lenses of clay and sand (sandy in the lower part, clayey in the upper part), up to 0.5 metres thick, constituting the remains of temporary water flows, the product of what Ferring has called a "low-energy water process".

(14A). Dark grey humified loam, with small-sized angular rubble. Sharply distinct from both overlying and underlying layers. Not hitherto dated, but regarded as belonging to the last interglacial.

(14B). Grey compact loam, with a considerable clay content and some angular rubble. The base of the layer pre-dates the emplacement of the large barrier slab, which subsequently had such a marked effect on the accumulation of deposits at the site.

(14C-F) (15) (16). Slope deposits formed prior to the emplacement of the slab.

The pollen zones previously described by Gerasimenko and their relation to the geological layers remain as before (ERAUL 2, Table 6.1) (Figure 5.13). Some of Chabai's comments concerning the lower part of the sequence are as follows.

Pollen zone VI. Geological layer 11. Archaeological horizon III-2. Upper Pryluky, equivalent among other things to the Krutitsa interstadial recognised on the Russian Plain. Apparently Jack Rink ("having analysed all the available data") now believes that this horizon dates to between 75 and 105,000 BP (Rink, Ferring, Chabai, JFA, in press).

Pollen zone IV. Geological layer 13. Archaeological horizons IV-1 to 5 (as well as overlying III–8A to E, and underlying V–1 to 2A) are all regarded as displaced. This does **not** apply to archaeological horizons V–3 to 6, in geological layer 14A (and Pollen zone III), which are *insitu*.
Pollen zone II. Geological layer 14B. Archaeological horizons VI-1 to 17 are likewise regarded as being *insitu*.

Summing up the site as a whole, Chabai comments that this 13 metre thick section contains 17 geological layers and 55 *insitu* archaeological horizons as well as 20 horizons that are more or less displaced. Of the former, 20 are Western Crimean Mousterian (A3A-IIA/2) and 35 are Crimean Micoquian (IIA/2-3 – VI/17). The earlier phase of the Micoquian (Ak-Kaya facies) corresponds to a number of very brief visits by people to the site.

Figures 5.6 and 5.7 here show the positions where samples were taken in 2004 from the south-eastern section along the line of squareS3/4. The corresponding luminescence sample numbers are 266-275. The notes made at the time incorporate information that was imparted in the field by V.P. Chabai. Samples 266, 267, 271, 272, 273, 274, and 275 are uncontroversial and correlate respectively with geological layers 7, 9, 13, 13A, 14A, 14B, and 14B(1) [though the (1) does not seem to be a standard part of Chabai's system and this requires clarification]. Layer 13A is said to correlate with the third terrace of the Alma river. Chabai emphasises the importance of layer 14A, because (in the case of success) that would be the first Last Interglacial archaeological occurrence in the Crimea to be absolutely dated. There are some questions that arise in relation to samples 268, 269, and 270, attributed respectively to geological layers 10 and 11. There is apparently a difference of opinion between Chabai and Ferring as to where the boundaries between these layers should be drawn, and this is reflected in the notes that accompany the samples. The line drawn between samples 269 and 270 presumably reflects the dotted line that appears at depth –800 on Chabai's sections [but the significance of this line and the boundary between layers 10 and 11 would probably need to be discussed with him if dates were successfully obtained for this part of the sequence].

Part 1 completed 8 August 2004; Part 2 completed 18 August 2005.

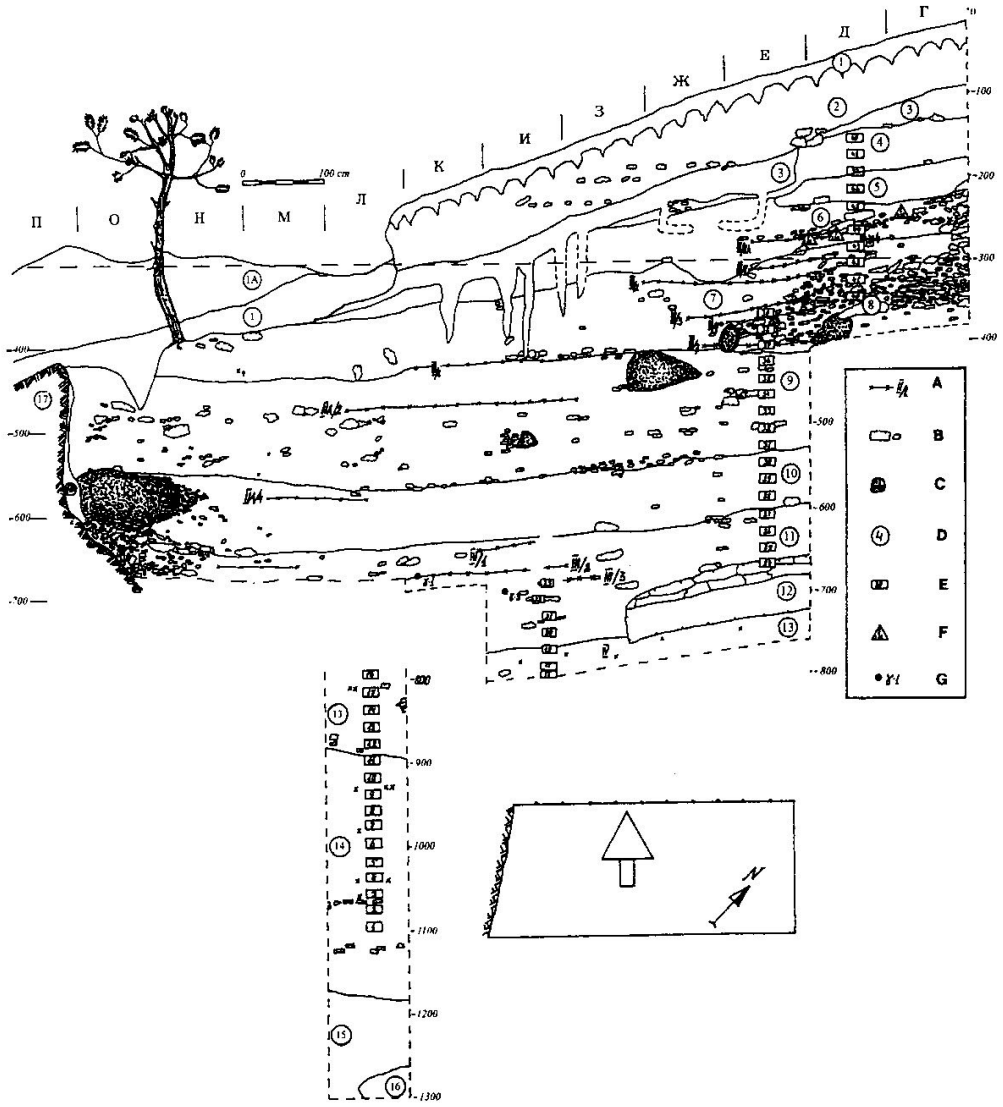


Fig. 8-4—Kabazi II: section along the line of squares "9": *A*–archeological levels; *B*–limestone blocks; *C*–large animal tunnels; *D*–numbers of Strata; *E*–numbers of pollen samples; *F*–ESR samples; *G*–ESR dosimeters.

Figure 5.11. Kabazi II section along line 9 (ERAUL 84)

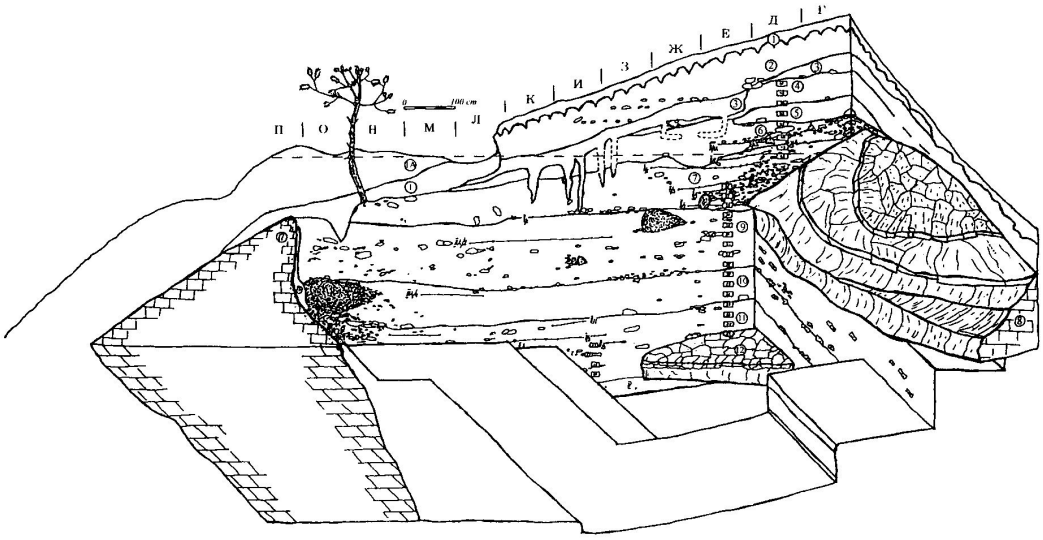


Fig. 8-2—Kabazi II: the lower excavation area showing disposition of: *17*–limestone barrier; *8, 12*–blocks; *1-7, 9-11*–sediments.

Figure 5.12. Kabazi II, lower excavation area (ERAUL 84)

TABLE 8-1
Kabazi II, Stratigraphic Description (all colors Munsell moist)

Stratum	Description
1a	(Soil A1 horizon): 10YR2/2 granular silt; strong fine sub-angular blocky structure; angular to sub-angular limestone granules and pebbles; few platy pebbles; abundant fine roots; common snails; clear smooth boundary.
1b	(Soil A2 horizon): 10YR3/2 granular silt; strong fine angular and sub-angular blocky structure; poorly sorted angular limestone granules and pebbles; common fine roots; few snails; clear irregular boundary.
2a	(Soil AC horizon): 10YR4/2 granular silt to silt loam; angular limestone granules and pebbles; smaller clasts sub-rounded; carbonate crusts on larger clasts; many fine roots; few snails; gradual smooth boundary.
2b	(Soil C1 horizon): 10YR4/3 granular silt; strong granular structure; poorly sorted rounded limestone granules and few pebbles; 1 mm to 2 mm carbonate crusts on clast bases; few fine woody roots; diffuse smooth boundary.
2c	(Soil C2 horizon): 10YR5/3 granular silt loam; strong granular structure; poorly sorted granule to cobble limestone clasts, sub-angular to angular; carbonate crusts coat larger clasts; erosional boundary in whole section, gradual in profile.
3	(Soil Ck horizon): 10YR6/3 granular silt; few limestone granules and pebbles, sub-angular to sub-rounded with carbonate coats; common carbonate filaments, soft carbonate masses and pores with carbonate linings; clear erosional boundary.
4	(Soil Ck2 horizon): 10YR6/4 granular silt, with increase in carbonate masses and filaments; clear boundary; unit is truncated ca. 2.3 meters from east wall.
5	(Unit inaccessible for description.)
6	10YR7/3 matrix; sub-angular to sub-rounded boulder to cobble eboulis clasts, common at base, on erosional surface, fining up through 6 and probably through 3; eboulis abundant in northern part of block near huge block of limestone fall; common carbonate filaments and carbonate pore linings; base of unit is disconformity with clast-filled, southwest trending shallow gullies.
7-8	10YR6/3 matrix; common granule to cobble clasts; smaller ones sub-rounded, larger ones angular; clasts abundant near large block as above; abundant artifacts and bones in CL II/1-II/7; clear horizontal contact with stratum 9 corresponds with CL II/8.
9	10YR7/4 matrix at top, 8.76YR7/4 at base; unit fines upward from clast supported granule to small pebble zones at base to zones with many fewer large clasts at top; few angular boulders through unit; smaller clasts rounded, larger ones angular; few thin beds of matrix-free granules; matrix is loamy sand-silty sand; no secondary carbonates; gradual boundary with 10.
10	8.75YR7/4 matrix; coarse, usually clast-supported unit; more boulder sized clasts than in 9; larger clasts in beds that dip gently to southwest; most clasts are angular eboulis; granule dominated lenses between coarser stone layers; matrix is silty sand; gradual contact with 11.
11	10YR7/3 matrix at top, 10YR6.5/4 at base; poorly sorted unit, mainly clast-supported; angular pebble eboulis common, few larger angular boulders to 30 cm; more silty matrix than 10; unit is harder than 10, and has few carbonate filaments and thin clast coatings in lower part; gradual contact with 13.
12	Huge limestone block in eastern part of excavation area.
13	10YR5.5/3 granular silt loam-loam; rare larger clast; common carbonate filaments, pore linings and few fine soft concretions; few pressure coats around clasts; base not exposed.

Table 5.7. Kabazi II stratigraphic description (ERAUL 84)

TABLE 13-4
Kabazi II, ROSY ESR Ages on Enamel and Analytical Data

Sample	Level	Square	Elev. (cm below datum)	Cementum U (ppm)	Enamel U (ppm)	Dentine U (ppm)	Early Uptake ESR Age (ka)	Linear Uptake ESR Age (ka)
94206A	II/1A	Д9	-265	82.9	0.6	116.6	17 ± 1	28 ± 2
94207A	II/1A	Д9	-270	48	0.8	58.9	26 ± 2	38 ± 3
94207B	II/1A	Д9	-270	46.7	0.7	47.8	21 ± 2	29 ± 2
Mean Level II/1A				**59.2 ± 20.5**	**0.7 ± 0.1**	**74.4 ± 36.9**	**21 ± 5**	**32 ± 6**
94212A	II/7B	М5	-415	64.5	0.6	53.8	22 ± 2	34 ± 2
94208A	II/7B	М4	-424	88.1	0.3	83.9	18 ± 2	29 ± 3
Mean Level II/7B				**76.3 ± 16.7**	**0.5 ± 0.2**	**68.9 ± 21.3**	**20 ± 3**	**32 ± 2**
95100A	II/8	Н5	-465	36.2	0.9	26.6	27 ± 2	39 ± 3
95105A	III/2	Г8	-671	20.9	< 0.1	25.5	48 ± 3	62 ± 5
95104A	III/2	Г8	-680	7.4	0.1	12.4	53 ± 5	60 ± 6
Mean Level III/2				**14.2 ± 9.5**	**0.1**	**19.0 ± 9.3**	**51 ± 3**	**61 ± 1**
95101A	III/3	Г8	-698	17.1	0.3	26	53 ± 4	69 ± 5

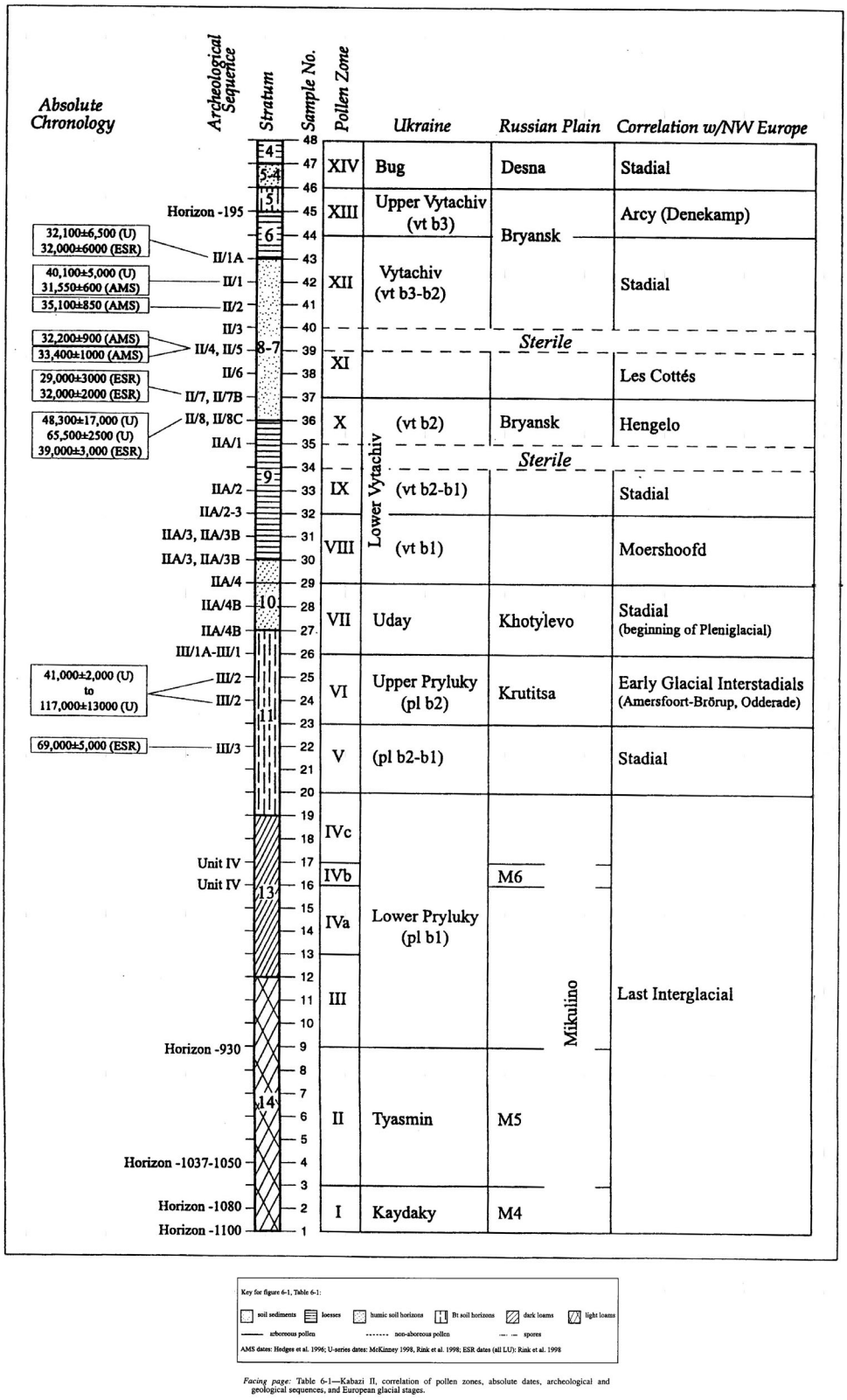
TABLE 13-5
Kabazi II, Mass Spectrometric U-Series Ages for Dentine (Den)

Sample	Level	$^{234}U/^{238}U$	$^{230}Th/^{234}U$	$^{230}Th/^{232}Th$	U [ppm]	U-series Age [ka]	% of ESR EU age
94207 Den	II/1A	1.045 ± .011	0.129 ± .001	625 ± 4	60.7 ± 0.6	15.0 ± 0.1	58 to 71
94205 Den	II/7B	1.112 ± .011	0.128 ± .001	3582 ± 24	45.7 ± 0.4	14.9 ± 0.1	75
94209 Den	II/7B	1.039 ± .014	0.131 ± .003	337 ± 7	58.6 ± 0.7	15.3 ± 0.3	77
95101 Den	III/3	1.119 ± .011	0.463 ± .002	2575 ± 7	24.1 ± 0.2	66.7 ± 0.5	126

TABLE 14-1
Kabazi II

Unit/ Level		Sample Number	Uranium ppm	Thorium ppm	U^{234}/U^{238}	Th^{230}/Th^{232}	Th^{230}/U^{234}	Age K years BP
I	3	221-281-E-3	4.1 ± 0.1	0.12 ± 0.04	1.04 ± 0.03	27.3	0.22 ± 0.02	27. ± 1/1
I	3	224-289-E-3	2.8 ± 0.1	0.04 ± 0.01	1.08 ± 0.03	44	0.25 ± 0.01	31. ± 1.5/1.5
I	3	127-289-D-1	1.1 ± 0.06	<0.01	1.16 ± 0.08	104	0.28 ± 0.03	34.7 ± 4.5/4.4
II	1	58-282-E-2	2.2 ± 0.1	<0.01	1.17 ± 0.04	549	0.31 ± 0.02	40.1 ± 5/4.7
II	1	225-290-E-3	3.3 ± 01	0.02 ± 0.01	1.14 ± 0.03	89.4	0.14 ± 0.01	16.7 ± 0.6/0.5
II	1A	39-291-E-1	2.5 ± 0.2	<0.01	1.06 ± 0.09	43	0.26 ± 0.04	32.1 ± 6.5/6
II	1A	226-291-E-3	5.3 ± 0.1	0.01 ± 0.002	1.11 ± 0.02	153	0.13 ± 0.003	14.7 ± 0.4/0.4
II	7	199-288-E-3	0.6 ± 0.1	0.02 ± 0.01	1.2 ± 0.2	36.7	0.35 ± 0.05	46.5 ± 8/7
II	7F8	222-283-E-3	3.4 ± 0.1	0.03 ± 0.01	1.14 ± 0.03	36.4	0.12 ± 0.01	13.9 ± 0.3
II	7F8	37-293-E-1	0.4 ± 0.1	<0.01	1.8 ± 0.7	50	0.37 ± 0.1	48.3 ± 17/15
II	7F8	228-293-E-3	1.8 ± 0.1	0.04 ± 0.01	1.11 ± 0.02	64.8	0.46 ± 0.01	65.5 ± 2.5/2.4
III	2	63-284-E-2	0.8 ± 0.1	<0.01	1.4 ± 0.1	640	0.69 ± 0.04	117. ± 13/12
III	2	210-284-E-3	2.3 ± 0.04	0.02 ± 0.01	1.22 ± 0.02	379.2	0.40 ± 0.01	53.9 ± 2/2
III	2	56-285-E-2	0.9 ± 0.1	<0.01	1.7 ± 0.3	613	0.34 ± 0.04	43. ± 7/6
III	2	223-285-E-3	10.6 ± 0.2	0.06 ± 0.01	1.16 ± 0.02	240.3	0.41 ± 0.01	55.8 ± 2/2
III	2	65-292-E-2	0.5 ± 0.02	<0.01	1.84 ± 0.07	606	0.32 ± 0.02	41.1 ± 2/2
III	2	227-2923	3.1 ± 0.06	0.1 ± 0.02	1.11 ± 0.03	46	0.48 ± 0.01	69.7 ± 3/3

Table 5.8. Kabazi II ESR and U-series dates (ERAUL 84)



Facing page: Table 6-1—Kabazi II, correlation of pollen zones, absolute dates, archeological and geological sequences, and European glacial stages.

Figure 5.13. Kabazi II pollen zones, after Gerasimenko (ERAUL 87)

ka BP	Glacial Stage	Vegetation/Climate	Kabazi II				Starosele				Kabazi V		
			Levels	*U-Series*	*ESR*	*AMS*	*Levels*	*U-Series*	*ESR*	*AMS*	*Levels*	*U-Series*	*ESR*
32	Arcy (Denekamp)	forest-steppe; climatic amelioration	horizon -195										
35	Stadial	xerophytic steppe; arid and cold; harsh continental climate	II/1A II/1 II/2 II/3 II/4 II/5	39.8±5	32±6	31.55±.6 35.1±.85 32.2±.9 33.4±1							
38	Les Cottés	pine forest, shrubs and steppe; inclement continental climate	II/6--II/7 II/7AB II/7C--II/7E		32±2								
42	Hengelo	forest-steppe vegetation, broad-leaved forest (birch) +pine + meadow steppe; moderate climate	II/7F8 II/8C IIA/1		39±3		1 2	about 60 (?)	>41.2±3.6	41.2±1.8 42.5±3.6			
58	Stadial	pine forest, shrubs and steppe; inclement continental climate	IIA/2 IIA/2-3										
62	Moershoofd	forest-steppe vegetation, broad-leaved forest + meadow steppe, moderate climate	IIA/3-IIA/3B IIA/4					?			II/3 through II/4A; (II/7 ?)		
78 (?)	Stadial	xerophytic steppe, continental climate	IIA/4B III/1A-III/1				3	about 67.5 (?)	42±4.7		III/1; III/1A III/2; III/3	73.3±6	55±4
105	Odderade (?) Brörup Amersfoort	forest-steppe vegetation, broad-leaved (birch) forest + meadow steppe, humid moderate climate	III/2	54±3	61±1 (LU)		4	>80	48±11 (LU) 77±6 (RU)				
118	Stadial	shrub-arboreous formations, cold and humid	III/3		53±4 or 70±5 69±5 (LU)								
128	hygrothermic optimum Eem xerothermic optimum	broad-leaved forests, warm and humid pine and broad-leaved forests, an increase in humidity pine and broad-leaved forests, cooler and slightly drier warm hornbeam-oak forests	IV horizon -930 horizons: -980; -1037--1050; -1080;1100; -1135--1145										

Table 11-1—Correlation of glacial stages, the Kabazi II pollen sequence, and archeological levels of Kabazi II, Starosele, Kabazi V

Table 5.9. Correlation of sites, after Chabai *et al.* (ERAUL 87)

Figure 5.14. Kabazi II section along line 3 / 4, after Chabai (2004)

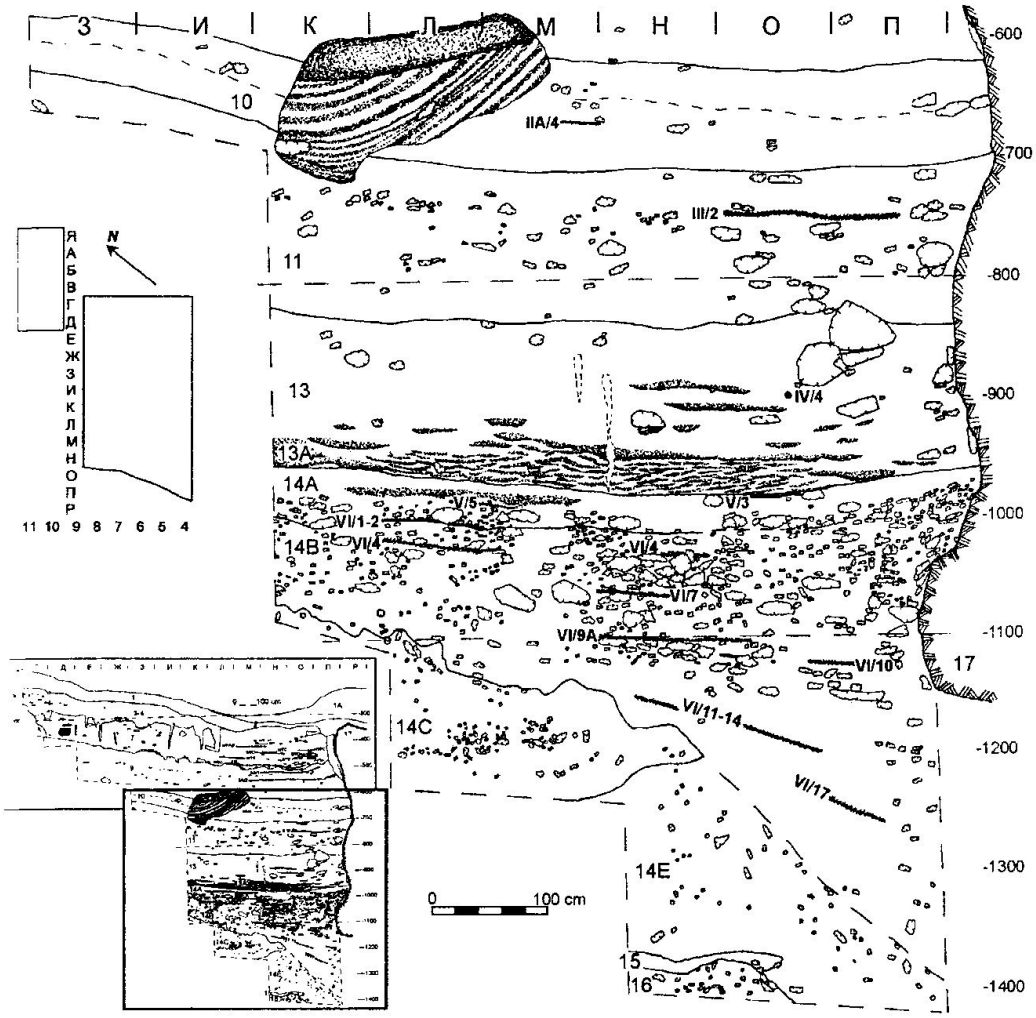


Рис. III-2. Кабази II, стратиграфическое положение 10-16 геологических слоев. Профиль по линии квадратов 3/4. Арабскими цифрами указано положение геологических слоев, сочетанием римских, арабских и букв – положение археологических горизонтов.

Fig. III-2. Kabazi II, the stratigraphical position of the geological layers from 10 through 16. The section along the square lines 3/4. The Arabic numerals showing the position of geological layers, the combination of Roman and Arabic numerals pointed the position of archeological levels.

Figure 5.15. Kabazi II section along line 3 / 4 lower portion, after Chabai (2004)

5.5.4 Karabai

This site was newly discovered in 2004, therefore no literature was available for it. We are dependent on the excavators to provide us with more information about it. A.I. Yevtushenko and V.P. Chabai guided our investigations in the field, described the stratigraphy, and suggested a suitable location for the taking of samples. The samples were taken in section S, square K. The stratigraphy, illustrated at Figure 5.8, shows a succession of archaeological layers (1, 2A, 2, 3-1, 3-2, 4-1, 4-2) separated by sterile horizons with sandy slope wash at the boundaries between the upper layers. A Western Crimean Mousterian is said to overlie a Micoquian occupation. Three full luminescence dating samples were taken from layers 2, 3-2, and 4-2, as well as 13 small tube samples and 1 surface sample, apart from samples for tephra, magnetic susceptibility, and sedimentary analysis.

First version 23 August 2005.

Appendix 5.1 Pre-sampling site assessment forms (by Burbidge and Allsworth-Jones)

Site	Kabazi V				
General Description					
Buried rock shelter at top of scree slope under Limestone cliffs. Multi-layer Middle Palaeolithic – Staroselian in upper part, and the Western Crimean Mousterian overlying Micoquian (or the other way around?)					
Geographic Description					
Top of scree slope under Limestone cliff. South facing, near the Alma river. ~ 400 m from Kabazi II. ~ 120 m above level of modern river.					
Latitude		**Longitude**		**Altitude**	
Bedrock Geology					
Nummulitic (Fossiliferous) Limestone Fossiliferous clays					
Archaeology & Quaternary Stratigraphy:					
Excavation History					
Flints discovered in 1962 by Petrun and Bilokrys (geologists) Site located 1983 Zaitsev 1985 Test excavation by Kolosov 1986 Start of proper excav: Kolosov & Chabai (Kolosov *et al*., 1988) 1990 Excav contd: Chabai & Yevtushenko 1993 & 1995 Excav contd: Yevtushenko					
Periods/cultures represented					
Staroselian in upper layers Lower layers = Western Crimean Mousterian overlying Micoquian					
Main activities represented					
"Base camp" – lenses of occupation deposits					
Common artefact types	e.g. Flint, quartzite, hearths/occupation, faunal, human etc.				
Flint, bone, burnt bone, hearths					
Faunal remains					
Horse – *Equus hydrundinus* – Butchered and cooked.					
Sedimentation types	e.g. Aeolian, fluvial, colluvial, anthropogenic, loessic, sandy				
Colluvial – weathered from clays and limestone – very fossil rich (nummoliths)					

Anthropogenic – Hearth layers / Burnt and deposition of flints etc.	
Approx. depth of stratigraphy	8 m including sondage
Approx. No. contexts / stratigraphic units	17 Lithological, IV Cultural, with subdivisions
Expected age range	II/3 ~ 62 ka, III/3 (III/1?) ~78 ka, IV ~ Eem? ⇒ ~ 50 ka – 120 ka, but may start younger ~ 30 ka… - selective use of dates
Existing chronological control e.g. Typology, Anthropology, Faunal, ^{14}C etc	
ESR on teeth, U Series on teeth (Rink, Lee, Rees-Jones, Goodgen) AMS 14C ? – No data, but mentioned U Series on teeth (McKinney) **All on Levels III/1 and III/1A**	
Artefacts/contexts of particular note	
III/1A	
Archaeological questions to be addressed	
Different Mousterian industries/cultures as go up stratigraphy - Define chronological relationships between these cultures at Kabazi V and link beyond - Compare with limited other instances	
Chronological questions to be addressed	
ESR and U Series results, all from III/1 and III/1A are often inconsistent with each other. Individual measurements are scattered over a large range, and selection of results to use in defining chronology sometimes appears suspect. E.g. McKinney chooses to average extremely widely scattered results to obtain 78 ka age for III/1, which fits with the chronology at the Starosel'e site, but his only result including detectable Th gives a date consistent with the much younger results of Rink *et al*. Problems with uptake models - Resolve ages of III/1 and III/1A and hence wider questions relating to quality of ESR and U Series work. ALSO: dates for upper and lower levels to define AGE RANGE at site – CHRONOSTRATIGRAPHY REQUIRED TO BE BELIEVABLE	
Regional connections	
Kabazi II, Starosel'e and Kabazi V chronologies and cultures have been associated. In Chabai, Marks and Monigal (1999), Kabazi V levels II/3-II/4A are linked to Kabazi II levels IIA/3 – IIA/4, while Kabazi V Levels III/1 – III/3 are linked to Kabazi II levels IIA/4B – III/1 AND Starosel'e level 3. This is based on limited and sometimes selective use of available dating evidence.	

Importance of the site archaeologically
Occupation site with different Middle Palaeolithic industries superimposed. No human bone, but all found so far were similar base camp sites.
Importance of the site in terms of the regional chronology
Links to Kabazi II and Starosel'e Superimposed different cultural occupation would link into wider Crimean arguments
Datability of the site
VERY POOR! (but you never know!!) Sediments contain limestone clasts, and are derived from silty clays with loads of fossils, ultimately derived from limestone. Allochthonous material? – Flint, bone, etc in anthropogenic layers. Any windblown input? Additional note made on site: Appears very bad, although lowest (14) is silty matrix rather than clay, and III/1A is thick enough to sample from.
Contexts on which to focus for sampling
Upper, III/1A and Lower (IV, 14) – III/1A to tie in with other dates and offers potential of burnt/bleached material in thick occupation surface Upper – II/3 in layer 9 if can locate, in any case above roof collapse level. Lower – IV in layer 14 – 2 samples? 1 for Micoquian + 1 for WCM? GET CHRONOSTRATIGRAPHY – NEEDS COHERENCE but is difficult… Good candidate for burnt flint, but likely to add to the confusion created by Rink *et al*. and McKinney: Needs chronostratigraphy, not isolated finds based dating.

Completed By	**Checked By**	**Date**
CIB		15/08/04

Site	Kabazi II				
General Description					
Very Deep (14 m) site containing Middle Palaeolithic from Micoquian to Staroselian. Formed as sediment trap on uphill side of large boulder, half way downscree slope in Alma valley.					
Geographic Description					
South facing slope (North bank) of Alma river (around corner from Kabazi V, in second ridge of Crimean mountains. 300 m asl, around half way down slope between cliff and present valley bottom. (~150 m from cliff, ~ 300 m below cliff)					
Latitude		**Longitude**		**Altitude**	
Bedrock Geology					
Nummulitic limestone, Marl and Chalk.					
Archaeology & Quaternary Stratigraphy:					
Excavation History					
Periods/cultures represented					
Disturbed upper part: “Staroselian” Below this is Western Crimean Mousterian Lower is Micoquian extending to interglacial					
Main activities represented					
Common artefact types	e.g. Flint, quartzite, hearths/occupation, faunal, human etc.				
Flint					
Faunal remains					
Sedimentation types	e.g. Aeolian, fluvial, colluvial, anthropogenic, loessic, sandy				
Predominantly colluvial Some slope-wash, sandy lenses					
Approx. depth of stratigraphy		11 m vertical section			
Approx. No. contexts / stratigraphic units		6 archaeological units + subdivisions 16 Lithological layers > 14 pollen zones			
Expected age range					
Existing chronological control e.g. Typology, Anthropology, Faunal, ^{14}C e.t.c					
14C, U Series, ESR } mostly in layers 7, 8, and 11					

Pollen
Artefacts/contexts of particular note
Archaeological questions to be addressed
Chronological questions to be addressed
Date oldest layers: initiation of site Date transitions from Micoquian – WCM – Staroselian (?) Provide absolute chronology for pollen sequence (robust enough that they actually use it!) Link pollen and transitions between sites in region Resolve rate of accumulation question and scatter in present (dating) results for lower layers – disagreements not too bad in lithological layers 7 and 8, compare with these. - scattered results in layer 11, and nothing below
Regional connections
II/7F8 – IIA/1 associated with 1-2 at Starosel'e using pollen and selected dates (U-series, ESR, AMS) IIA/3-IIA/4 associated with Kabazi V II/3-II/4A using pollen IIA/4B-III/1 associated with Starosel'e 3 and Kabazi V III/1-III/3 using pollen and selected dates Wider connections and implications flow from constraining pollen and cultural transitions, for Crimea and beyond.
Importance of the site archaeologically
Longest Palaeolithic stratigraphic sequence in the Crimea Succession of Middle Palaeolithic cultures/industries. Pollen/Stratigraphic sequence back into last interglacial: - regional point of comparison for sites of shorter stratigraphy. Very young middle Palaeolithic dates - ~30 ka in upper sequence – key to overlap of Middle Pal and Upper Pal (at Kostienki for e.g.)
Importance of the site in terms of the regional chronology
See above
Datability of the site
Big enough that some parts should be OK. Also colluvial transport for ~150m + may lead to OK bleaching… Plus, soil development in some levels may have lead to bleaching through bioturbation.
Contexts on which to focus for sampling
Layer 7: II/7 & 7AB – comparison with ESR / U Series, youngest in available section Layer 9: IIA/1 – associated with Starosel'e 1-2 (and possibly loessic) Layer 10: IIA/4 – associated with Kabazi V (soil) Layer 11: III/2 – associated with Starosel'e 4 Layer 13A: Sandy lenses at base – slope wash/alluvial? (-IV/4 in Layer 13)

Layer 14A: Soil sealed by sand, but also contains a lense? (-V/3) 13A and 14A: Broadly constrain VI, the lowermost archaeological unit, which has many subdivisions in layer 14B and give relatively good dating potential Layer 14B: Below most of archaeological units, to provide lower bound for sequence

Completed By	**Checked By**	**Date**
CIB		15/08/04

No pre-sampling site assessment form was completed for Karabai, as the site only became available whilst in the field.

Appendix 5.2 Luminescence sample forms

Site Code: **Site Name:** Sary-Kaya	**Date** 13/08/04	**Context No** Modern Surface	**Luminescence Sample No** EFD4L243
Description of sampling location:		**Sketch of surrounding area**	
Black bag sample from modern surface at top of section. Vegetation removed, and ~ 1 cm depth bits of topsoil were trowelled into a bag and sealed. ~2-300 m of down-slope colluvial reworking expected			
		Photo No:	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	-	-	-

Details:
-

Description of Sample:
Black bag containing ~ 200 g trowelled from top 1 cm, after vegetation removal. Sealed and put into second black bag

Nature of Dating Problem:
Assess level of bleaching in sediments below – Modern control. No spoil, deposition expected to be similar to archaeological sediments - colluvial (+ Aeolian?), although less limestone observed in top 1 m of section than below: reworking of different material?

Completed By	**Checked By**	**Date**
CIB		13/08/04

Site Code: **Site Name:** Sary-Kaya	**Date** 13/08/04	**Context No** 4	**Luminescence Sample No** EFD4L244
Description of sampling location :		**Sketch of surrounding area**	
Tube sample from colluvial layer sealing (colluvial) "soil" containing cultural horizons: Light grey-brown clayey silt with sub-angular limestone (some shelly) 1 mm – 20 cm. Seals slightly darker grey-brown "soil" layer (s). Attempt to isolate component not from limestone??? – as for caves. Depth = 274 cm 26 cm above Datum 26 cm 25 cm above boundary Layer 4 – Layer 5 20 cm right from tephra sampling column 13 cm from nearest limestone clast			
		Photo No:	
Gamma	**Reading**	**Assoc. Sample**	**Ref No**
Dosimetry	EFD4G077	ZLB for lab γ	-
Details:			
Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time Hole Depth = 20 cm Est. Solid Angle = 4π Gamma dose rate = 0.43 ± 0.02 Relatively U and Th rich spectrum (>1350 dose rate is >450) – clays?			
Description of Sample:			
15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg. Section exposed, *insitu* water content not relevant			
Nature of Dating Problem:			
Constrain soil and hence cultural layer (s). If dating colluviation / aeolian deposition provides terminus for archaeological layers (Ak-kaya facies of Micoquian: >40ka) and date for colder period.			

Completed By	**Checked By**	**Date**
CIB		13/08/04

Site Code: **Site Name:** Sary-Kaya	**Date** 13/08/04	**Context No** 5	**Luminescence Sample No** EFD4L245
Description of sampling location :		**Sketch of surrounding area**	
Tube sample from (colluvial) "soil" with artefact concentrations (4 cultural horizons in "soil"): Grey-brown silty-clay with sub-angular limestone (some shelly) 1 mm – 20 cm. Selaed by layer 4: lighter in colour, coarser "fine fraction". Seals Layer 6: Browner, damper, similar texture? Depth = 327 cm 18 cm above boundary Layer 5 – Layer 6 18 cm right from tephra sampling column 15 cm from nearest large limestone clast Attempt to isolate component not from limestone – as for caves.			
		Photo No:	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G078	ZLB for lab γ	-

Details:

Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time
Hole Depth = 19 cm
Est. Solid Angle = 4π
Gamma dose rate = 0.40 ± 0.02
If slightly lower dose rate than G077 and G079 (not significantly), this is probably because of more limestone in 5 and around: see TL sample sheets.
Relatively more ^{40}K than G077 looking at spectrum, but >1350 keV still > 450 keV – "clayey spectrum"

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg. Section exposed, *insitu* water content not relevant

Nature of Dating Problem:

Colluvial soil layer containing upper part of artefact concentration. Sample from middle to constrain cultural horizons. Micoquian: >40ka

Completed By	**Checked By**	**Date**
CIB		13/08/04

Site Code: **Site Name:** Sary-Kaya	**Date** 13/08/04	**Context No** 6 (cultural layer V)	**Luminescence Sample No** EFD4L246
Description of sampling location :		**Sketch of surrounding area**	
Tube sample from colluvial "soil" (?) containing lowermost cultural horizons. Brown silty clay with Limestone, 1 large block (~30 cm) at approximate level of sample, but in general only smaller stones. Sealed by layer 5: Greyer brown "soil". Seals Layer 7: Depth = ? cm ? cm below boundary Layer 5 – Layer 6 18 cm right from tephra sampling column 43 cm right from LHS of sondage 35 cm left from RHS of sondage 25 cm from nearest large limestone clast Attempt to isolate component not from limestone – as for caves.			
		Photo No:	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G079	ZLB for lab γ	-

Details:

Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time
Hole Depth = 20 cm
Est. Solid Angle = 4π
Gamma dose rate = 0.44 ± 0.02
U & Th rich? >1350 keV still > > 450 keV

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg. Section exposed, *insitu* water content not relevant

Nature of Dating Problem:

Sample taken approximately level with the lowest (oldest?) cultural layer – Mid-lower Layer 6. Micoquian: >40ka

Completed By	**Checked By**	**Date**
CIB		13/08/04

Site Code: **Site Name:** Sary-Kaya	**Date** 13/08/04	**Context No** Whole section: Profile samples	**Luminescence Sample No** EFD4L247 – 58

Description of sampling location :	**Sketch of surrounding area**
Small tube samples down section. Samples from upper, mid, and lower of each context, except layers 5 and 10, which have 5 and 6 tubes respectively. (10 = 3 either side of rubble layer)	EFD4L247 208 Layer 3 EFD4L248 228 Layer 4a EFD4L249 271 Layer 4b EFD4L250 294 Layer 4c EFD4L251 309 Layer 5a EFD4L252 322 Layer 5b EFD4L253 336 Layer 5c EFD4L254 354 Layer 6a EFD4L255 376 Layer 6b EFD4L256 417 Layer 6c EFD4L257 439 Layer 6d EFD4L258 460 Layer 7a
	Photo No:

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	-	-	-

Details:

Any dosimetry to be based on tube samples from the same section.

Description of Sample:

1 cm diameter x 2 cm length tubes. Black insulting tape around tubes upon excavation, labelled with duct tape and black bagged together. Labels: SK 1 – 12 / Layer / a, b, c, etc. Deposits friable: samples not the best.

Nature of Dating Problem:

Define progression through and around layers of interest. Hiatuses etc. Gain impression of colluviation. Layers of interest should be > 40 ka. Soil layer 5 indicates warmer.

Completed By	**Checked By**	**Date**
CIB		13/08/04

Site Code: **Site Name:** Kabazi II	**Date** 14/08/04	**Context No** Modern Surface	**Luminescence Sample No** EFD4L259
Description of sampling location :		**Sketch of surrounding area**	
Black bag sample from modern surface above excavations ~ 3 m upslope from section. Dark greyish brown, Humic, Limestone < 1cm. Vegetation removed, and ~ 1 cm depth bits of topsoil were trowelled into a bag and sealed. ~150 m of down-slope from limestone cliffs (~ 30 m drop in this distance).		**Photo No:**	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G081	-	-

Details:

Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time
Hole Depth = 0 cm
Est. Solid Angle = 2π
4π Gamma dose rate = 0.26 ± 0.02
Small but present ^{40}K and ^{137}Cs

Description of Sample:

Black bag containing ~ 200 g trowelled from top 1 cm, after vegetation removal. Sealed and put into second black bag

Nature of Dating Problem:

Colluvial slope: probably similar to many of the archaeological contexts beneath – test bleaching / residuals etc. – Define “OSL age” for zero age deposit.

Completed By	**Checked By**	**Date**
CIB		17/08/04

Site Code: **Site Name:** Kabazi V	**Date** 17/08/04	**Context No** Layer 12, Arch' Context III/1A	**Luminescence** **Sample No** EFD4L260
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from occupation level III/1A in Layer 12: Dark ashy with burnt bone, flint etc. Includes larger limestones – TL on heated sediment? – etc. Surface probably exposed for some time etc. Sealed by Layer 12, seals Layer 12: Colluvial Limestone (< 15 cm) rich, fossiliferous (nummulitic limestone). Attempt to isolate component not from limestone??? – as for caves. Square 6B Depth = -530 cm Layer III/1A is 8 – 9 cm thick 15 cm left from boundary square 6В-6Б			
		Photo No:	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G088	ZLB for lab γ	-

Details:

Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time
Hole Depth = 30 cm (tube inserted at back of pollen sampling column)
Est. Solid Angle = 4π
Gamma dose rate = 0.20 ± 0.01

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg. Section exposed, in-situ water content not relevant

Nature of Dating Problem:

Obtain date for context III/1A – linked to existing chronological control, associated with Kabazi II and Starosel'e levels. In series of archaeological layers with densest finds on site.
ESR 35 – 45 ka, U Series?. Constrain upper age of III/1 with U Series 73 ka and ESR 28 ka (U Series results very scattered)
Should postdate L261, L262 and 263 and equal L264 and 265.

Completed By	**Checked By**	**Date**
CIB		17/08/04

Site Code: **Site Name:** Kabazi V	**Date** 17/08/04	**Context No** Layer 12, Arch' Context III/4	**Luminescence** **Sample No** EFD4L261
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from lower part of Layer 12, including interleaved Micoquian and Western Crimean Mousterian: Whitish yellow-brown colluvium / exfoliation / weathering products. - Fossiliferous limestone rich. Sealed by Layer 12: similar except for occupation levels (only III/1A very dark, others slightly browner than matrix. Seals Layer 12A: Darker, damper, but still limestone rich. Attempt to isolate component not from limestone??? – as for caves. Square 6B Depth = -593 cm 15 cm below level III/3 29 cm above boundary Layer 12 – Layer 12A 12 cm left from boundary square 6B-6Б		**Photo No:**	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G089	ZLB for lab γ	-

Details:

Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time
Hole Depth = 29 cm (tube inserted at back of pollen sampling column)
Est. Solid Angle = 4π
Gamma dose rate = 0.19 ± 0.01

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg. Section exposed, *insitu* water content not relevant

Nature of Dating Problem:

Lower part of Layer 12, with interleaved Micoquian and Western Crimean Mousterian. Date transition, link to Kabazi II, link to pollen if sufficient in this layer.
Should predate L260, L264 and L265, and post date L262 and 263.

Completed By	**Checked By**	**Date**
CIB		17/08/04

Site Code: **Site Name:** Kabazi V	**Date** 17/08/04	**Context No** Layer 12A, Arch' Context III/5-3	**Luminescence Sample No** EFD4L262
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from Layer 12A: Yellowish grey-brown silty, with lots of nummuliths <1cm. Less limestone than above – all degraded? Softer, damper. Sealed by Layer 12: Whitish yellow with lots of limestone clasts. Seals Layer 14: Similar to 12A but harder – more fossiliferous. Attempt to isolate component not from limestone??? – as for caves. Square 6B Depth = -625 cm 15 cm below boundary Layer 12 – 12A 10 cm above boundary Layer 12A – 14 15 cm left from boundary square 6В-6Б			
		Photo No:	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G090	ZLB for lab γ	-

Details:

Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time
Hole Depth = 34 cm (tube inserted at back of pollen sampling column)
Est. Solid Angle = 4π
Gamma dose rate = 0.18 ± 0.01

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

More pollen and less limestone, postulated soil development. Clear Micoquian.
Constrain transition, link to pollen record.
Should predate L261 and post date L263.

Completed By	**Checked By**	**Date**
CIB		17/08/04

Site Code: **Site Name:** Kabazi V	**Date** 17/08/04	**Context No** Layer 14A, Arch' Context IV	**Luminescence Sample No** EFD4L263
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from Layer 14A, contains IV across site: Yellowish grey-brown silty, with lots of nummuliths. Sealed by Layer 12A: Similar but with less nummuliths. Seals Layer 14B: Similar to 14A but softer – greater clay/silt component. Sterile archaeologically. Attempt to isolate component not from limestone??? – as for caves. Square 6B Depth = -646 cm 13 cm below boundary Layer 12A – 14 26 cm above base of section 13 cm left from boundary square 6B-6Б			
		Photo No:	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G091	ZLB for lab γ	-

Details:

Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time
Hole Depth = 31 cm (tube inserted at back of pollen sampling column)
Est. Solid Angle = 4π
Gamma dose rate = 0.20 ± 0.01

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Contains IV – oldest artefacts on site. Base of pollen column – correlate. Constrain age of site.
Should predate L262.

Completed By	**Checked By**	**Date**
CIB		17/08/04

Site Code: **Site Name:** Kabazi V	**Date** 17/08/04	**Context No** Layer 12, Arch' Context III/1A	**Luminescence Sample No** EFD4L264
Description of sampling location:		**Sketch of surrounding area**	
Burnt flint found in III/1A during pollen sampling. Depth = -522 cm 26 cm right from boundary square 6В-6Б See EFD4L260 for general details.			
		Photo No:	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G093*	-	-

Details:

Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time
Hole Depth = 0 cm
Est. Solid Angle = 2π surface, 3.8π including pit walls?
Gamma dose rate = 0.20 ± 0.03 from in G088* - surface dose rates G092 (measured at surface in G088 location) and G093 are equal, so use G088 from in hole.
No extra material taken, refer to EFD4L260

Description of Sample:

Flint wrapped in black tape and zip lock bagged.

Nature of Dating Problem:

Potential spare material for dating III/1A
ESR and U Series dates poor and scattered (but argument ~30 ka or ~70 ka)
Without the sediment dates this flint will not help (CIB), but I think that it is valuable! (PAJ).
Should postdate L261, L262 and 263 and equal L260 and 265.

Completed By	**Checked By**	**Date**
CIB		17/08/04

Site Code: **Site Name:** Kabazi V	**Date** 17/08/04	**Context No** Layer 12, Arch Context III/1A	**Luminescence Sample No** EFD4L265
Description of sampling location:		**Sketch of surrounding area**	
Burnt "limestone" found in III/1A during ^{14}C sampling. Depth = -519 cm 30 cm right from boundary square 6В-6Б See EFD4L260 for general details.			
		Photo No:	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G094*	-	-

Details:

Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time
Hole Depth = 0 cm
Est. Solid Angle = 2π surface, 3.8π including pit walls?
Gamma dose rate = 0.20 ± 0.03 from in G088* - surface dose rates G092 (measured at surface in G088 location) and G093 are equal, so use G088 from in hole.
No extra material taken, refer to EFD4L260

Description of Sample:

Burnt limestone wrapped in black tape and zip lock bagged.

Nature of Dating Problem:

Potential spare material for dating III/1A
ESR and U Series dates poor and scattered (but argument ~30 ka or ~70 ka)
Without the sediment dates up and down section this will not help (CIB).
Should postdate L261, L262 and 263 and equal L260 and 264.

Completed By	**Checked By**	**Date**
CIB		17/08/04

Site Code: **Site Name:** Kabazi II	**Date** 19/08/04	**Context No** Layer 7, Arch Context II/7AB	**Luminescence Sample No** EFD4L266
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from mid Layer 7, Archaeological level II/7AB to associate directly with ESR samples of Jack Rink: Layer 7 = "upper soil" – Light grey-brown silt with coarser sand (rock fragments 1mm – 10 cm – weathered limestone). Sealed by Layer 1 locally: - Seals Layer 9: Light red-brown silty clay. Dense limestone fragments. Attempt to isolate component not from limestone??? – as for caves. Square M Depth = 412 cm 30 cm left from boundary square M-H Note: archaeological layers not actually very dark/visible: trace line of bones to locate.			
		Photo No:	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G095	ZLB for lab γ	-

Details:

Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time
Hole Depth = ? cm
Est. Solid Angle = 4π
Gamma dose rate = 0.15 ± 0.01

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Date for youngest archaeological layer "*insitu*" in this section. Compare with existing chronological control: Very young Middle Pal ages ~30 ka (ESR 29 ka & 32 ka from II/7) from U Series, AMS, and ^{14}C. Tie in for rest of sequence …
Should post date L267

Completed By	**Checked By**	**Date**
CIB		19/08/04

Site Code: **Site Name:** Kabazi II	**Date** 19/08/04	**Context No** Layer 9, Arch Context IIA/2	**Luminescence** **Sample No** EFD4L267
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from mid Layer 9, in archaeological level IIA/2: Light red-brown silty clay. Dense limestone fragments 1-30 mm, occasionally larger. Sealed by Layer 7: Light grey-brown silty clay, less dense clasts. Seals Layer 10: Similar to 9, but looser – more clasts and larger Attempt to isolate component not from limestone??? – as for caves. Square M Depth = 528 cm Note: location of archaeological layer IIA/2 not actually very dark/visible: trace line of bones to locate.			
		Photo No:	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G096	ZLB for lab γ	-

Details:

Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time
Hole Depth = ? cm
Est. Solid Angle = 4π
Gamma dose rate = 0.187 ± 0.007

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Date for IIA/2. Establish chronosequence. Alleged loessic layer, so…
Has been associated with Starosel’e 1-2. Lowest level of WCM at Kabazi II.
II/8 at bottom of Layer 7 has ESR of ?38±3 ka?

Completed By	**Checked By**	**Date**
CIB		19/08/04

Site Code: **Site Name:** Kabazi II	**Date** 19/08/04	**Context No** Layer 10, Arch' Context ~IIA/4ish	**Luminescence Sample No** EFD4L268

Description of sampling location:	**Sketch of surrounding area**
Tube sample from Upper Layer 10: Light red-brown silty clay fines. Like layer 9, but 3 fining up sequences, from limestone clasts 3-10 cm to silty sand. "Clast supported" and therefore looser than Layer 9. Sealed by Layer 9: Light red-brown silty clay + dense limestone fragments Seals Layer 11: More like layer 9 in upper part Attempt to isolate component not from limestone??? – as for caves. Square M Depth = 613 cm 33 cm left from boundary M-N See attached sketches illustrating different versions of Layer 10 boundaries *	*Note: some debate about layer boundaries: Sample from just above level of archaeological layer IIA/4 as inferred from section diagram, but layer not easily visible. Sample depth puts it just below the boundary from 9 – 10 in the section diagram, but clearly within sequences of fining up used to define 10 here. In the section diagram the boundary 10 – 11 is also lower than observed whilst sampling: This implies that only the upper part of 10 in the diagram was describes as 10 here – to dashed line in section diagram. Thus lower 10 included in upper 11 in my description: **Photo No:**

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G097	ZLB for lab γ	-

Details:

Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time
Hole Depth = ? cm
Est. Solid Angle = 4π
Gamma dose rate = 0.162 ± 0.008

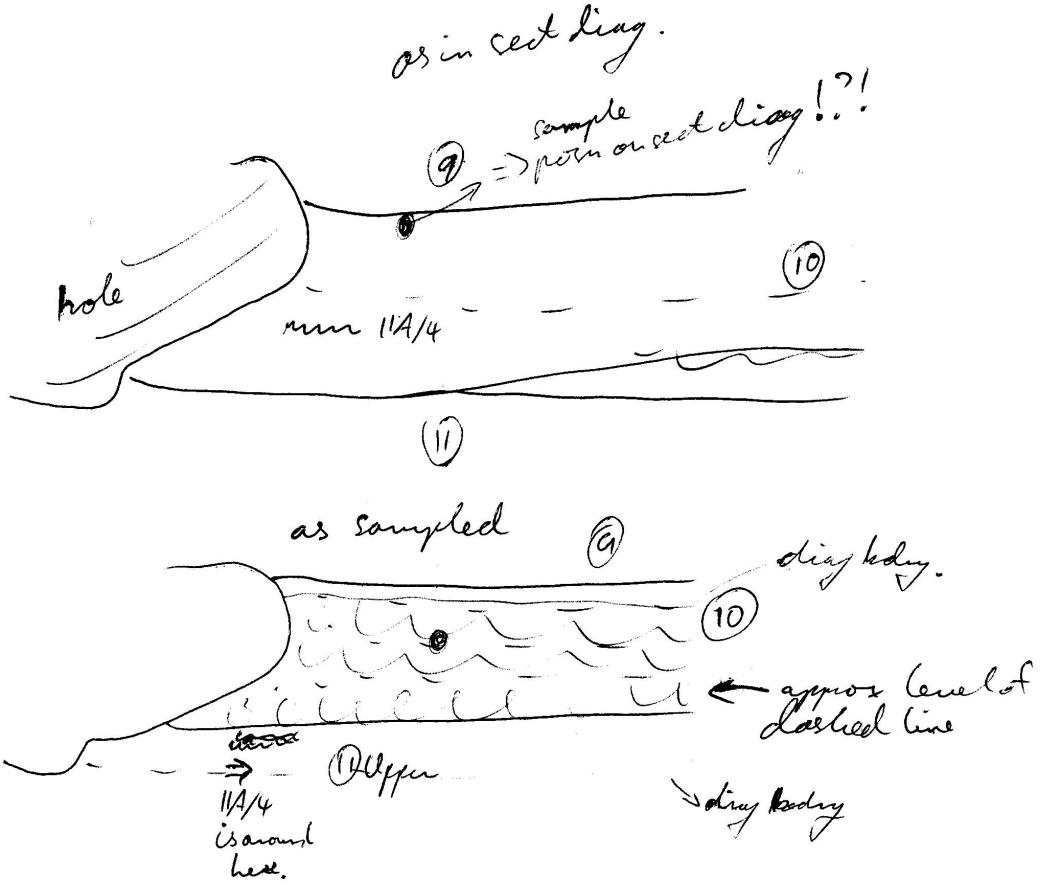
Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Establish chronosequence. Link to pollen and hence climate. Has been associated with Kabazi V.
Fining up from ~10 cm clasts to sandy in a non-alluvial context implies ?Gully erosion deposits by water? May not be good, but let's see…
*- versus… reflects disagreement Chabai versus Reid Ferring.

Completed By	**Checked By**	**Date**
CIB		19/08/04



- Sketch reflecting argument:

Section diagram according to Ferring.
Chabai has other ideas – more similar to what I saw when sampling.
Ferring bases the division on particle size analysis as well as inspection.
Different criteria?

Site Code: **Site Name:** Kabazi II	**Date** 19/08/04	**Context No** Layer 11 upper	**Luminescence Sample No** EFD4L269
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from upper Layer 11, just above archaeological level III/2, in Krutitsa soil: Light grey-brown silty clay. Dense limestone clasts <2 cm, occasionally <15 cm. More compact than Layer 10 Sealed by Layer 10: Looser, clast supported, lighter coloured matrix. More and looser clasts. Seals Layer 11 Lower, via layer of dense, horizontally aligned (lime) stones. III/2 lies on top of stones (bone etc). Attempt to isolate component not from limestone??? – as for caves. Square M Depth = 731 cm 37 cm left from M-N			
		Photo No:	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G098	ZLB for lab γ	-

Details:

Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time
Hole Depth = ? cm
Est. Solid Angle = 4π
Gamma dose rate = 0.20 ± 0.01

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Establish chronosequence, relate to pollen / climate. Has been associated with Starosel’e 4. Constrain III/2. At present has U Series of 41 ka and 117 ka, plus ESR of 74 – 85 ka: resolve/ match/ confirm/ deny this. Krutitsa soil

Completed By	**Checked By**	**Date**
CIB		19/08/04

Site Code: **Site Name:** Kabazi II	**Date** 19/08/04	**Context No** Layer 11 lower	**Luminescence Sample No** EFD4L270
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from lower Layer 11: Dense concentration of limestone clasts <40 cm below III/2, but reduced numbers and sizes as go down section. Lighter coloured matrix that 11 upper, but still silty clay. Below 8 m very few clasts – c.f. layer 13. Sealed by Layer 11 upper: Light grey-brown silty clay. Dense limestone clasts <2 cm. Seals Layer 13: Light yellowish grey-brown silty clay, more fines, less clasts < 2 cm. Attempt to isolate component not from limestone??? – as for caves. Square M Depth = 771 cm 40 cm left from M-N		**Photo No:**	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G099	ZLB for lab γ	-

Details:

Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time
Hole Depth = ? cm
Est. Solid Angle = 4π
Gamma dose rate = 0.19 ± 0.01

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Constrain III/2, see EFD4L271

Completed By	**Checked By**	**Date**
CIB		19/08/04

Site Code: **Site Name:** Kabazi II	**Date** 19/08/04	**Context No** Layer 13	**Luminescence Sample No** EFD4L271

Description of sampling location:	**Sketch of surrounding area**
Tube sample from colluvial Layer 13: Contains archaeology, but reworked. Light yellowish grey-brown silty clay. More fine matrix than 11, less clasts. Clasts mainly < 2 cm, also snails: Helix indicates warm & wet – in middle of layer, associated with occasional ~ 15 cm clasts. Sealed by Layer 11 lower: Silty clay with dense clasts, clearing lower. Seals Layer 13A: Similar to 13, but lenses of sandy & clayey material. Attempt to isolate component not from limestone??? – as for caves. Square M Depth = 873 cm 50 cm left from M-N	**Photo No:**

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G100	ZLB for lab γ	-

Details:

Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time
Hole Depth = ? cm
Est. Solid Angle = 4π
Gamma dose rate = 0.22 ± 0.01

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Stratigraphy. Colluvial layer – potentially big age gap between 11 lower and 13A – fill in & check all is well.
Colluviation as a resetting mechanism? Cold period, more or loess?

Completed By	**Checked By**	**Date**
CIB		19/08/04

Site Code: **Site Name:** Kabazi II	**Date** 19/08/04	**Context No** Layer 13A	**Luminescence Sample No** EFD4L272
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from "low energy water lain" deposit Layer 13A: Light yellowish grey-brown silty clay + clasts most obvious < 2 cm. This material sorted into sandier and clayier lenses in many locations Lenses get smaller and thinner towards top of 13A. Sealed by Layer 13: Similar to 13A but more homogeneous. Seals Layer 14A: Dark grey-brown silty clay, many large clasts. Attempt to isolate component not from limestone??? – as for caves. Square M Depth = 939 cm 29 cm left from M-N		**Photo No:**	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G101	ZLB for lab γ	-

Details:

Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time
Hole Depth = ? cm
Est. Solid Angle = 4π
Gamma dose rate = 0.24 ± 0.01

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Associated with third terrace of Alma river, down valley. Use with L273 to constrain last interglacial deposits and test how well dates are working on these different types of deposits. Should predate L273 and post date L271.

Completed By	**Checked By**	**Date**
CIB		19/08/04

Site Code: **Site Name:** Kabazi II	**Date** 19/08/04	**Context No** Layer 14A	**Luminescence Sample No** EFD4L273
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from "last interglacial soil" Layer 14A: Dark grey-brown silty clay. Limestone clasts > 2mm, many large clasts <30 cm. Helix snails – "A Horizon relative to 14B?? Sealed by Layer 13A: Light yellow grey-brown silty clay + clasts. Seals Layer 14B: Lighter colour Attempt to isolate component not from limestone??? – as for caves. Square L Depth = 998 cm 41 cm left from L-M 20 cm left from Rupert's column 20 cm below boundary 13A-14A 12 cm above boundary 14A-14B 10 cm from nearest large clast in section, but one at back of gamma spec hole.		**Photo No:**	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G102	ZLB for lab γ	-

Details:

Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time
Hole Depth = 12 cm
Est. Solid Angle = 4π
Gamma dose rate = 0.28 ± 0.01

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Would be first interglacial archaeology in the Crimea to be absolutely dated – Chabai.
Use with L272 to compare across boundary and as part of general chronostratigraphy.
Archaeological context V/3 and V/5.
End of interglacial – expected ~ 100-125ka
Should predate L272 and post date L274

Completed By	**Checked By**	**Date**
CIB		19/08/04

Site Code: **Site Name:** Kabazi II	**Date** 19/08/04	**Context No** Layer 14B	**Luminescence Sample No** EFD4L274
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from Layer 14B: Grey-brown silty clay. Lenses of large Limestone clasts, but not as dense as 14A. Horse bones in upper part. Clasts generally… Clayier towards base Helix snails "B Horizon" for 14A? Sealed by Layer 14A: Darker, denser large clasts. Seals Layer 14B1: Damper, clayier, less clasts. Attempt to isolate component not from limestone??? – as for caves. Square L Depth = 1065 cm 52 cm left from L-M 25 cm left from Rupert's column 52 cm below boundary 14A-14B 26 cm above boundary 14B-14B1		**Photo No:**	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G103	ZLB for lab γ	-

Details:

Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time
Hole Depth = 18 cm
Est. Solid Angle = 4π
Gamma dose rate = 0.29 ± 0.01

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Second interglacial lithological layer. Archaeological contexts VI/1-8?
Tie in with pollen. Interglacial sequence.
Fauna: Horse
Interglacial – expected ~ 100-125ka
Should predate L273 and post date L275

Completed By	**Checked By**	**Date**
CIB		19/08/04

Site Code: **Site Name:** Kabazi II	**Date** 19/08/04	**Context No** Layer 14B1	**Luminescence Sample No** EFD4L275
Description of sampling location:		**Sketch of surrounding area**	
Tin sample from Layer 14B1: Lowermost interglacial "soil" with "*insitu*" archaeology. 30° dip of layer indicates colluvial, but stones within are sub-horizontal – few stones so?, but could it just be discolouration at a contact layer? Grey-brown silty clay / clay. Damper than above, less large clasts. Still helix shells. Sealed by Layer 14B: Drier, more clasts. Seals Layer 14C: Similar to 14B1, but lighter in colour, with more small fossiliferous clasts. Attempt to isolate component not from limestone??? – as for caves. Square L Depth = 1111 cm 61 cm left from L-M ~60 cm left from Rupert's column 15 cm perp from boundary 14B-14B1 10 cm perp from boundary 14B1-14C		**Photo No:**	

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G104	ZLB for lab γ	-

Details:

Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time
Hole Depth = 25 cm
Est. Solid Angle = 4π
Gamma dose rate = 0.27 ± 0.01

Description of Sample:

12 cm × 4 cm × 3 cm stainless steel tin in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Lowest layer at site with "*insitu*" archaeology. Chabai is happy with this layer to provide the upper age for the site.
Phases during the interglacial? Interglacial sequence…
Also, following line of stones directly above this sample indicates that it may just predate the fall of the block, but this is unclear…
Should predate L274 and the rest!

Completed By	**Checked By**	**Date**
CIB		19/08/04

Site Code: **Site Name:** Kabazi V	**Date** 21/08/04	**Context No** Profile samples	**Luminescence Sample No** EFD4L276 – 291

Description of sampling location:

16 small zip lock bag samples of loose sediment from Kabazi V section XX cm to the right of boundary square 6В-6Б, between layers 10 and 14B.
All layers contain significant limestone and eboulis and appear colluvial, but much archaeology *insitu*. III/1A = dark ashy layer. 14A and 14B = damper, and see TL samples sheets for tubes.

Sketch of surrounding area

EFD4L276	480	Layer 10	
EFD4L277	496	Layer 12	III/1
EFD4L278	499	Layer 12	
EFD4L279	515.5	Layer 12	
EFD4L280	522.5	Layer 12	III/1A
EFD4L281	529.5	Layer 12	
EFD4L282	537.5	Layer 12	
EFD4L283	543.5	Layer 12	III/2
EFD4L284	548.5	Layer 12}	
EFD4L285	555.5	Layer 12}	
EFD4L286	566	Layer 12}	III/3&4
EFD4L287	582-587	Layer 12}	
EFD4L288	604-608	Layer 12}	
EFD4L289	624-627	Layer 12A	III/5
EFD4L290	638-643	Layer 14A	IV/4
EFD4L291	652-656	Layer 14B	V

Photo No:

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	-	-	-

Details:

Any dosimetry to be based on tube samples from the same section.

Description of Sample:

Small zip lock bags (~2-10 g), sampled under space blanket. Material trowelled into ZLB after surface of section had been cleaned. ZLB put directly into black bag. However: difficult to make light tight, so quality is variable. Lower in section likely to be better.
(~10-20 s to take each sample under blanket with ~5-10% of ambient light present - DWS)

Nature of Dating Problem:

Examine boundaries (stratigraphy) and process in section.
Link main samples.

Completed By	**Checked By**	**Date**
CIB		21/08/04

Site Code: **Site Name:** Kabazi II	**Date** 21/08/04	**Context No** Profile samples	**Luminescence Sample No** EFD4L292 – 308

Description of sampling location:	**Sketch of surrounding area**
15 small zip lock bag samples of loose sediment and 2 small tube samples from Kabazi II section between layers 7 and 14C. All layers contain significant limestone and eboulis. Most layers colluvially formed, but archaeology generally *insitu*.	EFD4L292 400 EFD4L293 452 EFD4L294 503 EFD4L295 546 EFD4L296 595 EFD4L297 650 EFD4L298 702 EFD4L299 745 EFD4L300 795 EFD4L301 848 EFD4L302 898 EFD4L303 947 EFD4L304 997 EFD4L305 1048 EFD4L306 1100 EFD4L307 1150 EFD4L307 1200
	Photo No:

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	-	-	-

Details:

Any dosimetry to be based on tube samples from the same section.

Description of Sample:

Small zip lock bags (~2 g), sampled without space blanket:
Samples collected by CB from rope & ladder at ~ 50 cm intervals from the toip.
Samples were scraped into a SS tube and dropped into zip-seal bags within black bags – some light exposure < 5 s? will have occurred (DWS).
2 cm x 1 cm diameter tubes used in soft sediment – lowermost two contexts. Taped with black insulation tape, labelled & black bagged.

Nature of Dating Problem:

Put samples in broader context – some parts of progression to fill in. Most useful for selection of dating samples?

Completed By	**Checked By**	**Date**
CIB		21/08/04

Site Code: **Site Name:** Kabazi II	**Date** 20/08/04 21/08/04	**Context No** Clast samples	**Luminescence Sample No** EFD4L309 – 310
Description of sampling location:		**Sketch of surrounding area**	
2 clast samples of limestone from likely sources of input to the sediment: 1/ Hard limestone from the block forming the sediment trap that is Kabazi II (associated with upper strata in cliff) 2/ Softer limestone from exposure of lower strata in cliff at top of slope above site.			
		Photo No:	
Gamma Dosimetry	**Reading** -	**Assoc. Sample** -	**Ref No** -
Details:			
-			
Description of Sample:			
Clast samples			
Nature of Dating Problem:			
For dissolution, to see which mineral phases and grain sizes might have made their way into the sediments from the bedrock.			

Completed By	**Checked By**	**Date**
CIB		21/08/04

Site Code: **Site Name:** Karabai	**Date** 24/08/04	**Context No** 2	**Luminescence Sample No** EFD4L311
Description of sampling location:		**Sketch of surrounding area**	
Tube sample from middle of archaeological context 2. Light brown sandy clay with (fossiliferous) limestone clasts < 0.5 cm. Low gradient colluvial. Sometimes whiter clayey matrix – "spring" precipitates? Sealed by 2-A: Similar to 2, except occasional limestone clasts <5 cm. SealS3-1: Whitish brown clayey (like lighter bits of 2) with some browner bits. Siltier Square K Depth = 580 cm 20 cm right from J-K 14 cm left from edge of Rupert's column 20 cm left from profile samples column 6 cm below boundary 2-A - 2 10 cm above boundary 2 – 3-1			
		Photo No:	
Gamma Dosimetry	**Reading** EFD4G106	**Assoc. Sample** ZLB for lab γ	**Ref No** -
Details:			
Rainbow MCA, 2" x 2" NaI Probe, 600 s counting time Hole Depth = 13 cm (soft sediment but quick sampling) Est. Solid Angle = 4π Gamma dose rate = 0.35 ± 0.01			
Description of Sample:			
15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.			
Nature of Dating Problem:			
Level 2 = dubious Western Crimean Mousterian, but is used to bracket level 3-1 : Micoquian. Provides young age for Middle Pal at site: below level 3-1 disturbed archaeology. Should post date L312			

Completed By	**Checked By**	**Date**
CIB		24/08/04

Site Code: **Site Name:** Karabai	**Date** 24/08/04	**Context No** 3-2	**Luminescence Sample No** EFD4L312

Description of sampling location:	**Sketch of surrounding area**
Tube sample from middle of archaeological contexT3-2. Whitish brown silty clay. Low gradient colluvial, limestone clasts < 0.5 cm. Root lines (dark humic, next to sampling position) Similar to Kostienki Sediments. Discontinuous upper part/lens included in sample: Light brown silty, more clasts. May have been below the water table during the Holocene etc… Sealed by archaeologically sterile layer below 3-1: Whitish brown silty clay, limestone < 0.5 cm SealS3-1 archaeologically sterile layer above 4-1: Similar to lower 3-2. Square K Depth = 621 cm 23 cm right from J-K 6 cm below boundary Sterile layer - 3-2 8 cm above boundary 3-2 – Sterile layer	**Photo No:**

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G107	ZLB for lab γ	-

Details:

Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time
Hole Depth = 12 cm (soft sediment but quick sampling)
Est. Solid Angle = 4π
Gamma dose rate = 0.35 ± 0.02

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Micoquian level below 3-1, which has artefact concentration: bracket level 3-1, and provides minimum age for 4-2, although this is some way (3 layers, 33 cm) below. Should predate L311 and post date L331

Completed By	**Checked By**	**Date**
CIB		24/08/04

Site Code: **Site Name:** Karabai	**Date** 24/08/04	**Context No** Profile samples (1) Layers 1A – 3-2	**Luminescence** **Sample No** EFD4L313 – 325

Description of sampling location:	**Sketch of surrounding area**
13 Small tube samples down section from – 5.05 m approx, every 10 cm to –6. m. All silty clay – colluvial with limestone clasts < 0.5 cm. May be loessic derived. * Labels 8 & 9 in reverse order.	EFD4L313 505 Layer 1-A EFD4L314 516 Layer 1 - 1-A EFD4L315 526 Layer 1 EFD4L316 537 Layer 1 - 2-A EFD4L317 548 Layer Top of 2-A EFD4L318 558 Layer Lower 2-A EFD4L319 569 Layer 2-A – 2 * EFD4L320 580 Layer 2 * EFD4L321 589 Layer 2 – 3-1 EFD4L322 597 Layer 3-1 EFD4L323 606 Layer 3-1 – 3-2 EFD4L324 619 Layer 3-2 EFD4L325 630 Layer 3-2 – 4-1
	Photo No:

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	-	-	-

Details:

Any dosimetry to be based on tube samples from the same section.

Description of Sample:

1 cm diameter x 2 cm length tubes. Black insulating tape around tubes upon excavation, labelled with duct tape and black bagged together. No labels on outside of tape, only on tubes. Nos 8 & 9 swapped – in each other's place

Nature of Dating Problem:

Provide context for tubes and examine progression, hiatuses etc down section.

Completed By	**Checked By**	**Date**
CIB		24/08/04

Site Code: **Site Name:** Karabai	**Date** 25/08/04	**Context No** Modern Surface	**Luminescence Sample No** EFD4L326
Description of sampling location:		**Sketch of surrounding area**	
Black bag sample from modern surface above section. ~ 2 m behind top of section, ~ 2 m from cut at left hand end of section. Close to gamma spec reading. Dark black brown humic, limestone clasts < 1 cm.			
		Photo No:	

Gamma	**Reading**	**Assoc. Sample**	**Ref No**
Dosimetry	EFD4G075	-	-

Details:

Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time
Hole Depth = 0 cm
Est. Solid Angle = 2π
4π Gamma dose rate = 0.61 ± 0.03
OK ^{40}K peak but little else – no ^{137}Cs

Description of Sample:

Black bag containing ~ 200 g trowelled from top 1 cm, after vegetation removal. Sealed and put into second black bag

Nature of Dating Problem:

Examine bleaching of modern sediments. This looks colluvial in a similar way to the archaeological sediments and therefore should be a good analogue.

Completed By	**Checked By**	**Date**
CIB		25/08/04

Site Code: **Site Name:** Karabai	**Date** 25/08/04	**Context No** Profile samples (2) LayerS3-2 – 4-1	**Luminescence Sample No** EFD4L327 – 330

Description of sampling location:	**Sketch of surrounding area**
13 Small tube samples down section from – 635 cm every 10 cm All silty clay – colluvial with limestone clasts < 0.5 cm. May be loessic derived.	EFD4L327 637 Sterile between 3-2 and 4-1 EFD4L328 647 Sterile between 4-1 and 4-2 EFD4L329 656 4-2 EFD4L330 666 Sterile between 4-2 and 5 (4.3) Numbers 14 – (following on from Profiling 1)
	Photo No:

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	-	-	-

Details:

Any dosimetry to be based on tube samples from the same section.

Description of Sample:

1 cm diameter x 2 cm length tubes. Black insulting tape around tubes upon excavation, labelled with duct tape and black bagged together. No labels on outside of tape, only on tubes.

Nature of Dating Problem:

Examine progression in lower layers, close to water before draining.

Completed By	**Checked By**	**Date**
CIB		25/08/04

Site Code: **Site Name:** Karabai	**Date** 25/08/04	**Context No** 4-2	**Luminescence Sample No** EFD4L331

Description of sampling location:	**Sketch of surrounding area**
Tube sample from middle of archaeological context 4-2. Artefact concentration and possible soil layer. Less stony than layers surrounding. Brown silty clay plus some whitish clayey areas. Limestone clasts < 1 cm. Colluvial. May have been below the water table during the Holocene etc… Sealed by archaeologically sterile layer below 4-1: Whitish brown silty clay, limestone < 5 cm Seals sterile or 4-3: Light brown silty clay. Square K Depth = 659 cm 25.5 cm right from J-K 4 cm below boundary Sterile layer - 4-2 4 cm above boundary 4-2 – Sterile layer/4-3 14 cm above water level during sampling 9 cm from nearest limestone clast	**Photo No:**

Gamma Dosimetry	**Reading**	**Assoc. Sample**	**Ref No**
	EFD4G108	ZLB for lab γ	-

Details:

Rainbow MCA, 2” x 2” NaI Probe, 600 s counting time
Hole Depth = 20 cm
Est. Solid Angle = 4π
Gamma dose rate = 0.38 ± 0.02

Description of Sample:

15 cm × 3 cm ∅ stainless steel tube in zip lock bag with loose sediment for high resolution lab γ. Total mass as sampled ~ 1 kg.

Nature of Dating Problem:

Date layer of highest artefact concentration at site (Micoquian).
Construct chronostratigraphy for comparison with Sary-Kaya locally etc.
Should predate L312

Completed By	**Checked By**	**Date**
CIB		25/08/04

Appendix 5.3 Field gamma spectrometry forms

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G075.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Karabai	**Measurement Date**	12/08/04
Context	Ground surface above section	**Spectrum No.**	1

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	492 (1476 keV)		
Ch. Width (eV)		3	2.97		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		8828	8899	1750	
Count Rate (cps)		14.71	14.8	2.91	
Dose Rate (mGy/a)		0.29	0.29	0.31	0.31
Error			0.015	0.016	0.015
Mean Dose Rate (mGy/a)			0.303 ± 0.015		

Location and geometry
Ground surface above and behind section
~ 2 m behind sampled section
~ 2 m from cut on LHS of sampled section
and see TL sample sheet
Geometry: ~ 2 π
Hole depth = 0 cm
OK ^{40}K peak, apparently little else.
No ^{137}Cs visible
Not thought to be spoil from excavation – dark, humic

Estimated solid angle (π Rad.)	2 π	**4π Gamma dose rate (mGy/a)**	0.61 ± 0.03

TL Samples
EFD4L326

Date	12/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G076.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Sary-Kaya	**Measurement Date**	13/08/04
Context	Ground surface upslope from section	**Spectrum No.**	1

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	468 (1404 keV)		
Ch. Width (eV)		3	3.12		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		5566	5889	988	
Count Rate (cps)		9.27	9.82	1.65	
Dose Rate (mGy/a)		0.18	0.191	0.175	0.200
Error			0.013	0.010	0.010
Mean Dose Rate (mGy/a)			0.18 ± 0.01 , + ^{137}Cs 0.016 ± 0.01		

Location and geometry
Shoulder in spectrum around 180 – 200: 540 – 600 keV
DR>450 > DR>1350: ^{137}Cs, but very minor
Mixed spectrum (more than Karabai), ^{40}K smallish but OK
Geometry: ~ 2 π
Hole depth = 0 cm

Estimated solid angle (π Rad.)	2 π	**4π Gamma dose rate (mGy/a)**	0.36 ± 0.02 + ^{137}Cs 0.03 ± 0.02

TL Samples
-

Date	13/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G077.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Sary-Kaya	**Measurement Date**	13/08/04
Context	4	**Spectrum No.**	2

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	479 (1496 keV)		
Ch. Width (eV)		3	3.05		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		12229	12666	2508	
Count Rate (cps)		20.38	21.11	4.18	
Dose Rate (mGy/a)		0.40	0.412	0.445	0.437
Error			0.02	0.02	0.02
Mean Dose Rate (mGy/a)			0.43 ± 0.02		

Location and geometry

~ 1.5 m from edge of section (not vertical).
and see TL sample sheet
Geometry: π at surface of section,
Hole depth = 20 cm
Relatively U and Th rich spectrum (>1350 dose rate is >450)

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.43 ± 0.02

TL Samples
EFD4L244

Date	13/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G078.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Sary-Kaya	**Measurement Date**	13/08/04
Context	5	**Spectrum No.**	3

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	478 (1459 keV)		
Ch. Width (eV)		3	3.06		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		11371	11757	2350	
Count Rate (cps)		18.95	19.6	3.92	
Dose Rate (mGy/a)		0.37	0.38	0.42	0.41
Error			0.02	0.02	0.02
Mean Dose Rate (mGy/a)			0.40 ± 0.02		

Location and geometry

50 cm below EFD4G077, and see TL sample sheet
Geometry: π at surface of section,
Hole depth = 19 cm
If slightly lower dose rate than G077 and G079 (not significantly), this is probably because of more limestone in 5 and around: see TL sample sheets.
Relatively more ^{40}K than G077 looking at spectrum, but >1350 keV still > 450 keV

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.40 ± 0.02

TL Samples
EFD4L245

Date	13/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G079.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Sary-Kaya	**Measurement Date**	13/08/04
Context	6	**Spectrum No.**	4

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	475 (1452.8 keV)		
Ch. Width (eV)		3	3.08		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		12338	12847	2610	
Count Rate (cps)		20.6	21.4	4.4	
Dose Rate (mGy/a)		0.40	0.42	0.46	0.45
Error			0.02	0.02	0.02
Mean Dose Rate (mGy/a)			0.44 ± 0.02		

Location and geometry

~ 1.5 m from edge of section (not vertical).
and see EFD4G077 and TL sample sheet
Geometry: π at surface of section,
Hole depth = 20 cm
U & Th rich? >1350 keV still > > 450 keV

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.44 ± 0.02

TL Samples
EFD4L246

Date	13/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G080.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi V	**Measurement Date**	14/08/04
Context	III/3	**Spectrum No.**	1

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	461 [is this one of U/Th series?] (1455 keV)		
Ch. Width (eV)		3	3.17		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		9364	10079	1921	
Count Rate (cps)		7.80	8.40	1.60	
Dose Rate (mGy/a)		0.15	0.16	0.17	0.18
Error			0.01	0.01	0.01
Mean Dose Rate (mGy/a)			0.17 ± 0.01		

Location and geometry

Measurement at surface of section to test approx dose rate.
~ 3.5 m below top of section.
~ 0.5 m from base of section.
~ 5 m across from opposite wall of pit
and see TL sample sheet
Geometry: 2 π at surface of section, ~ 3.8 π including pit walls
Hole depth = 0 cm

Estimated solid angle (π Rad.)	2 π / 3.8 π	**4π Gamma dose rate (mGy/a)**	?

TL Samples
-

Date	14/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G081.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi II	**Measurement Date**	14/08/04
Context	Surface	**Spectrum No.**	2

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	463 (1389 keV) [is this too low? U/Th series]		
Ch. Width (eV)		3	3.16		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		3782	4052	707	
Count Rate (cps)		6.3	6.75	1.17	
Dose Rate (mGy/a)		0.12	0.131	0.125	0.138
Error			0.007	0.008	0.007
Mean Dose Rate (mGy/a)			0.13 ± 0.01		

Location and geometry

Modern surface ~3m uphill (N) of excavation – no spoil
Adjacent to modern surface sample
Peak Ch 180-200 (540-600 keV): ^{137}Cs or one of U/Th series
^{40}K small but seems to be there
>1350 keV > >450 keV indicating ^{137}Cs, but only by 0.006 – within errors so take average
and see TL sample sheet
Geometry: 2 π
Hole depth = 0 cm

Estimated solid angle (π Rad.)	2 π	**4π Gamma dose rate (mGy/a)**	0.26 ± 0.02

TL Samples
EFD4L259

Date	14/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G082.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi II	**Measurement Date**	14/08/04
Context	Surface of spoil next to pit	**Spectrum No.**	3

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	467 (1481 keV) [^{40}K? see previous]		
Ch. Width (eV)		3	3.13		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		3993	4236	869	
Count Rate (cps)		6.66	7.06	1.45	
Dose Rate (mGy/a)		0.13	0.14	0.15	0.15
Error			0.01	0.01	0.01
Mean Dose Rate (mGy/a)			0.15 ± 0.01		

Location and geometry

Spoil from 2002 excavation – Platform downhill from excavation. Thick spoil. Not much features in spectrum, but possible ^{40}K peak. However, still coming out at 460 ish. Shoulder ~520keV indicates U/Th series…not K at 4___? – see G084.
Geometry: 2 π
Hole depth = 0 cm

Estimated solid angle (π Rad.)	2 π	**4π Gamma dose rate (mGy/a)**	0.30 ± 0.02

TL Samples
-

Date	14/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G083.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi II	**Measurement Date**	14/08/04
Context	Limestone surface – top of block next to pit	**Spectrum No.**	4

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	471 (1474 keV)		
Ch. Width (eV)		3	3.10		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		2708	2854	564	
Count Rate (cps)		4.51	4.76	0.94	
Dose Rate (mGy/a)		0.088	0.093	0.100	0.102
Error			0.005	0.006	0.005
Mean Dose Rate (mGy/a)			0.098 ± 0.005		

Location and geometry

Top of limestone block forming the sediment trap that is Kabazi II itself – just downhill from top of RHS of sampled section.
Virtually no ^{40}K peak apparent by eye. Shoulder around 520 keV evident again.
Still questions over ^{40}K position, so see G084.
Geometry: 2 π
Hole depth = 0 cm

Estimated solid angle (π Rad.)	2 π	**4π Gamma dose rate (mGy/a)**	0.20 ± 0.01

TL Samples
-

Date	14/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G084.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	House in Vishennoe	**Measurement Date**	14/08/04
Context	Porch floor, corner	**Spectrum No.**	5

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	460 (1380 keV)		
Ch. Width (eV)		3	3.10		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		5322	5705	1133	
Count Rate (cps)		8.87	9.51	1.89	
Dose Rate (mGy/a)		0.17	0.19	0.20	0.20
Error			0.01	0.01	0.01
Mean Dose Rate (mGy/a)			0.20 ± 0.01		

Location and geometry

Measurement to check energy calibration / instrument performance and whether the peak used for calibration during data processing for the Kabazi samples was really ^{40}K. see G080 – 83, and G085 & 6.

Measurement in corner of porch: concrete floor with limestone aggregate, walls of uncertain construction, but probably local materials.

^{40}K appears to be present, but is small as at Kabazi.
Automatic calibration indicateS4^{0}K in channel 460, as for measurements at Kabazi.

Geometry: >3 π
Hole depth = 0 cm

Estimated solid angle (π Rad.)		**4π Gamma dose rate (mGy/a)**	

TL Samples
-

Date	14/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G085.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	House in Vishennoe	**Measurement Date**	14/08/04
Context	Stove top in corner of room	**Spectrum No.**	6

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	469 (1407 keV)		
Ch. Width (eV)		3	3.12		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		13079	13794	2746	
Count Rate (cps)		21.80	22.99	4.58	
Dose Rate (mGy/a)		0.42	0.45	0.49	0.47
Error			0.02	0.02	0.02
Mean Dose Rate (mGy/a)			0.47 ± 0.02		

Location and geometry

Measurement to check energy calibration / instrument performance and whether the peak used for calibration during data processing for the Kabazi samples was really ^{40}K. see G080 – 83, and G084 & 6.

Measurement on stove in corner of room: possibly higher K environment – stove is steel with brick inside, chimney and stove may be of imported firebrick – higher K, also tiles around stove probably imported.

Much higher gamma dose rate, including stronger 40K peak. Aghain appears in Ch 460 – 470 region rather than 480.

Estimated solid angle (π Rad.)		**4π Gamma dose rate (mGy/a)**	

TL Samples
-

Date	14/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G086.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	House in Vishennoe	**Measurement Date**	14/08/04
Context	Stove top in corner of room	**Spectrum No.**	1(series2)

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	487 (1407 keV)		
Ch. Width (eV)		3	3.002		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		13199	13464	2438	
Count Rate (cps)		22.00	22.44	4.06	
Dose Rate (mGy/a)		0.43	0.44	0.43	0.46 (why higher?)
Error			0.02	0.02	0.02
Mean Dose Rate (mGy/a)			0.44 ± 0.02		

Location and geometry

Closer to chimney than G085 to try to increase 40K from fire bricks. No increase, but gamma dose rate assuming 40K at Ch 487 is equal. Dgamma calibrated in Rainbow 3 gives slightly lower than G085, so repeat in same position (G087).
However, 40K has returned beyond Ch 480, so no gain/HV adjustment required.

MCA was opened and loose screw removed, batteries removed and put back between G085 and G086: Still more likely that everything has simply cooled down…

Estimated solid angle (π Rad.)		**4π Gamma dose rate (mGy/a)**	

TL Samples
-

Date	14/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G087.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	House in Vishennoe	**Measurement Date**	15/08/04
Context	Stove top in corner of room	**Spectrum No.**	1

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	491 (1474 keV)		
Ch. Width (eV)		3	2.98		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		13665	13781	2528	
Count Rate (cps)		22.8	23.0	4.21	
Dose Rate (mGy/a)		0.44	0.45	0.45	0.47 (why higher?)
Error			0.02	0.02	0.02
Mean Dose Rate (mGy/a)			0.46 ± 0.02		

Location and geometry

As G085.
Gamma dose rate calibrated in Rainbow 3 is well within errors of G085 result, despite 40K position having drifted from Ch 469 to Ch 491…
Rainbow 3 dose rate is higher than field gamma dose rate in both cases…different factors somewhere

Estimated solid angle (π Rad.)		**4π Gamma dose rate (mGy/a)**	

TL Samples
-

Date	15/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G088.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi V	**Measurement Date**	17/08/04
Context	Layer 12, Context III/1A	**Spectrum No.**	1

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	475 (1425 keV)		
Ch. Width (eV)		3	3.08		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		5717	5964	1109	
Count Rate (cps)		9.53	9.94	1.85	
Dose Rate (mGy/a)		0.19	0.19	0.20	0.21
Error			0.01	0.01	0.01
Mean Dose Rate (mGy/a)			0.20 ± 0.01		

Location and geometry

~ 3.5 m below top of section.
~ 0.5 m from base of section.
~ 5 m across from opposite wall of pit
Geometry: 2 π at surface of section, ~ 3.8 π including pit walls
Hole depth = 30 cm (tube inserted at back of pollen sampling column)
and see TL sample sheet

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.20 ± 0.01

TL Samples
EFD4L260

Date	18/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G089.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi V	**Measurement Date**	17/08/04
Context	Layer 12, Context III/3A	**Spectrum No.**	2

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	465 (1425 keV)		
Ch. Width (eV)		3	3.14		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		5265	5565	1079	
Count Rate (cps)		8.8	9.28	1.80	
Dose Rate (mGy/a)		0.17	0.18	0.19	0.20
Error			0.01	0.01	0.01
Mean Dose Rate (mGy/a)			0.19 ± 0.01		

Location and geometry

~ 3.5 m below top of section.
~ 0.5 m from base of section.
~ 5 m across from opposite wall of pit
Geometry: 2 π at surface of section, ~ 3.8 π including pit walls
Hole depth = 29 cm (tube inserted at back of pollen sampling column)
and see TL sample sheet

^{40}K not visible in spectrum

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.19 ± 0.01

TL Samples
EFD4L261

Date	17/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G090.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi V	**Measurement Date**	17/08/04
Context	Layer 12A, Context III/5	**Spectrum No.**	3

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	493 (1479 keV)		
Ch. Width (eV)		3			
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		5476	5512	976	
Count Rate (cps)		9.13	9.19	1.63	
Dose Rate (mGy/a)		0.18	0.18	0.17	0.19
Error			0.01	0.01	0.01
Mean Dose Rate (mGy/a)			0.18 ± 0.01		

Location and geometry

~ 3.5 m below top of section.
~ 0.5 m from base of section.
~ 5 m across from opposite wall of pit
Geometry: 2 π at surface of section, ~ 3.8 π including pit walls
Hole depth = 34 cm (tube inserted at back of pollen sampling column)
and see TL sample sheet

^{40}K visible in spectrum

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.18 ± 0.01

TL Samples
EFD4L262

Date	17/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G091.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi V	**Measurement Date**	17/08/04
Context	Layer 14, Context IV/1	**Spectrum No.**	4

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	497 (1473 keV)		
Ch. Width (eV)		3	2.94		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		5833	5839	1067	
Count Rate (cps)		9.72	9.73	1.78	
Dose Rate (mGy/a)		0.19	0.190	0.189	0.205
Error			0.010	0.011	0.010
Mean Dose Rate (mGy/a)			0.195 ± 0.010		

Location and geometry

~ 3.5 m below top of section.
~ 0.5 m from base of section.
~ 5 m across from opposite wall of pit
Geometry: 2 π at surface of section, ~ 3.8 π including pit walls
Hole depth = 31 cm (tube inserted at back of pollen sampling column)
and see TL sample sheet

^{40}K visible in spectrum

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.20 ± 0.01

TL Samples
EFD4L263

Date	17/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G092.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi V	**Measurement Date**	17/08/04
Context	Layer 12, Context III/1A	**Spectrum No.**	5

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	495 (1456 keV)		
Ch. Width (eV)		3	2.95		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		5247	5258	958	
Count Rate (cps)		8.7	8.76	1.59	
Dose Rate (mGy/a)		0.17	0.17	0.17	0.19
Error			0.01	0.01	0.01
Mean Dose Rate (mGy/a)			0.18 ± 0.01		

Location and geometry

As for G088 (Context III/1A, ??? cm left from boundary Square 6В-6Б), but with probe at surface of section: for comparison with surface dose rates around EFD4L264 and L265

~ 3.5 m below top of section.
~ 0.5 m from base of section.
~ 5 m across from opposite wall of pit
Geometry: 2 π at surface of section, ~ 3.8 π including pit walls
Hole depth = ~4 cm (tube placed at back of pollen sampling column)
and see TL sample sheet

^{40}K visible in spectrum

Dose rate in 35 cm hole (G088) = 0.20 ± 0.01, dose rate at surface (entrance to hole) = 0.18 ± 0.01 } why bother with hole?… 3.8 π geometry from pit walls keeps dose rate similar to context, but any variations will be AVERAGED OUT.

Estimated solid angle (π Rad.)	2 π or 3.8 π ?	**4π Gamma dose rate (mGy/a)**	0.20 ± 0.03 from in G088

TL Samples
-

Date	17/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G093.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi V	**Measurement Date**	17/08/04
Context	Layer 12, Context III/1A	**Spectrum No.**	6

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	499 (!!) (1473 keV)		
Ch. Width (eV)		3	2.93		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		5236	5203	914	
Count Rate (cps)		8.73	8.67	1.52	
Dose Rate (mGy/a)		0.17	0.17	0.16	0.18
Error			0.01	0.01	0.01
Mean Dose Rate (mGy/a)			0.17 ± 0.01		

Location and geometry

Surface of section, in front of Burnt flint sampling location (EFD4L264): Context III/1A, 26 cm right from boundary Square 6В-6Б).

~ 3.5 m below top of section.
~ 0.5 m from base of section.
~ 5 m across from opposite wall of pit
Geometry: 2 π at surface of section, ~ 3.8 π including pit walls
Hole depth = 0 cm
and see TL sample sheet

^{40}K visible in spectrum

Within errors of surface measurement G092, therefore dose rate should be approx equal to G088, but allow extra uncertainty

Estimated solid angle (π Rad.)	2 π or 3.8 π ?	**4π Gamma dose rate (mGy/a)**	0.20 ± 0.03 from in G088

TL Samples
EFD4L264

Date	17/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G094.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi V	**Measurement Date**	17/08/04
Context	Layer 12, Context III/1A	**Spectrum No.**	7

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	488 (1429 keV)		
Ch. Width (eV)		3	2.996		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		5383	5464	981	
Count Rate (cps)		8.97	9.11	1.64	
Dose Rate (mGy/a)		0.17	0.178	0.174	0.192
Error			0.009	0.010	0.009
Mean Dose Rate (mGy/a)			0.18 ± 0.01		

Location and geometry

Surface of section, in front of Burnt flint sampling location (EFD4L265): Context III/1A, 30 cm right from boundary Square 6В-6Б).

~ 3.5 m below top of section.
~ 0.5 m from base of section.
~ 5 m across from opposite wall of pit
Geometry: 2 π at surface of section, ~ 3.8 π including pit walls
Hole depth = 0 cm
and see TL sample sheet

^{40}K visible in spectrum

Within errors of surface measurement G092, therefore dose rate should be approx equal to G088, but allow extra uncertainty

Estimated solid angle (π Rad.)	2 π or 3.8 π ?	**4π Gamma dose rate (mGy/a)**	0.20 ± 0.03 from in G088

TL Samples
EFD4L265

Date	17/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G095.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi II	**Measurement Date**	21/08/04
Context	Layer 7, Context II/7AB	**Spectrum No.**	11

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	487		
Ch. Width (eV)		3	3.00		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		2213	2278	435	
Count Rate (cps)		7.38	7.59	1.45	
Dose Rate (mGy/a)		0.143	0.15	0.15	0.16
Error			0.01	0.01	0.01
Mean Dose Rate (mGy/a)			0.153 ± 0.007		

Location and geometry

~ 7 m across from opposite wall of pit
Geometry: ~ 3.2 π at surface of section
Hole depth = ? cm
and see TL sample sheet

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.15 ± 0.01

TL Samples
EFD4L266

Date	22/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G096.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi II	**Measurement Date**	21/08/04
Context	Layer 9, Arch IIA/2	**Spectrum No.**	10

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	461 (1384 keV)		
Ch. Width (eV)		3	3.17		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		2518	2716	534	
Count Rate (cps)		8.393	9.05	9.78	
Dose Rate (mGy/a)		0.164	0.177	0.190	0.190
Error			0.01	0.01	0.01
Mean Dose Rate (mGy/a)			0.187 ± 0.007		

Location and geometry

~ 7 m across from opposite wall of pit
Geometry: ~ 3.2 π at surface of section
Hole depth = ? cm
and see TL sample sheet

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.187 ± 0.007

TL Samples
EFD4L267

Date	22/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G097.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi II	**Measurement Date**	21/08/04
Context	Layer 10	**Spectrum No.**	9

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	477 (1512 keV)		
Ch. Width (eV)		3	3.06		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		2499	2625	461	
Count Rate (cps)		8.33	8.75	1.54	
Dose Rate (mGy/a)		0.162	0.171	0.164	0.181
Error			0.009	0.011	0.009
Mean Dose Rate (mGy/a)			0.162 ± 0.008		

Location and geometry

~ 7 m across from opposite wall of pit
Geometry: ~ 3.5 π at surface of section
Hole depth = ? cm
and see TL sample sheet

near boundary of layers 9 and 10 on section diagram, but as noted during sampling was within layers of "fining up".

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.162 ± 0.008

TL Samples
EFD4L268

Date	22/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G098.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi II	**Measurement Date**	21/08/04
Context	Layer 11 Upper	**Spectrum No.**	8

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	472 (1446 keV)		
Ch. Width (eV)		3	3.10		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		2764	2887	577	
Count Rate (cps)		9.21	9.62	1.92	
Dose Rate (mGy/a)		0.18	0.190	0.205	0.203
Error			0.010	0.013	0.010
Mean Dose Rate (mGy/a)			0.20 ± 0.01		

Location and geometry

~ 7 m across from opposite wall of pit
Geometry: ~ 3.5 π at surface of section
Hole depth = ? cm
and see TL sample sheet

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.20 ± 0.01

TL Samples
EFD4L269

Date	22/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G099.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi II	**Measurement Date**	21/08/04
Context	Layer 11 Lower	**Spectrum No.**	7

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	477		
Ch. Width (eV)		3	3.06		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		2725	2816	551	
Count Rate (cps)		9.08	9.39	1.84	
Dose Rate (mGy/a)		0.18	0.183	0.196	0.198
Error			0.010	0.012	0.010
Mean Dose Rate (mGy/a)			0.19 ± 0.01		

Location and geometry

~ 7 m across from opposite wall of pit
Geometry: ~ 3.5 π at surface of section
Hole depth = ? cm
and see TL sample sheet

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.19 ± 0.01

TL Samples
EFD4L270

Date	22/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G100.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi II	**Measurement Date**	21/08/04
Context	Layer 13	**Spectrum No.**	6

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	493		
Ch. Width (eV)		3	2.97		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		3336	3360	603	
Count Rate (cps)		11.12	11.2	2.01	
Dose Rate (mGy/a)		0.22	0.218	0.214	0.232
Error			0.012	0.013	0.011
Mean Dose Rate (mGy/a)			0.22 ± 0.01		

Location and geometry

~ 7 m across from opposite wall of pit
Geometry: ~ 3.5 π at surface of section
Hole depth = ? cm
and see TL sample sheet

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.22 ± 0.01

TL Samples
EFD4L271

Date	22/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G101.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi II	**Measurement Date**	21/08/04
Context	Layer 13A	**Spectrum No.**	5

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	467		
Ch. Width (eV)		3	3.13		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		3480	3688	663	
Count Rate (cps)		11.6	12.29	2.21	
Dose Rate (mGy/a)		0.23	0.240	0.235	0.254
Error			0.013	0.014	0.012
Mean Dose Rate (mGy/a)			0.244 ± 0.01		

Location and geometry

~ 7 m across from opposite wall of pit
Geometry: 3.8 π at surface of section
Hole depth = ? cm
and see TL sample sheet

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.24 ± 0.01

TL Samples
EFD4L272

Date	22/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G102.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi II	**Measurement Date**	21/08/04
Context	Layer 14A	**Spectrum No.**	4

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	473		
Ch. Width (eV)		3	3.09		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		3840	4019	810	
Count Rate (cps)		12.8	13.36	2.70	
Dose Rate (mGy/a)		0.25	0.261	0.288	0.279
Error			0.014	0.017	0.014
Mean Dose Rate (mGy/a)			0.276 ± 0.01		

Location and geometry

~ 7 m across from opposite wall of pit
Geometry: 3.8 π at surface of section
Tube could not be driven in far: Hole depth = 12 cm after chiseling of Limestone block!
and see TL sample sheet

Estimated solid angle (π Rad.)	4 π?	**4π Gamma dose rate (mGy/a)**	0.28 ± 0.01

TL Samples
EFD4L273

Date	22/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G103.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi II	**Measurement Date**	21/08/04
Context	Layer 14B	**Spectrum No.**	3

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	485		
Ch. Width (eV)		3	3.01		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		4206	4292	789	
Count Rate (cps)		14.02	14.31	2.63	
Dose Rate (mGy/a)		0.27	0.279	0.280	0.296
Error			0.015	0.017	0.014
Mean Dose Rate (mGy/a)			0.285 ± 0.01		

Location and geometry

~ 7 m across from opposite wall of pit
Geometry: 3.8 π at surface of section
Hole depth = 18 cm
and see TL sample sheet

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.29 ± 0.01

TL Samples
EFD4L274

Date	22/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G104.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi II	**Measurement Date**	21/08/04
Context	Layer 14B1	**Spectrum No.**	2

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	473		
Ch. Width (eV)		3	3.09		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		3829	3986	792	
Count Rate (cps)		12.76	13.3	2.64	
Dose Rate (mGy/a)		0.25	0.259	0.281	0.276
Error			0.014	0.017	0.014
Mean Dose Rate (mGy/a)			0.272 ± 0.01		

Location and geometry

~ 7 m across from opposite wall of pit
Geometry: 3.9 π at surface of section
Hole depth = 25 cm
and see TL sample sheet

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.27 ± 0.01

TL Samples
EFD4L275

Date	22/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G105.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Kabazi II	**Measurement Date**	21/08/04
Context	Layer 10 Lower / 11 Upper "Krutitsa"	**Spectrum No.**	12

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	458		
Ch. Width (eV)		3	3.19		
Count Time(s)	**183**	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		1349	1454	295	
Count Rate (cps)		7.37	7.95	1.61	
Dose Rate (mGy/a)		0.14	0.15	0.17	0.17
Error			0.01	0.01	0.01
Mean Dose Rate (mGy/a)			0.165 ± 0.007		

Location and geometry

Check on soil for loessic content (High dose rate)

~ 7 m across from opposite wall of pit
Geometry: 3.5 π at surface of section
Hole depth = 0 cm
and see TL sample sheet

Detector held adjacent to vertical surface ~ ½ way up section where a "Krutitsa" soil had been reported. Gamma spectrometry shows no evidence of elevated dose rates, therefore …

Estimated solid angle (π Rad.)	2π surface , ~3.5π tot	**4π Gamma dose rate (mGy/a)**	~0.2 ± 0.01

TL Samples
-

Date	22/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G106.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Karabai	**Measurement Date**	24/08/04
Context	II	**Spectrum No.**	1

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	479		
Ch. Width (eV)		3	3.05		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		10075	10417	2036	
Count Rate (cps)		16.8	17.4	3.39	
Dose Rate (mGy/a)		0.33	0.339	0.361	0.363
Error			0.018	0.019	0.018
Mean Dose Rate (mGy/a)			0.35 ± 0.02		

Location and geometry

Geometry: 3.5 π at surface of section
Hole depth = 13 cm
and see TL sample sheet
^{40}K clear, but U + Th strong - indicates Ch2 gamma DR higher than Ch1?

Estimated solid angle (π Rad.)	~4 π	**4π Gamma dose rate (mGy/a)**	0.35 ± 0.01

TL Samples
EFD4L311

Date	25/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G107.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Karabai	**Measurement Date**	24/08/04
Context	III/2	**Spectrum No.**	2

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	491		
Ch. Width (eV)		3	2.98		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		10159	10238	2013	
Count Rate (cps)		16.9	17.06	3.36	
Dose Rate (mGy/a)		0.33	0.339	0.361	0.363
Error			0.017	0.019	0.017
Mean Dose Rate (mGy/a)			0.35 ± 0.02		

Location and geometry

~ 3.5 m from RHS of section
Geometry: 3.5 π at surface of section
Hole depth = 12 cm
and see TL sample sheet
Spectrum similar to G106

Estimated solid angle (π Rad.)	~4 π	**4π Gamma dose rate (mGy/a)**	0.35 ± 0.02

TL Samples
EFD4L312

Date	25/08/04
Completed By	CIB
Checked By	

Log No.		**Instrument**	Rainbow No.1
Filename	EFD4G108.asc (EFD4G---.asc)	**Detector**	2"x 2"
Project	EFCHED	**Conversion Factors**	Ch1 = 1.95 E-02 Ch2 = 1.07 E-01 (mGy/a/cps)
Site	Karabai	**Measurement Date**	25/08/04
Context	4-2	**Spectrum No.**	1

		Field	**Analysis (Package = Rainbow3)**		
^{40}K in Ch.		487	479		
Ch. Width (eV)		3	3.05		
Count Time(s)	600	**Ch1 (>450KeV)**	**Ch1 (>450KeV)**	**Ch2 (>1350KeV)**	**E**
Integral Counts		10716	11092	2182	
Count Rate (cps)		17.9	18.49	3.64	
Dose Rate (mGy/a)		0.35	0.360	0.387	0.384
Error			0.019	0.020	0.019
Mean Dose Rate (mGy/a)			0.38 ± 0.02		

Location and geometry

~ 3.5 m from RHS of section
14 cm above ponded water at bottom of excavation
Geometry: 3.5 π at surface of section
Hole depth = 20 cm
and see TL sample sheet

Estimated solid angle (π Rad.)	4 π	**4π Gamma dose rate (mGy/a)**	0.38 ± 0.02

TL Samples
EFD4L331

Date	25/08/04
Completed By	CIB
Checked By	

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